

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF
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END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 General Requirements**

- 1.1.1 Project Location is: 3190 Mavis Road, Mississauga, ON.
- 1.1.2 The requirements of the Articles of Agreement, Conditions of the Contract, Division 1 apply to and from all Sections of the Contract Documents and the Work.
- 1.1.3 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.
- 1.1.4 It is intended that the Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Include materials not herein mentioned, but which may be found necessary to complete or perfect any portion of the Work in accordance with the Contract Documents.
- 1.1.5 Work designated as “not in contract” (NIC) is not included in this Contract.
- 1.1.6 Specifications, schedules and Contract Drawings are complementary, and items mentioned or indicated on one, may not necessarily be mentioned or indicated on the others, but shall in all cases be included in the Contract.
- 1.1.7 The Specifications have generally been divided into Divisions and Divisions into Sections for reference, but a Section may consist of the work of more than one Subcontractors or supplier. The responsibility of for determining which Subcontractor or supplier shall provide labour, material, products, equipment and services to complete the Work rests solely with the Contractor.
- 1.1.8 The terms “review”, “acceptance”, “acceptable”, “satisfactory”, “selected”, “directed”, “required”, “submit”, or similar words or phrases which are used in standards or elsewhere in the Contract Documents, it shall be understood, that words “by (to) the Agency” follow, unless context provides otherwise.
- 1.1.9 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 outside the building. Where any part of a surface is exposed to view, all other portions of that surface to be considered as exposed to view.
- 1.1.10 This Work includes but is not limited to removals and construction of the Second Floor Expansion at the Agency’s (Region of Peel) TransHelp (Accessible Transportation) Facility and PRPS (Peel Regional Paramedic Services) Satellite Station at 3190 Mavis Road in Mississauga as indicated in Contract Documents and specified in various Sections of Specification. This will also include modifications/extension to the current building systems, and site adjustments as applicable.

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1.2 High Level Summary of Major Work

Work covered by this Contract includes, but is not limited to the following:

- 1.2.1 Work in this Contract includes furnishing labour, materials, products, equipment, services and other related expenses to execute selective demolition and complete construction of the facility specified under Contract Documents including fit-out of the furniture, fixtures and equipment.
 - 1.2.2 Approximately 450.4m² of new construction of a second story addition for the Agency to be occupied by Accessible Transportation (TransHelp) and Peel Regional Paramedic Services (PRPS) Satellite Station complete with mechanical, electrical, lighting, communication, security, sound masking, fire protection systems, BAS Upgrades etc. as indicated in the Contract Documents and Specified in the Specifications.
 - 1.2.3 The Agency will apply and provide building permits to the successful Contractor. Contractor is responsible to coordinate with the municipalities and arrange for all required inspections and will be responsible for closure of all the permits. Arrange for all other permits, pay the fee and arrange for inspections required by authorities having jurisdiction including TSSA and ESA.
 - 1.2.4 All the materials/components to be used on this project shall be new. Material/components removed from the existing system shall not be used anywhere except the items indicated in the Contract Documents. All materials/components removed shall be legally disposed off Site.
 - 1.2.5 The Contractor shall be responsible for locating all existing underground services and utilities in working area prior to digging. The Contractor will arrange and pay for locating and protecting all existing underground utilities and services such as hydro, natural gas, Public Sector Network (PSN) fibres, cable TV, underground fuel tanks and pipes and all other services prior to and during construction. Damages by the Contractor shall be restored to the satisfaction of the utility companies/Consultant at no expenses to the Agency. Do not dig before locate work is completed.
 - 1.2.6 Hand dig within one (1) meter of (or when crossing) hydro, gas, PSN fibre, TV cable, fuel tanks & pipes etc.
 - 1.2.7 Structural work as indicated in the Contract Documents.
 - 1.2.8 Relocate existing condensing unit, extend electrical wiring, control wiring and refrigerant piping as shown on the Contract Drawing. Supply, install, test and commission new mechanical and electrical units as shown on Contract Drawings complete with electrical wiring, control wiring and refrigerant piping. Other mechanical equipment such as radiant panel, energy recovery ventilator, electric duct heater, electric heater, HVAC fans, and diffuser shall be supplied, installed, test and commission as per the Contract Drawings.
 - 1.2.9 The Contractor is responsible for hiring an Engineer with PEO designation to review the Sprinkler Drawings, Specification, submission of all the required documents to the City of Mississauga, supervise and approve the
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- installation as per permit/other documents. Pay all the required fees.
- 1.2.10 Upgrade the existing BAS as specified in the Contract Drawings and detailed in the Specification.
 - 1.2.11 Provide air and water balancing c/w reports and equipment start-up c/w reports.
 - 1.2.12 Provide Testing, Adjusting, Balancing, Commissioning and Performance verification of the mechanical systems.
 - 1.2.13 Provide electrical distribution systems, communications, conduit systems, grounding systems, lighting, lighting control system, fire alarm system, security and access control and CCTV, lightning protection, etc., as specified and shown on the Contract Drawings. All electrical work to have fully functional systems.
 - 1.2.14 All the cables used on this project shall be copper and inside the conduit. All the conduits shall be concealed in walls/ceiling/slabs. No exception.
 - 1.2.15 The Contractor is required to power-up the input points for the system furniture with the building power including terminations. The Contractor will also provide all communications cables and jacks for data. All communication cables are required to be jacketed, plated, labelled and terminated into the system furniture. The cost shall be included in the Contract Price (not to allowance). The Contractor will co-ordinate all related work with the Consultant and the Agency.
 - 1.2.16 Contractor will include Ten (10) duplex power duplex power receptacles/connections for 120V power and Fifteen (15) data outlets/connections complete with conduit, cables and breakers as required in addition to what is shown on the Contract Drawings with average length of cables 30 feet in the Contract Price. Location will be decided during the construction phase by the Consultant/Agency.
 - 1.2.17 Provide selective demolition and extend the lighting protection system in the other building areas as shown on the Contract Drawings and obtain necessary approvals by the authorities having jurisdiction. Provide a copy of certification of installation and test report upon completion of work. The work on the lighting protection system shall be performed by Buchell Lightning Protection Ltd, Ontario.
 - 1.2.18 Carefully remove all second floor patio stones and transport to Agency's other facility located at 3515 Wolfedale Road, Mississauga. Include loading, transportation and unloading cost in the Contract Lump-Sum Price. The distance between these two facility is around four (4) kilometers.
 - 1.2.19 Provide Sound Masking System in open office area and meeting rooms. This work will be performed by Environmental Acoustics as required by the Agency.
 - 1.2.20 Work on extension of the existing access control system will be performed by OHM Security. Five (5) new doors to be secured through card readers. The existing double door leading to patio has two (2) existing card readers from both sides with Automatic Door Operators (ADO). The Security
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Contractor will remove the card readers and ADO's from both the sides before the start of Contractor and re-install one card reader and ADO on the lobby side only on the new door. The extra card reader, accessories and ADO will be returned to the Agency.

- 1.2.21 Remove two (2) exterior building mounted CCTV cameras (North-East & South-East corner of the building) before start of construction, storage and re-installation and testing of cameras at the same location after completion of construction. The work shall be done by OHM Security. Include cost of extension of cable & conduit, as required.
 - 1.2.22 Protect and maintain including watering all the existing landscape work including bioswale in the construction area. Repair damaged landscape work after construction work to the satisfaction of the Consultant/Agency.
 - 1.2.23 Contractor will be responsible for snow removal on site. Contractor will remove snow from access road, site circulation path and elsewhere as required to permit access to the work, parking and other construction area to facilitate the construction work.
 - 1.2.24 Contractor will ensure clear access to the temporary office of Peel Regional Paramedic Services (PRPS) is always maintained for movement of ambulance. Refer to attached **Appendix- 8.5** showing tentative location of PRPS temporary office and movement of ambulances within site. Further, access to the fuel island shall also be maintained all the time during construction.
 - 1.2.25 Contractor will coordinate with commissioning consultant engaged by the Agency. Provide documents and attend meetings with the commissioning consultant as requested by them throughout the execution of the project. The proposed commissioning plan is attached at **Appendix-8.6**. Provide completed and approved commissioning (Cx) documentation to Consultant for review and approve Cx documentation.
 - 1.2.26 Prior to execution of work, take photographs of all areas in the facility including landscape area to capture existing conditions and submit the same to the Consultant/Agency. All areas shall be restored to original condition or better after completion of work.
 - 1.2.27 Unless noted otherwise, upon completion of the Work, Contractor is responsible for restoring interior finishes to existing base building condition or better, including but not limited to patching and painting.
 - 1.2.28 Remove the existing carpet tiles in the open office area, meeting rooms and into other areas on the ground floor, store in safe place and re-install after construction to the satisfaction of the Agency.
 - 1.2.29 Elevator can be reserved for the Contractor's use for limited time. in a pre-Contractor shall coordinate with the Agency for booking of elevator. Contractors shall properly cover all inside surfaces of the elevator to protect from being damaged.
 - 1.2.30 Provide temporary heating required during entire construction period, including equipment, maintenance and fuel.
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- 1.2.31 All building electrical power shutdown(s), if required, shall be scheduled on Saturday between the hours of 9:00AM and 5:00 PM. Advance notice to the Agency will be required.
- 1.2.32 Provide new penetrations (holes) in walls & floors as required to facilitate/execute the work.
- 1.2.33 All cutting, scanning ,coring, patching and painting work as required to facilitate the work. Scanning to be done prior to coring in all cases.
- 1.2.34 Modifications of existing penetrations (holes) in walls & floors including removal of existing concrete and provision of new penetrations (holes) in walls & floors as required to facilitate the work.
- 1.2.35 Sealing of all penetrations. Seal all penetrations in fire rated assemblies (walls and floors) with approved fire rated materials/assemblies.
- 1.2.36 Prepare and submit progress report every two (2) weeks in PDF. Progress report shall be complete with site photographs. A sample of progress report may be shared by the Contractor at the pre-construction meeting with successful Contractor.
- 1.2.37 The Contractor will submit Site Specific Safety Plan and Crane Safety/Hoisting Plan to the Agency for approval by Health and Safety Associates of the Region of Peel.
- 1.2.38 All the warranties on this project will start from the date of Ready-for-Takeover.
- 1.2.39 The Contractor will complete all the required forms and application, worksheet, calculations and other related documents in timely manner to obtain the SaveONenergy financial incentives and rebates by the Agency for this project before final payment is made. All the cost associated with this work shall be included in the Lump-sum contract price.
- 1.2.40 Access to site shall be generally from Mavis Road. Work shall be specifically confined to work site limits indicated on the Contract Drawings and generally within area defined by property lines. Work on Municipal property shall be carried out under regulations of respective Municipality (City of Mississauga and/or Region of Peel) and authorities having jurisdiction including without any limitations any associated fees, permits, insurance or bonding required. The Contractor will assume responsibility for care, custody and control of site and perform work to the extent covered in the Contract Documents. Make good damage to site, to adjacent properties and to rights-of-way caused by Work of this Contract.

1.3 Existing Site Conditions

- 1.3.1 The Contractor and subtrades to accept sole responsibility for any error or neglect on their part in ascertaining the nature of all existing conditions which will affect the Work. No allowances will be made for any difficulties encountered by the Contractor and subtrades due to any features or peculiarities of the site surrounding property, or building, which exist at the time of tender submission.

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- 1.3.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between site conditions and the Contract Documents to the Consultant/Agency prior to the commencement of the Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant/Agency.
 - 1.3.3 Before commencing the Work of any section or trade, carefully examine the Work of other sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant/ Agency, defects which might affect new work. Commencement of the Work shall constitute acceptance of conditions and the work of other sections, trades, and other Subcontractors upon which the new work depends. If repair of surfaces is required after commencement of specific work it shall be included in the Work of the trade providing the specific system or finish.
- 1.4 **Use of Site**
- 1.4.1 Accept full responsibility for assigned work areas from the time of the Contract award until Contract Completion.
 - 1.4.2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances or exits. Direct construction traffic and locate access to site as directed by authorities having jurisdiction.
 - 1.4.3 Where encroachment beyond property limits is necessary make arrangements with respective property agency.
 - 1.4.4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
 - 1.4.5 Remove or alter existing work to prevent injury or damage to portions of existing work which remains.
 - 1.4.6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, to the satisfaction of the Agency.
- 1.5 **Access/Property Constraints**
- 1.5.1 Access to Site shall be from the Mavis Road Gate on Northeast side of property. The Southeast Construction Gate to be used in case of Emergency only.
 - 1.5.2 Noise levels are to comply with local municipal by-laws and be respectful of the adjacent neighborhood.
 - 1.5.3 Provide and maintain access facilities as may be required for access to the Work.
 - 1.5.4 Confine work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.
 - 1.5.5 Determine and make arrangement as required for loading and unloading of
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- equipment and products at times that will not affect public traffic flow and that will be permitted by the local municipality by-laws.
- 1.5.6 Make provisions and arrangements and provide allowances, if times for loading and unloading, allowed by the local municipality, are other than regular working hours.
- 1.5.7 All products, materials and equipment required on site shall be portable and/or size suitable for access and movement on site and without causing damage to buildings.
- 1.5.8 The Work shall be confined to the area defined on the Contract Drawings and by the property lines.
- 1.5.9 Provide locked doors and barriers. Permit access by the Agency and Agency to work areas and to areas Contractor is responsible for.
- 1.5.10 The Contractor is responsible for all direct and indirect costs associated with deposits or pre-ordering costs required for material or equipment etc. The Contractor is responsible for all storage costs for equipment or material as required by the Work. Increases in equipment, material or labour costs subsequent to Tender shall not be justification for any increase in Contract Price. There is no Price Variation Clause (PVC) in this Contract.
- 1.6 **Security**
- 1.6.1 Be responsible for security of all areas affected by the Work of this Contract until taken over by the Agency. Take steps to prevent entry to the site by unauthorized persons and guard against theft, fire and damage by any cause.
- 1.6.2 Provide suitable surveillance equipment and/or employ guard services, as required to adequately protect the Work. Use of facilities such as site entrances as directed by the Agency's personnel and as specified.
- 1.6.3 Take acceptable precautions to guard work site, premises, materials and the public during and after working hours due to the Work of this Contract.
- 1.7 **Continuity of Existing Services**
- 1.7.1 Maintain existing fire main and hydrants as shown on Contract Drawings.
- 1.7.2 Coordinate and provide necessary services, access, exiting and other facilities as required.
- 1.8 **Applicable Standards**
- 1.8.1 All work shall be done in strict compliance with the National Building Code of Canada, Ontario Building Code (OBC), Ontario Fire Code (OFC) the Electrical Safety Code (ESC), and all local and municipal by-laws and requirements. All components of the system shall be ULC listed and labelled. Material shall meet current ASTM and ANSI Standards
- 1.9 **Warranty**
- 1.9.1 Provide **On-Site Warranty** for 2 years for parts, equipment, and labour
-

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from the date of Ready-for-Takeover of the Project. The Warranty service shall be provided with a guaranteed response time of twenty-four hours.

- 1.9.2 Make good promptly, without any expense to the Agency, any defects which occur during the entire warranty period.
- 1.9.3 Prior to the end of the one-year and two-year warranty periods following the date of Ready-for-Takeover of the Work, perform with the Agency inspections of the Work and review any defects or deficiencies which have been observed and reported during that period. Perform appropriate repairs to the Work in accordance with the Contract Documents.
- 1.9.4 The warranties shall in no way supplant any other warranties of a longer period in other Sections of this Specification

1.10 Work Schedule

- 1.10.1 Immediately upon award of Contract and pre-construction meeting, Contractor will start submitting the shop drawings within two weeks to the Consultant for approval and ordering before the start of construction.
- 1.10.2 The Substantial Completion date of the project is April 30, 2025 and attain Ready-for-Takeover by June 30, 2025.
- 1.10.3 All Work under this Project shall be carried out during the normal business hours between 7:00am am to 4:00 pm.
- 1.10.4 Work must be carried out and completed in a continuous period. Be prepared to reschedule some work due to Agency's daily operations and activities without any additional cost to the
- 1.10.5 The Consultant will issue Substantial Completion Certificate (Form-9) upon Substantial Performance of Work.
- 1.10.6 Once the Work has started, it must be carried out and completed in a continuous time.

1.11 Cleaning and Isolation of Work Area

- 1.11.1 Remove all materials, equipment and debris from the property and leave the premises clean and tidy to the Agency's satisfaction. If the site is not kept clean, the Agency reserves the right to have the site cleaned at the Contractor's expense from the outstanding amount owed plus administration.
- 1.11.2 All debris must be removed from the premises and taken to an authorized disposal area at the Contractor's expense at the end of each day's work. Use of the Agency's garbage container is strictly prohibited.
- 1.11.3 Isolate the work area using thick commercial plyboard from floor to ceiling.

1.12 Temporary Facilities and Controls

- 1.12.1 Hoarding, Fencing and Barriers:
 - ,1 Prevent unauthorized entry to the construction site. Barricade, guard or lock access points to the satisfaction of the Consultant/Agency.

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- .2 Install signs for movement of the people and vehicles around the Site as required by the Consultant/Agency.
 - .3 Remove fencing, barriers and barricades upon Contract completion.
- 1.12.2 Scaffolding, Hoists and other lifting devices:
- .1 Select, operate and maintain scaffolding and hoisting equipment as required to perform the Work and as directed by the Consultant/Agency.
 - .2 Road occupancy permit shall be required for removing the existing equipment and other components from high levels and unloading the equipment from trailer, installing the new equipment on the second floor and roof and other components. Allow for all costs associated with applying for and obtaining the road occupancy permit for deploying the crane on site, crane rental and preparation of crane safety plan. Allow for multiple crane lifts as required to facilitate and complete the work in a satisfactory and safe manner. Deploy flag person as required.
 - .3 Submit crane safety plan at least 10 working days in advance for review and approval by Health & Safety associates of the Agency.
 - .4 Design and construct scaffolding in accordance with CAN/CSA S269.2-M.
 - .5 Take precautions to prevent the overloading of formwork and scaffolding or other temporary structures during the progress of the Work.
- 1.13 **Fire Protection and Fire Watch**
- 1.13.1 All life safety system should always be operational.
 - 1.13.2 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.
 - 1.13.3 Provide and maintain fire extinguishers and accessories as required on the site. All fire protection measures shall have the approval of all prevailing regulations.
 - 1.13.3 Obtain hot work permit in advance from the Agency as and when required. Provide 48 hours advance notice to the Agency in the event of fire alarm shut-downs.
 - 1.13.4 Arrange and provide fire watch services in the entire building when the fire alarm system is down/in by-pass mode. Fire watch service shall end ½ hour after completion of hot work. Fire watch service shall be provided by properly trained personnel that will not be executing the construction work. Include the cost in the Contract Price.
 - 1.13.5 The following procedure shall be followed on the day of hot work.
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- .1 Call Classic Fire Life Safety at 645 Garyray Drive, Toronto, ON M9L 1P9 Contact person: Mrs. Blair Sarginson, Tel: 416-740-3000 X 1318, and inform them that the fire alarm panel will be in test. Engage and pay Classic Fire for work related to Fire Alarm and include in the Contract price.
 - .2 Call Mississauga Fire Department and inform them that the fire alarm panel will be in test.
 - .3 Put the fire alarm panel in test/by-pass mode, Protect the detectors and proceed with the work.
 - .4 Provide trained, qualified and certified personnel to perform fire watch services in the buildings.
 - .5 After completion of hot work, put the fire alarm panel back in the normal mode of operation, remove protection from the detectors (if any).
 - .6 Call Classic Fire & Mississauga Fire Departments and inform them that the test is complete.
 - .7 Inform Agency that the hot work is complete.
 - .8 Maintain a log for the fire watch services provided by the Contractor and present a copy to the Agency for verification.
- 1.14 **Cutting, Patching and Remedial Work**
- 1.14.1 Provide labour, products, equipment, services, and tools necessary for cutting, patching and remedial work affected by the Work.
 - 1.14.2 Where existing work is to be made good, match new work exactly with the existing work in material, construction and finish to the satisfaction of the Agency.
 - 1.14.3 Where existing work is to be made good, there shall be no visible difference in appearance, performance or aesthetics between the existing work and the new work at a distance of three (3) meters from the surface being made good.
 - 1.14.4 Properly prepare surfaces to receive patching, finishing and painting.
- 1.15 **Fire Barriers**
- 1.15.1 Where the conduit, piping or devices etc. are required to pass through fire rated separations, make penetrations and provide fire barrier seals with a fire resistance rating equivalent to the rating of the separation. Seal all the penetrations to the satisfaction of the Agency.
 - 1.15.2 Prior to installation, submit for review, proposed fire barrier seal materials, method of installation and ULC system number.
 - 1.15.3 Acceptable Manufacturer: 3M or approved equivalent.
- 1.16 **Substitutions**
- 1.16.1 Lump-Sum Contract Price must be based on specified products in the Contract Documents. Proposals for alternate products may be submitted in
-

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writing to the Consultant, only after award of the Contract. No alternates will be permitted without prior written approval from the Consultant and the Agency. The Contract price will be adjusted accordingly to all credits arising from any alternates, if accepted and approved, by the Consultant/Agency.

1.17 Sub-contractors required on the Project

The following work will be performed by the base building contractor/sub-contractor required by the Agency on this project. The Contractor will engage, pay and carry all costs in the Lump-Sum Contract price.

1.17.1 Fire Alarm: by Classic Fire Life Safety, Toronto

1.17.2 Sound Masking System: by Environmental Acoustics, Mississauga

1.17.3 Access Control & CCTV : by OHM Security, Mississauga

1.17.4 Lightning Arrestor: by Burchell Lightning Protection Ltd

1.17.5 Other vendors specified in other Sections of the Specification.

1.18 Progress Photographs

Submit the progress photographs at the following milestones:

1.18.1 Before start of work on site: both exterior and interior.

1.18.2 Demolition work at 25%, 50%, 75% and 100% completion.

1.18.3 Progress at 20%, 40%, 60%, 80% and 100% completion.

1.18.4 Other photographs as requested by Consultant/Agency.

1.19 Contingency Allowance

Contingency Allowance of \$450,000.00 has been established for this project. The Contingency Work must be approved in advance by the Agency. Unexpended portion of contingency allowance will be deducted from the Contract Price.

1.20 Cash Allowance

Cash Allowances included herein are for items of the Work which could not be fully qualified prior to tendering. Unexpended portion of cash allowance will be deducted from the from the Contract Price.

1.20.1 Include in a Total Contract Price, a cash allowance of \$375,000 provided for the work to be performed which shall include the following:

.1 Inspection and Testing: Note that the Stipulated Price includes Construction Inspection and Testing as noted within the Contract Documents. This item is for Inspection and Testing in addition to the services provided under Contract to be requested at the discretion of the Consultant or the Agency.

.2 Furniture, appliances, window coverings, audio-visual, supplied and installed.

.3 Interior and exterior signage- supplied and installed

.4 Door hardware- supplied and installed.

.5 Any other items identified and advised by the Consultant/Agency.

1.20.2 Contractor will not charge any overhead and profit, supervision and

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coordination fee, administration fee on cash allowance work/items. All cash allowance will be paid at actuals.

1.20.3 Where the amount expended for a Cash Allowance item is less than the specified amount of the Cash Allowance, the Agency will be credited for the unexpended amount as a credit Change Order.

1.20.4 No Statutory Holdback and Warranty Security Holdback deductions will be applied on Cash Allowance items.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 26 15, Requests for Information**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Requests for Information.
- 1.1.2 Submittal Procedures.
- 1.1.3 Screening of RFI's.
- 1.1.4 Response to RFI's.
- 1.1.5 Response Timing.

1.2 Request for Information (RFI)

- 1.2.1 A request for information (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents or to obtain additional information.
- 1.2.2 An RFI shall not constitute notice of claim for a delay.

1.3 Submittal Procedures

- 1.3.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.3.2 Number RFI's consecutively in one sequence in order submitted, in numbering system as established by the Consultant/Contractor.
 - 1.3.3 Submit one distinct subject per RFI form. Do not combine unrelated items on one form.
 - 1.3.4 RFI Form:
 - .1 Submit a draft "Request for Information" form to be approved by the Consultant.
 - .2 Submit RFI's to the Consultant on approved "Request for Information" form. The Consultant shall not respond to an RFI except as submitted on this form.
 - .3 Where RFI form does not have sufficient space to provide complete information thereon, attach additional sheets as required.
 - .4 Submit with RFI form all necessary supporting documentation.
 - 1.3.5 RFI Log:
 - .1 Maintain log of RFI's sent to and responses received from the Consultant, complete with corresponding dates.
 - .2 Submit updated log of RFI's at each construction meeting.
 - 1.3.6 Submit RFI's sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do so will not be paid by the Agency.
 - 1.3.7 Only the Contractor shall submit RFI's to the Consultant.
 - 1.3.8 RFI's submitted by Subcontractors or Suppliers directly to the Agency will not be accepted.
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PROJECT 22701****Appendix 8.2, Division 01, Section 01 26 15, Requests for Information**

- 1.4 **Screening of RFI's**
 - 1.4.1 Contractor shall satisfy itself that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the Interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents. Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.

- 1.5 **Response to RFI's**
 - 1.5.1 Consultant shall review RFI's from the Contractor submitted in accordance with this section with the following understandings:
 - 1.5.2 Consultant response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Price or Contract Time or changes in the Work.
 - 1.5.3 Only the Consultant shall respond to RFI's. Responses to RFI's received from entities other than the Consultant shall not be considered.

- 1.6 **Response Timing**
 - 1.6.1 Allow 5 Working Days for review of each RFI by the Consultant.
 - 1.6.2 Consultant review of RFI commences on date of receipt of RFI submission.

- 2. **PRODUCTS** – NOT APPLICABLE

- 3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 31 00, Project Management and Coordination**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Preconstruction Conference
- 1.1.2 Project Meetings
- 1.1.3 On Site Documents
- 1.1.4 Cost Breakdown

1.2 Pre-construction Meeting

- 1.2.1 The Consultant will call for and administer a Pre-construction Meeting at time and place to be announced.
- 1.2.2 Contractor, all major Subcontractors, and major suppliers shall attend the Pre-construction Conference.
- 1.2.3 Agenda will include, but not be limited to, the following items.
 - .1 Lines of communication and contact information
 - .2 Schedules
 - .3 Use of premises
 - .4 Location of any Contractor on-site facilities
 - .5 Security
 - .6 Housekeeping
 - .7 Submittal and RFI procedures
 - .8 Inspection and testing procedures, on-Site and off-Site
 - .9 Health and safety
 - .10 Contractor's Schedule of Values
 - .11 Contractor's Schedule of Submittals
- 1.2.4 The Consultant will distribute copies of minutes to attendees. Attendees shall have seven days to submit comments or additions to minutes. Minutes will constitute final documentation of results of Pre-construction Conference.

1.3 Project Meetings

- 1.3.1 The Consultant will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
- 1.3.2 Meetings will be held minimum bi-weekly on site.

1.4 On-Site Documents

- 1.4.1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed shop drawings.
 - .5 Requests for Information (RFI's)
-

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Appendix 8.2, Division 01, Section 01 31 00, Project Management and Coordination

- .6 Change orders.
- .7 Other modifications to Contract.
- .8 Field test reports.
- .9 DSS reports
- .10 Approved Work schedule.
- .11 Manufacturers' installation and application instructions.
- .12 Safety Data Sheets (SDS).
- .13 Health and Safety Plan and other safety related documents.
- .14 Other documents as reasonably requested by Consultant/Agency.

1.5 **Cost Breakdown**

- 1.5.1 Submit a detailed cost breakdown to the Consultant/Agency at least ten working days prior to the submission of the first progress claim. After approval by Consultant/Agency, the cost breakdown will be used as basis for progress monthly payment.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 32 00, Construction Progress Documentation**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Submittals.
- 1.1.2 Schedules.
- 1.1.3 Format.
- 1.1.4 Submission.
- 1.1.5 Critical Path Scheduling.
- 1.1.6 Submittals Schedule.

1.2 Submittals

- 1.2.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3 Schedules Required

- 1.3.1 Submit schedules as follows:
 - .1 Construction Progress Schedule.
 - .2 Submittal Schedule for Shop Drawings and Product Data.
 - .3 Submittal Schedule for Samples.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for purchasing Products or Services.
 - .6 Shutdown or closure activity.

1.4 Format

- 1.4.1 Prepare schedule in form of a horizontal bar chart using Microsoft Project 2016 or later.
- 1.4.2 Provide a separate bar for each major item of work, trade or operation.
- 1.4.3 Split horizontally for projected and actual performance.
- 1.4.4 Provide horizontal time scale identifying first workday of each week.
- 1.4.5 Format for listings: chronological order of start of each item of work.
- 1.4.6 Identification of listings: By Systems description.

1.5 Submission

- 1.5.1 Submit initial format of schedules within 10 working days after award of Contract.
- 1.5.2 Submit schedules in electronic format, by email as PDF files.
- 1.5.3 Consultant will review schedule and return reviewed copy within 10 days after receipt.
- 1.5.4 Resubmit finalized schedule within 7 days after return of reviewed copy.
- 1.5.5 During progress of Work revise and resubmit schedule as directed by Consultant.
- 1.5.6 Submit revised progress schedule with each application for payment.

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PROJECT 22701****Appendix 8.2, Division 01, Section 01 32 00, Construction Progress Documentation**

- 1.5.7 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Subcontractors.
 - .3 Other concerned parties.
 - .4 Instruct recipients to report to Contractor within 10 days, any problems anticipated by timetable shown in schedule.
 - 1.5.8 Table current and up to date schedule at each regular site meeting.
 - 1.6 **Critical Path Scheduling**
 - 1.6.1 Include complete sequence of construction activities.
 - 1.6.2 Schedules shall represent a practical plan to complete the work within the Contract period and shall convey the plan to execute the work. Schedules as developed shall show the sequence and interdependencies of activities required for complete performance of the work.
 - 1.6.3 The submittal of schedules shall be understood to be the Contractor's representation that the schedule meets the requirements of the Contract Documents and that the work will be executed in the sequence and duration indicated in the schedule.
 - 1.6.4 Failure to include any element of work required for performance of the Contract or failure to properly sequence the work shall not excuse the Contractor from completing all work within the Contract Time.
 - 1.6.5 All schedules shall be developed utilizing industry standard 'best practices' including, but not limited to:
 - .1 No open-ended activities.
 - .2 No use of constraints other than those defined in the Contract Documents without the prior approval of the Agency.
 - .3 No negative leads or lags.
 - .4 No excessive leads or lags without prior justification and approval from the Agency.
 - .5 For individual schedule construction activities, do not exceed 14 days in duration without prior approval of the Agency. Subdivide activities exceeding 14 days in duration to an appropriate level.
 - .6 Sufficiently describe schedule activities to include what is to be accomplished in each work area. Express activity durations in whole days. Clearly define work that is to be performed by subcontract.
 - .7 Create the schedule in conformance with the work-hours and constraints set forth in these Contract Documents.
 - 1.6.6 Include dates for commencement and completion of each major element of construction.
 - 1.6.7 Show projected percentage of completion of each item as of first day of month.
 - 1.6.8 Indicate progress of each activity to date of submission schedule.
-

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PROJECT 22701**

Appendix 8.2, Division 01, Section 01 32 00, Construction Progress Documentation

- 1.6.9 Show changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.
- 1.6.10 Provide a narrative report to define:
 - .1 Problem areas, anticipated delays, and impact on schedule.
 - .2 Corrective action recommended and its effect.
 - .3 Effect of changes on schedules of other prime contractors.

1.7 **Submittals Schedule**

- 1.7.1 Include schedule for submitting shop drawings, product data, and samples. Indicate manufacture and delivery lead times into the shop drawing submittal schedule.
- 1.7.2 Indicate dates for submitting review time, resubmission time, and last date for meeting fabrication schedule.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 33 00, Submittal Procedures**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Administrative.
- 1.1.2 Requests for information.
- 1.1.3 Shop drawings and product data.
- 1.1.4 Interference drawings.
- 1.1.5 Progress photographs.
- 1.1.6 Samples.
- 1.1.7 Mock-ups
- 1.1.8 Certificates and transcripts.

1.2 Administrative

- 1.2.1 Work affected by submittal shall not proceed until review is complete.
- 1.2.2 Present shop drawings, product data, samples and mock-ups in metric units.
- 1.2.3 Where items or information is not produced in metric units converted values are acceptable.
- 1.2.4 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- 1.2.5 Notify Consultant in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- 1.2.6 Verify field measurements and affected adjacent work are coordinated.
- 1.2.7 Keep one reviewed s copy of each submission on site.

1.3 Requests for Information (RFI's)

- 1.3.1 Refer to Section 01 26 15 – Requests for Information.

1.4 Shop Drawings and Product Data

- 1.4.1 The term “shop drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures, product data and other data which the Contractor provides to illustrate details of a portion of Work.
 - 1.4.2 Coordinate each submission with requirements of Work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
 - 1.4.3 Submit shop drawings bearing stamp and signature of qualified professional Engineer registered or licensed in the Province of Ontario where required by the individual specification sections. Each submittal and each resubmittal must bear the stamp of the Engineer.
 - 1.4.4 Indicate materials, methods of construction and attachment or anchorage,
-

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PROJECT 22701****Appendix 8.2, Division 01, Section 01 33 00, Submittal Procedures**

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

- 1.4.5 Prior to submission to Consultant, review all submitted drawings. By this review, Contractor represents to have determined and verified field measurements, site conditions, materials, catalogue number and similar data and to have checked and coordinated each drawing with the requirements of Work and of Contract Documents. Contractor's review of each drawing shall be indicated by stamp, date and signature of a responsible person.
 - 1.4.6 At time of submission, notify Consultant in writing of any deviations in drawings from the requirements of the Contract Documents.
 - 1.4.7 Allow ten days for Agency's review of each submission.
 - 1.4.8 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
 - 1.4.9 Make any changes in submitted drawings which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.
 - 1.4.10 Accompany submissions with transmittal letter containing:
 - .1 Date
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing. Product data and sample.
 - .5 Other pertinent data.
 - 1.4.11 Submissions 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, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 33 00, Submittal Procedures**

- .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - 1.4.12 After Consultant's review, distribute copies.
 - 1.4.13 Submit one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
 - 1.4.14 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
 - 1.4.15 Delete information not applicable to project.
 - 1.4.16 Supplement standard information to provide details applicable to project.
 - 1.4.17 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
 - 1.4.18 The review of shop drawings by the Consultant is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.
 - 1.5 **Interference Drawings**
 - 1.5.1 Prepare interference drawings to coordinate the installation of the work of all sections, within available space. Conflicts between trades which could be determined beforehand, by the careful coordination and preparation of interference drawings, shall be corrected at no expense to the Agency.
 - 1.5.2 Prepare interference drawings of all buried services as necessary to avoid conflicts with new or existing structures, foundations or services.
 - 1.5.3 Submit interference and equipment placing drawings as specified in Section 01 71 00, when requested by the Consultant.
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PROJECT 22701****Appendix 8.2, Division 01, Section 01 33 00, Submittal Procedures**

- 1.6 **Progress Photographs**
 - 1.6.1 Progress photographs shall be electronically formatted and labelled as to location and view.

- 1.7 **Samples**
 - 1.7.1 Submit for review samples as requested in respective specification Sections. Label samples with origin, manufacturer, product information, applicable specification section, and intended use.
 - 1.7.2 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents
 - 1.7.3 Where colour, pattern or texture is criterion, submit full range of manufacturer's samples.
 - 1.7.4 Adjustments made on samples by Consultant/Agency are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
 - 1.7.5 Make changes in samples which Agency may require, consistent with Contract Documents.
 - 1.7.6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

- 1.8 **Mock-Ups**
 - 1.8.1 Erect mock-ups in accordance with 01 45 00 – Quality Control.

- 1.9 **Certificates and Transcripts**
 - 1.9.1 Immediately after award of Contract, Submit Workplace Safety and Insurance Board Experience Report.

- 2. **PRODUCTS** – NOT APPLICABLE

- 3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 35 29, Health and Safety Requirements**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Safety Requirements
- 1.1.2 Fire Protection
- 1.1.3 Accident Reporting
- 1.1.4 Records on Site

1.2 References

- 1.2.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- 1.2.2 Fire Commissioners of Canada, FC 301, Standard for Construction Operations.
- 1.2.3 National Fire Protection Agency (NFPA)
 - .1 NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations
- 1.2.4 Occupational Health and Safety Act.
 - .1 R.R.O. 1990, Reg. 860: Workplace Hazardous Materials Information System (WHMIS)
 - .2 O. Reg. 632/05: Confined Spaces
- 1.2.5 Ontario Building Code.

1.3 Submittals

- 1.3.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.3.2 Submit to Consultant copies of the following documents, including updates issued:
 - .1 Notice of Project filed with Provincial Ministry of Labour or equivalent for Place of Work
 - .2 Site-specific Health and Safety Plan prior to commencement of work on the work site. Plan shall include but not be limited to the following:
 - .1 Name and contact info of Contractor's Health and Safety Representative for Work Site; including twenty-four (24) hour emergency contact phone numbers.
 - .2 Phone numbers of local fire, police, and ambulance outside of 911 services.
 - .3 Location of nearest medical facility and level of injury that each can service.
 - 1.3.3 Submit to the Consultant and Municipal Fire Department, for review, a "Fire Safety Plan" conforming to Section 2.14 of the National Fire Code of Canada. Maintain a copy of the "Fire Safety Plan" on site.
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- .1 Copies of certification for all employees on site of applicable safety training including, but not limited to:
 - .1 WHMIS.
 - .2 Fall arrest and protection.
 - .3 Suspended Access Equipment.
 - .4 Erection of Scaffolding.
 - .5 License for powder actuated devices.
 - .2 On-site Contingency and Emergency Response Plan addressing:
 - .1 Standard procedures to be implemented during emergency situations.
 - .2 Preventative planning and protocols to address possible emergency situations.
 - 1.3.4 Guidelines for handling, storing, and disposing of hazardous materials that maybe encountered on site, including measures to prevent damage or injury in case of an accidental spill.
 - 1.3.5 Incident and accident reports, promptly if and upon occurrence
 - .1 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
 - .2 Accident or Incident Reports, within 24 hours of occurrence.
 - 1.3.6 Submit other data, information and documentation upon request by the Agency as stipulated elsewhere in this section.
 - 1.4 **Compliance Requirements**
 - 1.4.1 Comply with the latest edition of the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.
 - 1.5 **Constructor**
 - 1.5.1 Notify all regulatory bodies required for construction activities, (i.e., Notice of Project, employer notification, etc.). Notifications shall include, but not be limited to, the notification requirements laid out in OHS Act Sec 51-53 and the requirements of Ontario Regulation 213/91 for Construction Projects, Sections 5, 6 and 7. For the purpose of this contract the Contractor shall be the "Constructor".
 - 1.5.2 The "Constructor" will be solely responsible for the safety of all persons on the Site.
 - 1.6 **Safety Requirements**
 - 1.6.1 Observe and enforce all construction safety measures and comply with the latest edition and amending regulations of the following documents and in the event of any differences among those provisions, the most stringent shall apply:
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, August 1997, Ontario Regulation 213/91
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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- including amendments.
 - .2 Hazardous Products Act and Canada Labour Code.
 - .3 The Workplace Safety and Insurance Board, O. Reg 454.
 - .4 Ontario Building Code Act, Ontario Regulation 332/12 including amendments.
 - .5 National Building Code of Canada, Part 8: Safety Measures on Construction and Demolition Sites.
 - .6 National Fire Code of Canada.
 - .7 NFPA 241 Standard for Safeguarding Construction, Alteration,
 - .8 Demolition Operations, 2013 Edition
 - .9 Environmental Protection Act.
 - .10 The Power Commission Act.
 - .11 The Boiler and Pressure Vessels Act.
 - .12 The Elevators and Lifts Act.
 - .13 The Operating Engineer's Act.
 - .14 Municipal statutes.
 - 1.6.2 Obey all Federal, Provincial and Municipal Laws, Acts, Statutes, Regulations, Ordinances and By-laws which could in any way, pertain to the work outlined in the Contract, or to any employees of the Contractor. Satisfy all statutory requirements imposed by the Occupational Health and Safety Act and Regulations made thereunder, on a Contractor, and Constructor and/or Employer with respect to or arising out of the performance of the Contractors obligations under this Contract.
 - 1.6.3 Working at Heights: The supervisor of the project, will be responsible to ensure that his employees and subcontractors/suppliers have current Working at Heights and Fall Protection certification.
 - 1.6.4 The supervisor of the project will be responsible for his employees and subcontractors/suppliers maintaining standard safety practices, as well as the specific safety rules listed below, while working on the Agency's property.
 - 1.6.5 The Consultant/Agency reserves the right to order individuals to leave the site if the individual is in violation of any safety requirement or any Act. Any expense incurred will be the responsibility of the Contractor.
 - 1.6.6 Notify the Consultant should any hazardous condition become apparent.
 - 1.6.7 Enforce the use of CSA approved hard hats, reflective vests and safety boots for all persons entering or working at the construction site. Refuse admission to those refusing to conform to this requirement.
 - 1.6.8 Provide safeguard and protection against accident, injury or damage to any person on the site, adjacent work areas and adjacent property.
 - 1.7 **Confined Space**
 - 1.7.1 Confined Space: Where applicable, provide the Consultant/Agency and all Regulatory Authorities with a copy of the Contractors' Confined Space
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Entry Procedure. In the event that defined procedures are not available, abide by the applicable requirements of the Occupational Health and Safety Act and all regulations made thereunder.

- 1.7.2 Persons intended to work in confined spaces, as defined by the Consultant/Agency, must have formal training in performing work in confined spaces.
 - 1.7.3 Provide proof of valid certificates of such training for all workers prior to entry of such workers into confined spaces.
 - 1.7.4 Provide all necessary safety equipment for entry into confined spaces.
 - 1.7.5 Where workers are required to enter a confined space, as defined by the OHSAA, O. Reg. 632/05 Section 221.2, ensure that workers of the Contractor and all Subcontractors follow the requirements of the above legislation, including but not limited to:
 - .1 Having a method for recognizing each confined space to which the program applies
 - .2 Having a method for assessing the hazards to which workers may be exposed
 - .3 Having a method for the development of confined space entry plans (which include on-site rescue procedures)
 - .4 Having a method for training workers
 - .5 Having an entry-permit system.
 - .6 Supply the necessary tools and equipment to perform the confined space entry. These items include, but are not limited to, required documentation, gas detectors, breathing equipment, fall protection and rescue equipment.

 - 1.8 **Safety Meetings**
 - 1.8.1 Site toolbox safety meetings will be held weekly for all Contractor employees and all sub trade contractors.
 - 1.8.2 Where a Joint Health and Safety Committee is required on a project, workers and supervisors, selected, as members of the committee must attend.

 - 1.9 **Workplace Hazardous Materials Information System (WHMIS)**
 - 1.9.1 Be familiar with WHMIS regulations and be responsible for compliance.
 - 1.9.2 Provide to the Consultant a list of Designated Substances that will be brought to the site prior to commencing work. Safety Data Sheets (SDS) and the hazardous material inventory for each substance listed must be kept on the Project.
 - 1.9.3 Be responsible for all other requirements of regulations as applicable to Employers.
 - 1.9.4 All controlled products to be properly labelled and stored.
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- 1.9.5 Immediately inform Consultant/Agency if any unforeseen or peculiar safety-related factor, hazard, or condition becomes evident during performance of Work.
- 1.10 **Fire Protection**
 - 1.10.1 Provide and maintain safeguard and protection against fire in accordance with current fire codes and regulations.
 - 1.10.2 Provide temporary fire protection throughout the course of construction. Particular attention shall be paid to the elimination of fire hazards.
 - 1.10.3 Comply with the requirements of FCC No. 301 Standards for Construction Operations issued by the Fire Commissioner of Canada and the National Building Code.
 - 1.10.4 Provide and maintain portable fire extinguishers during construction, in accordance with Part 6 of the National Fire Code of Canada 2015 and NFPA 241.
 - 1.10.5 Maintain unobstructed access for firefighting at all areas in accordance with the National Building Code of Canada.
- 1.11 **First Aid**
 - 1.11.1 Provide such equipment and medical facility as required by WSI Act to supply first aid services to anyone who may be injured at the place of Work. Report all accidents or injuries to the proper authorities and to the Agency.
- 1.12 **Accident Reporting**
 - 1.12.1 Investigate and report incidents and accidents as required by Occupational Safety and Health Act, and the Regulations made pursuant to the Act.
- 1.13 **Records on Site**
 - 1.13.1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.
 - 1.13.2 Upon request, make copies available to the Consultant/Agency.
- 2. **PRODUCTS** – NOT APPLICABLE
- 3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 35 43, Environmental Procedures**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Administrative
- 1.1.2 Fires
- 1.1.3 Disposal of Wastes
- 1.1.4 Drainage
- 1.1.5 Site Clearing and Plant Protection
- 1.1.6 Pollution Control
- 1.1.7 Unanticipated Soil Contamination

1.2 References

- 1.2.1 Statutes of Canada 1999 Chapter 33.
 - .1 Canadian Environmental Protection Act 1999.
 - .2 SOR/2003-289. Federal Halocarbon Regulations, 2003.
 - .3 Transportation of Dangerous Goods Act, 1992 (1992, c. 34)
- 1.2.2 Province of Ontario Environmental Protection Act, R.S.O. 1990, c. E.19

1.3 Administrative

- 1.3.1 Comply with all federal, provincial, and municipal regulatory requirements and guidelines for environmental protection and natural resource conservation, including those referenced above.
- 1.3.2 Failure to comply with environmental requirements may result in a stop work order or assessment of damages commensurate with repair of damage.
- 1.3.3 It is the Contractor's responsibility to be aware of environmental requirements and the best management practices and pollution control measures necessary to meet them.
- 1.3.4 It is the Contractor's responsibility to obtain and abide by permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.
- 1.3.5 All hazardous materials are to be stored with secondary containment.

1.4 Fires

- 1.4.1 Fires and burning of rubbish on site not permitted.

1.5 Disposal of Wastes

- 1.5.1 Refer to Section 01 74 19 – Cleaning, Waste Management and Disposal.

1.6 Drainage

- 1.6.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
 - 1.6.2 Do not pump water containing deleterious substances into waterways,
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sewer or drainage systems.

1.6.3 Protect storm drains against entry by sediment, debris, oil, or chemicals.

1.6.4 Control disposal or runoff of water containing deleterious substances or other harmful substances in accordance with local authority requirements.

1.7 **Pollution Control**

1.7.1 Maintain, inspect, and repair temporary erosion and pollution control features installed under this contract on a weekly basis. Submit inspection logs to the Consultant when requested.

1.7.2 Control emissions from equipment and plant to conform to federal, provincial, and municipal requirements.

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

1.7.4 Take all measures necessary to prevent material and mud tracking on adjacent roads and streets.

1.7.5 Use mechanical sweepers as often as necessary to keep adjacent roads and streets clean of material and mud that is deposited from this project.

1.7.6 On site disposal or clean out of concrete trucks is not permitted. Any spillage of concrete onto asphalt or other surfaces must be cleaned up before spillage sets.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 41 00, Regulatory Requirements**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 References
- 1.1.2 Owner's Regulations
- 1.1.3 Standards and Definitions
- 1.1.4 Hazardous Materials
- 1.1.5 Spills Reporting
- 1.1.6 Protection of Water Quality
- 1.1.7 Potable Water Systems
- 1.1.8 Access for Inspection and Testing
- 1.1.9 Other Regulatory Requirements

1.2 References

- 1.2.1 Perform Work in accordance with Ontario Building Code (OBC), National Fire Code of Canada (NFC), the Canadian Electrical Code CSA C22.1-18, including all Supplements and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- 1.2.2 Where a material is designated in the Contract Documents for a certain application, unless otherwise specified, that material shall conform to standards designated in the Code. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards invoked by the aforementioned Code.
- 1.2.3 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
 - .3 Manufacturer's instructions.
- 1.2.4 Where requirements of Contract Documents exceed Code requirements provide such additional requirements.
- 1.2.5 Where the Building Code or the Contract Documents do not provide all information necessary for complete installation of an item, then the manufacturer's instructions for first quality workmanship shall be strictly complied with.

1.3 Owner's Regulations

- 1.3.1 Conform to requirements, regulations and procedures of the Agency.

1.4 Standards and Definitions

- 1.4.1 Where a reference is made to specification standards produced by various organizations and agencies, conform to latest edition of standards, as amended and revised to date of Contract.

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- 1.4.2 Have a copy of each specified standard which relates to your work available on the site to be produced immediately on Consultant's request.
- 1.5 **Hazardous Materials**
- 1.5.1 Definition: "Hazardous Material" is material, in any form, which by its nature, may be flammable, explosive, irritating, corrosive, poisonous, or may react violently with other materials, if used, handled or stored improperly. Included are substances prohibited, restricted, designated or otherwise controlled by law.
- 1.5.2 Provide SDS for all materials brought to the Place of Work.
- 1.5.3 Hazardous Materials will not be introduced for experimental or any other use prior to being evaluated for hazards.
- 1.5.4 Make known to the Agency those hazardous materials or designated substances intended to be used in the workplace and receive permission to use before introducing to the Owner's property.
- 1.5.5 Many common construction materials such as asbestos pipe and various insulations are designated substances and shall not be used under any circumstances.
- 1.6 **Spills Reporting**
- 1.6.1 Spills or discharges of pollutants or contaminants under the control of the Contractor, and spills or discharges of pollutants or contaminants that are a result of the Contractor's operations that cause or are likely to cause adverse effects shall forthwith be reported to the Agency. Such spills or discharges and their adverse effects shall be as defined in the Environmental Protection Act R.S.O. 1999.
- 1.6.2 All spills or discharges of liquid, other than accumulated rainwater, from luminaries, internally illuminated signs, lamps, and liquid type transformers under the control of the Contractor, and all spills or discharges from this equipment that are a result of the Contractor's operations shall, unless otherwise indicated in the Contract, be assumed to contain PCB's and shall forthwith be reported to the Agency.
- 1.6.3 This reporting will not relieve the Contractor of his legislated responsibilities regarding such spills or discharges.
- 1.7 **Potable Water Systems**
- 1.7.1 Potable water systems in completed buildings must meet criteria and guidelines established by Provincial and Municipal authorities, prior to occupancy by the Owner.
- 1.7.2 Upon completion, submit testing certificates verifying water quality and water systems meets all applicable Provincial and Legislated Standards
- 1.8 **Access for Inspection and Testing**
- 1.8.1 Cooperate fully with and provide assistance to, all outside authorities including Building Inspectors, utilities, testing agencies and consultants,
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 01, Section 01 41 00, Regulatory Requirements

with the inspection of the Work.

1.9 **Other Regulatory Requirements**

1.9.1 Conform to the requirements of the Ontario Ministry of Transportation, Regional and Local authorities regarding transportation of materials.

1.9.2 Obtain required road occupancy permits.

1.9.3 Pay any required roadway damage deposits required by the local municipality.

1.9.4 Conform to the requirements of the Ontario Ministry of the Environment.

1.9.5 Conform to the requirements of the Ontario Ministry of Labour.

1.9.6 Conform to all applicable local by-laws, regulations and ordinances.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 45 00, Quality Control**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Inspection
- 1.1.2 Independent Inspection Agencies.
- 1.1.3 Access to Work
- 1.1.4 Procedures
- 1.1.5 Rejected Work
- 1.1.6 Reports
- 1.1.7 Contractors Responsibilities
- 1.1.8 Tests and Mix Designs
- 1.1.9 Mock-Ups
- 1.1.10 Equipment and Systems.

1.2 Inspection

- 1.2.1 Contractor is responsible for Quality Control (QC).
- 1.2.2 Allow Consultant and Agency access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- 1.2.3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant/Agency instructions, or law of Place of Work.
- 1.2.4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

1.3 Independent Inspection Agencies

- 1.3.1 Independent Inspection and Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Contractor and paid from the cash allowances.
- 1.3.2 Provide equipment required for executing inspection and testing by appointed agencies.
- 1.3.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- 1.3.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Agency. Pay costs for retesting and re-inspection.

1.4 Access to Work

- 1.4.1 Allow inspection and testing agencies access to Work, off site manufacturing and fabrication plants.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 45 00, Quality Control**

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

1.5 **Procedures**

1.5.1 Notify Agency 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.

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

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

1.6 **Rejected Work**

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

1.6.2 Make good other work damaged by such removals or replacements promptly.

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

1.7 **Reports**

1.7.1 Submit electronic .pdf format inspection and test reports to Consultant.

1.7.2 Provide copies to Subcontractor of work being inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.8 **Contractors Responsibilities**

1.8.1 Be responsible for the execution of the Construction Quality Plan and pay all costs for the execution of the Construction Quality Plan. Designate an experienced site representative for carrying out the Construction Quality Plan.

1.8.2 Provide the Consultant with a completed quality product for the Work. Contractor shall be responsible for any costs associated with re-testing and reperforming the Work as a result of the Contractor's poor performance or workmanship or other failure to comply with the Contract Documents.

1.8.3 All Work shall be done by persons qualified in their respective trades, and the workmanship shall be first-class in every respect. Contractor is responsible for ensuring employees are appropriately trained. All materials and equipment furnished shall be the best of their respective kinds for the intended use and unless otherwise specified, same shall be new and of the latest design.

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- 1.8.4 The Consultant/Agency will have the authority to reject Work that does not conform to the Contract Documents or may require special inspection or testing, whether or not such Work is to be then fabricated, installed or completed.
 - 1.8.5 Failure by a Contractor to conduct its operations, means and methods and coordinate proper sequencing of the Work may cause the Consultant to withhold payment or any other means deemed necessary to correct non-conforming Work.
 - 1.8.6 The Consultant shall engage a testing firm to perform such engineering laboratory services and on-site inspection as deemed necessary by the Consultant. The testing firm will determine compliance with the requirements of the Contract Documents. This Work will not be a service to the Contractors for the performing of tests and checking of materials required of the Contractors.
 - 1.8.7 Copies of test and inspection reports will be furnished to the Contractor. The laboratory and its representatives will be instructed to promptly call to the attention of the Contractor, any instance of non-compliance with the requirements of the Contract Documents. Failure to so notify the Contractor shall not relieve the Contractor of any of its responsibilities for compliance or making good workmanship or materials which are not in compliance with the requirements of the Contract Documents. The Contractor shall notify the Consultant and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 1.8.8 Contractor's construction materials, procedures and work shall be subject to specified testing procedures and shall be in conformance with the Contract Documents as verified by Testing agency.
 - 1.8.9 Cooperate with the testing firm and provide labor to assist with sample preparations where applicable.
 - 1.8.10 Except where specifically indicated to be provided by another entity as identified, inspections, tests, and similar quality control services including those specified to be performed by independent agency are the Contractor's responsibility, and costs thereof are not to be included in contract sum.
 - 1.8.11 Cooperate with independent agencies performing required inspections, tests, and similar services. Provide auxiliary services as reasonably requested, including access to Work, the taking of samples or assistance with the taking of samples, delivery of samples to test laboratories, and security and protection for samples and test equipment at Project site.
 - 1.8.12 Coordination: Contractor and each engaged independent agency performing inspections, tests, and similar services for project are required to coordinate and sequence activities so as to accommodate required services with minimum delay of Work and without the need of removal/replacement of work to accommodate inspections and tests. Scheduling of times for inspections, tests, taking of samples, and similar activities is the Contractor's responsibility.
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- 1.8.13 Where sampling and testing is required for Sections of Work listed in the Contract Documents, the tests shall be performed by an independent testing lab and paid for by the Contractor.
 - 1.8.14 Test procedures to be used shall be submitted for approval of the Consultant where other than those specified are recommended by the testing agency.
 - 1.8.15 Testing Agency Duties: The independent Testing Agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Agency and Contractors in performance of its duties and shall provide qualified personnel to perform required inspections and tests.
 - 1.8.16 Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.
- 1.9 **Tests and Mix Designs**
- 1.9.1 Furnish test results and mix designs as requested.
- 1.10 **Mockups**
- 1.10.1 Prepare mockups for Work specifically requested in Contract Documents.
 - 1.10.2 Construct in locations acceptable to Consultant.
 - 1.10.3 Prepare mockups for Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
 - 1.10.4 Mock-ups may remain as part of Work unless indicated otherwise.
- 1.11 **Equipment and Systems**
- 1.11.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
2. **PRODUCTS** – NOT APPLICABLE
3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 51 00, Temporary Utilities**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

1.1.1 Temporary utilities for Construction

1.2 Installation and Removal

1.2.1 Electricity, natural gas and water is available in the building and can be used solely for the purpose of construction work free of charge.

1.2.2 Remove from site all such work after use.

1.3 Water Supply, Electricity and Natural Gas

1.3.1 The Agency shall provide temporary electric power, gas and water for the purpose of construction. The electric power shall be supplied through existing 120V, 15A receptacles. If additional power source is required and available at the facility, Contractor shall coordinate with the Consultant and Agency and arrange for distribution at Contractor's expense. Do not connect to the building's power supply without written permission of the Consultant/Agency. Standard 12.5mm (1/2") exterior hose bibs are available for water. Natural gas is also available on site and can be used for construction, as required.

1.3.2 The points of delivery and limits on the amount available will be determined on site by the Consultant/Agency whose written permission must be obtained before any connection is made.

1.4 Temporary Heating and Ventilation

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

1.4.2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted, unless prior approval is given by the Consultant/Agency.

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

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

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

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

1.4.4 Maintain temperatures of minimum 10° C in areas where construction is in progress.

1.4.5 Ventilating:

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

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- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- 1.4.6 Permanent heating system of building may not be used when available, Be responsible for damage to heating system if use is permitted.
 - 1.4.7 On completion of Work for which permanent heating system is used, replace filters.
 - 1.4.8 Ensure Date of Substantial Performance and warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.
 - 1.4.9 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform to applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct fired combustion units to outside.
 - 1.4.10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.
- 1.5 **Temporary Power and Light**
- 1.5.1 Existing sources of electric power can be made available to the Contractor free of charge. Conversions or alterations to existing sources of electric power to meet construction requirements are the responsibility of the Contractor.
 - 1.5.2 The points of delivery and limits on amount available will be determined on site by the Consultant whose written permission must be obtained before any connection is made.
 - 1.5.3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Consultant provided that guarantees are not affected.
 - 1.5.4 Provide and maintain temporary lighting throughout project. Lighting levels shall be sufficient to complete work including inspections. Provide minimum lighting levels of 400 lux at work areas. Lighting levels at floors and stairs not within work areas shall be not less than 160 lux at all times during construction activity.
 - 1.5.5 All equipment used shall be CSA approved.
 - 1.5.6 Wiring and method of installation shall conform to local power requirements
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and shall be reviewed by a licensed inspector prior to use.

1.6 **Temporary Communication Facilities**

1.6.1 Provide and pay for temporary telephone, fax, cellular data, lines and all equipment necessary for the Contractor's own use.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

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1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Construction aids.
- 1.1.2 Site storage.
- 1.1.3 Construction parking
- 1.1.4 Offices
- 1.1.5 Equipment, tool and material storage.
- 1.1.6 Sanitary facilities.
- 1.1.7 Signage.
- 1.1.8 Shoring

1.2 References

- 1.2.1 CSA Group (CSA)
 - .1 CAN/CSA Z321-96 (R2006) Signs and Symbols for the Workplace
 - .2 CAN/CSA Z797-18 Code of Practice for Access Scaffold

1.3 Installation and Removal

- 1.3.1 Provide construction facilities in order to execute work expeditiously.
- 1.3.2 Remove from site all such work after use.

1.4 Scaffolding

- 1.4.1 Scaffolding in accordance with CSA Z797.
- 1.4.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.
- 1.4.3 Enclose and heat scaffolding during cold weather.

1.5 Hoisting

- 1.5.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Obtain all required approvals.
- 1.5.2 Hoists and cranes shall be operated by qualified operator.

1.6 Site Storage/Loading

- 1.6.1 Do not unreasonably encumber premises with products.
- 1.6.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.7 Construction Parking

- 1.7.1 Limited parking will be permitted on site at areas designated by the Agency provided it does not disrupt performance of Work or ongoing Agency's operations.
- 1.7.2 Provide and maintain adequate access to project site.
- 1.7.3 If authorized to use existing roads for access to project site, maintain such

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roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.8 Offices

1.8.1 General Contractor and Subcontractors may provide their own offices as necessary and subject to site constraints. Direct location of these offices.

1.9 Equipment, Tool and Material Storage

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

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

1.9.3 The Agency is not responsible for and shall not provide storage space for Contractor use.

1.10 Sanitary Facilities

1.10.1 Contractor will provide and maintain portable toilet on site in compliance with *Occupational Health and Safety Act* for use by the workmen of the Contractor.

1.10.2 Use of building washroom is not permitted.

1.11 Public Traffic Flow

1.11.1 Provide and maintain flag persons, police officer, traffic signals, barricades and illumination as required by authorities having jurisdiction and/or as necessary to perform the Work and protect public.

1.12 Shoring

1.12.1 Examine the site to determine the conditions under which work will be performed.

1.12.2 Contractor shall formulate his own conclusions as to the extent of the existing conditions and shoring required.

1.12.3 The method of shoring shall be according to the Contractor's and his Engineer's directions.

1.12.4 All existing loads must be shored prior to commencement of demolition and removal of load bearing elements.

1.12.5 All shoring and frame braces must be supplied with a safe load rating which must not be exceeded. Install in accordance with manufacturer's recommended procedures and safety guidelines. Ensure that the safe load conditions of the shoring are not exceeded by dead, live or construction loads.

1.12.6 All shoring shall be subject to the Consultant's review and approval prior to commencing demolition work.

1.12.7 Completely remove all shoring after new structure is installed and all concrete is set.

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- 1.12.8 Submit shoring drawings and a proposed installation procedure stamped by a professional engineer registered in the Province of Ontario. Procedures shall follow the information provided on these drawings. The shoring design engineer shall be retained and paid for by the Contractor. The shoring engineer shall review all existing conditions on site prior to completing shoring design.
 - 1.12.9 Removal of existing materials without proper engineered shoring is a safety hazard and will not be permitted.
 - 1.12.10 Make good all damage to the existing structure and adjoining structures and bear full responsibility for failure to provide adequate shoring.
 - 1.12.11 The failure or refusal of the Agency to suggest the use of shoring, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of the work or of any of their obligations under the Contract, nor impose any liability on the Agency or their agents; nor shall any delay, whether caused by any action or want of action on the part of the Contractor, or by any act of the Agency, or their agents, or employees, relieve the Contractor from necessity of properly and adequately protecting the existing structure from collapse or damage, nor from and of his obligations under the Contract relating to injury to persons or property, nor entitle him to any claims for extra compensation or an extension in schedule.
- 1.13 **Snow Removal**
- 1.13.1 Allow no accumulation of ice and snow on site and on roof. Remove snow from access road, site circulation paths and elsewhere as required to permit access to the Work, parking and uninterrupted construction progress.
2. **PRODUCTS** – NOT APPLICABLE
3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 56 00, Temporary Barriers and Enclosures**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Barriers.
- 1.1.2 Environmental Controls.
- 1.1.3 Traffic Controls.
- 1.1.4 Fire Routes.

1.2 Installation and Removal

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

1.3 Site Fencing

- 1.3.1 Contractor's lay-down area designated by the Consultant/Agency must be secured and there must be no access by unauthorized persons. Provide temporary fencing around whole work site. Use modular free-standing fencing: galvanized, minimum 1.8m high, chain link or welded steel mesh, pipe rail. Provide one lockable truck entrance gate and at least one pedestrian door as directed. Equip all gates with locks and keys. Maintain fence in good repair.

1.4 Hoarding

- 1.4.1 Erect temporary site enclosure using modular freestanding fencing: galvanized, minimum 1.8m high, chain link or welded steel mesh, pipe rail. Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys. Maintain fence in good repair.

1.5 Guard Rails and Barricades

- 1.5.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs and wherever else necessary to prevent accidental falls.
- 1.5.2 Provide as required by governing authorities.

1.6 Weather Enclosures

- 1.6.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- 1.6.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- 1.6.3 Design enclosures to withstand wind pressure and snow loading.

1.7 Dust Tight Screens

- 1.7.1 Provide dust tight screens or partitions to localize dust generating activities,
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and for protection of workers, finished areas of Work and public.

1.7.2 Maintain and relocate protection until such work is complete.

1.8 **Protection for Off Site and Public Property**

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

1.8.2 Be responsible for damage incurred.

1.9 **Protection of Building Finishes**

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

1.9.2 Provide necessary screens, covers, and hoardings.

1.9.3 Confirm with Consultant/Agency locations and installation schedule 3 days prior to installation.

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

1.10 **Protection of Surrounding Work**

1.10.1 Provide protection for finished and partially finished Work from damage.

1.10.2 Provide necessary cover and protection.

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

1.11 **Public Traffic Flow**

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

1.12 **Fire Routes**

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

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 61 00, Common Product Requirements**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 Product quality, availability, storage, handling, protection, and transportation.
- 1.1.2 Manufacturer's instructions.
- 1.1.3 Quality of Work, coordination and fastenings.
- 1.1.4 Dielectric Separation
- 1.1.5 Tolerances for Execution of Work.
- 1.1.6 Protection of Work in progress.
- 1.1.7 Existing Utilities

1.2 Definition – Basis of Design

- 1.2.1 Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - .1 Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- 1.2.2 Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - .1 Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
- 1.2.3 Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 -Submittal Procedures.
- 1.2.4 Lump-Sum Contract Price must be based on specified products in the Contract Documents. Proposals for alternate products may be submitted in writing to the Consultant, only after award of the Contract. No alternates will be permitted without prior written approval from the Consultant and the Agency. The Contract price will be adjusted accordingly to all credits arising from any alternates, if accepted and approved, by the Consultant/Agency.

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1.3 Quality

- 1.3.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- 1.3.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- 1.3.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with the Consultant/Agency based upon requirements of Contract Documents.
- 1.3.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- 1.3.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 Availability

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

1.5 Storage, Handling and Protection

- 1.5.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
 - 1.5.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
 - 1.5.3 Store products subject to damage from weather in weatherproof enclosures.
 - 1.5.4 Store cementitious products clear of earth or concrete floors, and away from walls.
 - 1.5.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
 - 1.5.6 Store sheet materials and lumber on flat, solid supports and keep clear of
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- ground. Slope to shed moisture.
- 1.5.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- 1.5.8 Remove and replace damaged products at own expense and to satisfaction of Agency.
- 1.5.9 Touch up damaged factory finished surfaces to Agency's satisfaction. Use touch up materials to match original. Do not paint over name plates.
- 1.6 **Transportation**
- 1.6.1 Pay costs of transportation of products required in performance of Work.
- 1.7 **Manufacturer's Instructions**
- 1.7.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- 1.7.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
- 1.7.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re installation at no increase in Contract Price or Contract Time.
- 1.8 **Quality of Work**
- 1.8.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- 1.8.2 Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- 1.8.3 Do not employ anyone unskilled in their required duties. Agency reserves right to require dismissal from site, workers deemed incompetent or careless.
- 1.8.4 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.
- 1.9 **Coordination**
- 1.9.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- 1.9.2 Be responsible for coordination and placement of openings, sleeves and accessories.
- 1.10 **Concealment**
- 1.10.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
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- 1.10.2 Before installation, inform Agency if there is interference. Install as directed by the Consultant.
- 1.11 **Remedial Work**
- 1.11.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- 1.11.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.
- 1.12 **Location of Fixtures**
- 1.12.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- 1.12.2 Inform Consultant of conflicting installation. Install as directed.
- 1.13 **Fastenings**
- 1.13.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- 1.13.2 Prevent electrolytic action between dissimilar metals and materials.
- 1.13.3 Use non- corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- 1.13.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- 1.13.5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- 1.13.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- 1.14 **Fastenings – Equipment**
- 1.14.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- 1.14.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- 1.14.3 Bolts may not project more than one diameter beyond nuts.
- 1.14.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.
- 1.15 **Dielectric Separation**
- 1.15.1 Ensure that a dielectric separator is provided in a permanent manner over entire contact surfaces to prevent electrolytic action (galvanic corrosion) between dissimilar materials. Similarly, prevent corrosion to aluminum in contact with alkaline materials such as contained in cementitious materials.
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1.16 Tolerances for Execution of Work

1.16.1 Unless specifically indicated otherwise, Work shall be installed plumb, level, square and straight.

1.16.2 Unless acceptable tolerances are otherwise specified in specification sections, or are otherwise required for proper functioning of equipment, site services and mechanical and electrical systems:

.1 "Plumb and level" shall mean plumb or level within 1mm in 1m.

2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.

.3 "Straight" shall mean within 1mm under a 1m long straight edge.

.4 "Flush" shall mean within:

.1 1mm for interior concrete, masonry and similar surfaces.

.2 0.5 mm for other interior surfaces.

1.16.3 Allowable tolerances shall not be cumulative.

1.17 Protection of Work in Progress

1.17.1 Adequately protect Work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no increase in Contract Price or Contract Time.

1.17.2 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Consultant.

1.18 Existing Utilities

1.18.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

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

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 71 00, Examination and Preparation**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

1.1.1 Field Engineering.

1.2 Submittals

1.2.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.2.2 On request of Consultant/Agency, submit documentation to verify accuracy of field engineering work.

1.3 Examination of Work and Site

1.3.1 Examine the site and existing building to be fully informed of their particulars as related to the Work.

1.3.2 Verify dimensions of completed Work in place before fabrication of Work to be incorporated with it. Ensure that all necessary job dimensions are taken for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions.

1.3.3 No claims for extra payment will be paid for extra work made necessary or for difficulties encountered due to conditions of the site which were visible or reasonably inferable from an examination of the site at the time prior to tender closing date and furthermore, failure of the Contractor to visit and examine the site shall be deemed a waiver of all claims for extra payment due to any condition of the site existing prior to tender closing date.

1.3.4 As-found damage: Record by photography and submit evidence to Consultant before commencing work, any found damaged surfaces or materials adjacent to new work, and not included under scope of this new work. Remedial work to any damage, not so recorded, shall be the responsibility of the Contractor.

1.4 Existing Services

1.4.1 Before commencing work, establish location and extent of service lines in area of Work and notify Agency of findings. The Contractor is responsible for coordination of all utility locates.

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

1.4.3 Where Work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to building occupants, pedestrian and vehicular traffic.

1.4.4 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

1.4.5 Install temporary drain plugs to prevent construction debris from blocking

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PROJECT 22701****Appendix 8.2, Division 01, Section 01 71 00, Examination and Preparation**

pipes downstream of the work.

- 1.4.6 All existing concrete floor slabs shall be scanned prior to any cutting or breaking of concrete. Employ a qualified concrete scanning company or inspection and testing agency to scan and map floor slabs for reinforcing, plastic and metal conduit, piping, grounding cables, embedment and the like. Map all slabs and provide copies to the Consultant.

1.5 **Location of Services, Equipment and Fixtures**

- 1.5.1 Location of services, equipment, fixtures and outlets indicated on Contract Drawings or specified are to be considered as approximate.
- 1.5.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance. Include existing equipment which affects or will be affected by the work.
- 1.5.3 Inform Consultant of impending installation and obtain approval for actual location.
- 1.5.4 Location of existing services where indicated, is approximate and is based on information provided by the Consultant. Undertake all locates to determine exact locations of existing services and lay out new services to avoid any conflicts with new building elements.
- 1.5.5 Submit field drawings and interference drawings to indicate relative position of various services and equipment.
- 1.5.6 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided.
- 1.5.7 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus and connections are coordinated.
- 1.5.8 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance and access are maintained.
- 1.5.9 Submit interference drawings in accordance with Section 01 33 00.
- 1.5.10 Unless specifically indicated by the Consultant, interference drawings will be received for information only and will not be reviewed.

1.6 **Records**

- 1.6.1 Maintain a complete, accurate log of control work as it progresses.
- 1.6.2 Record locations of maintained, re-routed and abandoned service lines.

1.7 **Subsurface Conditions**

- 1.7.1 Promptly notify Consultant in writing if conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- 1.7.2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work.

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2. **PRODUCTS** – NOT APPLICABLE
3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 01, Section 01 74 19, Cleaning, Waste Management and Disposal**

1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

1.1.1 Requirements for cleaning, waste management and disposal.

1.2 Description of Work

1.2.1 Identify, implement and document measures to achieve the waste management objectives listed above.

1.2.2 Minimize the amount of solid waste (including land-clearing debris) generated by construction and demolition activities.

1.2.3 Of the solid waste (including land-clearing debris) that is generated by Construction, Renovation and Demolition (CRD) activities, divert more than 75 per cent from landfill (through re-use and recycling).

1.2.4 Comply with all applicable Environmental Protection Act of Ontario regulations relating to construction waste management including Ontario Regulation 102/94 and Ontario Regulation 103/94.

1.2.5 Follow a strategy based on the 3R's hierarchy: Reduce the generation of waste materials at the Project site, Reuse waste materials on other construction sites (when feasible) and Recycle waste materials as feedstock for manufacturing processes that create new products. Identify opportunities to reuse and recycle waste in accordance with the requirements of Ontario Regulation 102/94 and these Specifications.

1.2.6 Complete and adhere to Demolition and Construction Waste Management Off-site Sorting Worksheets (Schedule): Summarize all shipments of waste materials from the Project site. Refer to item 1.10.1 for further details.

1.2.7 Initiate the reuse/recycling process by separating the various types of waste materials at the Project site in accordance with the requirements of Ontario Regulation 103/94 and these specifications. Refer to section 1.10.1 for further details.

1.2.8 The Contractor shall be directly responsible for all waste management/disposal for all subtrades. This responsibility shall not be that of subtrades.

1.3 References

1.3.1 Ontario Environmental Protection Act. Ontario Regulation 102/94: Waste Audits and Waste Reduction Work Plans.

1.3.2 Ontario Ministry of the Environment (MOE). A Guide to Waste Audits and Reduction Work Plans for Construction and Demolition Projects as Required under Ontario Regulation 102/94.

1.3.3 Ontario Environmental Protection Act. Ontario Regulation 103/94: Industrial, Commercial and Institutional Source Separation Programs.

1.3.4 Ontario Ministry of the Environment (MOE). A Guide to Source Separation of Recyclable Materials for Industrial, Commercial and Institutional Sectors

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- and Multi-Unit Residential Buildings as Required Under Ontario Regulation 103/94.
- 1.3.5 Canadian Construction Association. Standard Construction Document CCA 27- 1997: A Guide on Construction Environmental Management Planning.
 - 1.3.6 Canadian Construction Association. Standard Construction Document CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
 - 1.3.7 Canada Public Works and Government Service Canada 2002 National Construction Renovation and Demolition Non-Hazardous Solid Waste Management Protocol. National Fire Protection Association (NFPA)
 - 1.3.8 NFPA 241-22 Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- 1.4 **Code of Practice**
- 1.4.1 Comply with Canadian Construction Association’s “Code of Practice” outlined in Standard.
 - 1.4.2 Construction Document CCA 27-1997 (or latest version) to encourage improved waste management practices.
- 1.5 **Definitions**
- 1.5.1 Solid Waste: Any waste material (including land-clearing debris) that is sent from the Project site to another location for disposal.
 - 1.5.2 Land-Clearing Debris: Waste materials resulting from land-clearing that include pre-existing development materials and plant matter, but do not include soil.
 - 1.5.3 Reused Waste: Waste materials that are sent to a location off-site (e.g. another construction Project or product supplier) where they are used in their original form (i.e. without additional processing).
 - 1.5.4 Recycled Waste: Waste materials that are sent off-site to a recycling facility where they are used to displace virgin materials as feedstock for manufacturing processes that create new products.
 - 1.5.5 Landfill Waste: Waste materials that are sent to a landfill site for disposal. This includes incinerated material.
- 1.6 **Construction Coordinator**
- 1.6.1 Designate an individual to be responsible for all aspects for coordination during construction (including construction waste management).
 - 1.6.2 The Contractor shall be responsible for:
 - .1 Arranging waste management service agreements with waste haulers and waste receiving facilities.
 - .2 Supervising on-site waste management activities on a daily basis. Coordinating waste management tasks with Contractors to ensure timely and orderly progress of the Work.
 - .3 Preparing waste management documentation.
-

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- .4 Reporting waste management progress to the Consultant.
- 1.7 **Kick-Off Meeting**
 - 1.7.1 Prior to start of construction, the Contractor shall hold a kick-off meeting with the Consultant/Agency to review the Construction Waste Management Program requirements. This meeting shall include a review of:
 - .1 Construction Waste Management Objectives.
 - .2 Construction Waste Management Requirements and Procedures.
- 1.8 **Orientation Meeting**
 - 1.8.1 Prior to mobilization on-site, the Contractor in conjunction with the Consultant/ Agency shall hold an orientation meeting with the construction team to explain the Construction Waste Management Program requirements to the Contractors. This meeting shall include a review of:
 - .1 Construction Waste Management Objectives.
 - .2 Waste Estimates and Waste Diversion Estimates.
 - .3 Material Separation Requirements and Procedures.
 - .4 The Contractor shall hold a questions and answers session to clarify the requirements and procedures for all Sub-Contractors.
- 1.9 **Site Assessment**
 - 1.9.1 Allocate sufficient area on the construction site for the placement of material separation bins in an accessible, efficient arrangement.
 - 1.9.2 Provide “blue box” recycling bins near the construction trailer for recycling waste generated by site workers and visitors.
- 1.10 **Construction Waste Management Plan**
 - 1.10.1 Create a Construction Waste Management (CWM) Plan to be implemented by the Contractor. The plan shall include, but not be limited to the following procedures:
 - .1 Waste Reduction:
 - .1 Invite suppliers to retrieve/retain packaging after delivery (for reuse).
 - .2 Prevent damage of materials due to mishandling, improper storage and contamination.
 - .3 Use prefabricated assemblies built at a central facility (when possible) to avoid waste generation at the site.
 - .2 Waste Diversion:
 - .1 Contact local salvaging/recycling facilities and arrange for recycling services. Only facilities operating under a Certificate of Approval as required by the Environmental Protection Act of Ontario are acceptable. Incineration is not to be considered a means of diversion from landfill.
 - .2 Provide on-site bins for the collection, handling, and storage

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- of waste that are properly sized to accommodate expected waste quantities.
- .3 Follow the material acceptance requirements of the salvaging/recycling facilities so that materials are properly sorted, grouped, and packaged.
 - .4 Provide separate, properly labeled containers for each of the following material types:
 - .1 Land clearing debris.
 - .2 Asphalt.
 - .3 Portland cement concrete/masonry/stone.
 - .4 Steel and other metals.
 - .5 Wood.
 - .6 Gypsum (e.g. drywall).
 - .7 Cardboard.
 - .8 Plastic.
 - .9 “Blue box” waste.
 - .10 Mixed waste.
 - .11 Other types (as required by salvaging/recycling facilities).
 - .5 Provide separate containers for “blue box” waste (generated by site workers) collected in a mixed condition that will be separated for recycling off-site. The waste deposited in this container shall include:
 - .1 Aluminum food or beverage cans.
 - .2 Glass bottles and jars for food or beverage.
 - .3 PET bottles for food or beverages.
 - .4 Steel food or beverage cans.
 - .5 Cardboard and paper products.
 - .6 Protect materials from damage and contamination.
 - .6 Waste Tracking:
 - .1 Coordinate delivery of separated materials to approved salvage or recycling facilities.
 - .2 Assemble documentation from each receiving facility to corroborate that the waste was (or will be) actually recycled/salvaged.
- 1.10.2 Submit the CWM Plan prior to the start of construction for approval.
- 1.11 **Inspections and Maintenance**
- 1.11.1 Conduct daily inspections of material separation bins to check for and remedy cross-contamination.
- 1.12 **Project Cleanliness**
- 1.12.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

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- 1.12.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Consultant/Agency. Do not burn waste materials on site.
- 1.12.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- 1.12.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- 1.12.5 Provide on-site containers for collection of waste materials and debris.
- 1.12.6 Provide and use clearly marked separate bins for recycling.
- 1.12.7 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.
- 1.12.8 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- 1.12.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- 1.12.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

2. PRODUCTS**2.1 Products**

- 2.1.1 All cleaning materials and products shall be low VOC type. Submit list of cleaning products including SDS for approval prior to commencement of cleaning operations.
- 2.1.2 Use only cleaning materials recommended by manufacturer of surface to be cleaned and recommended by cleaning material manufacturer.

3. EXECUTION**3.1 Final Cleaning**

- 3.1.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- 3.1.2 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.
- 3.1.3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- 3.1.4 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- 3.1.5 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors

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- and ceilings.
- 3.1.6 Clean lighting reflectors, lenses, and other lighting surfaces. Clean and/or replace lamps, light fixtures, grilles and lenses.
 - 3.1.7 HEPA vacuum clean and dust building interiors, behind grilles, louvres and screens.
 - 3.1.8 Thoroughly vacuum clean interior of electrical equipment.
 - 3.1.9 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
 - 3.1.10 Clean and seal concrete floor surfaces with non-skid matte sealer.
 - 3.1.11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
 - 3.1.12 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
 - 3.1.13 Broom clean and wash exterior paved areas, walks, steps and surfaces; rake clean other surfaces of grounds.
 - 3.1.14 Remove dirt and other disfiguration from exterior surfaces.
 - 3.1.15 Clean and sweep roofs. Clear all drains, scuppers, gutters and downspouts.
 - 3.1.16 Remove debris and surplus materials from crawl spaces and other accessible concealed spaces.
 - 3.1.17 Remove snow and ice from access to building.
 - 3.1.18 Under the direction of Agency, aim adjustable luminaires.
 - 3.1.19 Completion of the Contract shall not be attained until the Contractor has removed surplus products, materials, tools, construction machinery and equipment.

END OF SECTION

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1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

1.1.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 References

1.2.1 Canadian Construction Documents Committee

1.2.2 CCDC2-2020 Stipulated Price Contract including Supplementary Conditions.

1.2.3 The Construction Act.

1.3 Inspection and Declaration

1.3.1 Contractor's Inspection: The Contractor shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents. Submit duplicate copies of the deficiency list to the Consultant/Agency.

.1 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Consultant's review.

1.3.2 Consultant's Review: Consultant and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

1.3.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by Boiler Inspection Branch, Fire Commissioner, Utility companies, TSSA, ESA and other regulatory agencies have been submitted.

.5 Operation of systems have been demonstrated to Agency's personnel.

.6 Work is complete and ready for Final Review by the Consultant.

1.3.4 Final Inspection: when items noted above are completed, request final review of Work by the Consultant, Agency, and Contractor. If Work is deemed incomplete by the Consultant, complete outstanding items and request re-review.

1.3.5 Declaration of Substantial Performance: when Consultant consider deficiencies and defects have been corrected and it appears requirements

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of Contract have been Substantially Performed, Consultant will issue Certificate of Substantial Performance of the Contract under Section 32 of the Act (Form-9).

- 1.3.6 Warranty Periods: The date of Ready-for-Takeover shall be the date for commencement for on-site warranty period for a period of two (2) years.
- 1.3.7 Final Payment: Once the project attain the Ready-for-Takeover, proper invoice shall be submitted to the Consultant for release of final payment.
- 1.3.8 Payment of Basic Holdback: Shall be released after 60 days from the Date Of Publication of Form-9 in Daily Commercial News.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

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1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

- 1.1.1 As built, samples, and specifications.
- 1.1.2 Equipment and systems.
- 1.1.3 Product data, materials and finishes, and related information.
- 1.1.4 Operation and maintenance data.
- 1.1.5 Spare parts, special tools and maintenance materials.
- 1.1.6 Warranties and bonds.
- 1.1.7 Final site survey.

1.2 Submittals

- 1.2.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3 Submission

- 1.3.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- 1.3.2 At least 2 weeks prior to commencement of scheduled commissioning activities, submit 2 copies of the draft Operating and Maintenance Manuals, for Consultant's review and use during the commissioning activities. After the completion of the commissioning activities, the Consultant will return to the Contractor 1 draft copy, with review comments, for revision. Submit 1 copy of the revised Operating and Maintenance for approval prior to the production of final copies. Prior to the Issuance of the Final Certificate of Completion, submit 2 copies of the final Operating and Maintenance Manuals.
- 1.3.3 Building will not be deemed ready for use unless the draft copies of the Operating and Maintenance Manuals and the "As-built" Record Documents have been submitted and reviewed by the Consultant.
- 1.3.4 Building will not be deemed ready for use unless the completed and submitted Operating and Maintenance Manuals and "As-built" Record Documents have been accepted by the Consultant.
- 1.3.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- 1.3.6 If requested, furnish evidence as to type, source and quality of products provided.
- 1.3.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

1.4 Format

- 1.4.1 Organize data in the form as instructional manual.
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- 1.4.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
 - 1.4.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
 - 1.4.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
 - 1.4.5 Arrange content by Section numbers and sequence of Table of Contents.
 - 1.4.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
 - 1.4.7 Text: manufacturer's printed data, or typewritten data.
 - 1.4.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
 - 1.4.9 Provide 1:1 scaled CAD files in .dwg format. Provide duplicate copies on memory stick.
- 1.5 **Contents Each Volume**
- 1.5.1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses and telephone numbers of Agency and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
 - 1.5.2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - 1.5.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - 1.5.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - 1.5.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- 1.6 **As-Builts and Samples**
- 1.6.1 In addition to requirements in General Conditions, maintain at the site one record copy of the following documents for Consultant's review:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
 - 1.6.2 Store record documents and samples in field office apart from documents
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- used for construction. Provide files, racks, and secure storage.
- 1.6.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
 - 1.6.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
 - 1.6.5 Keep record documents and samples available for inspection by Consultant.
- 1.7 **Recording Actual Site Conditions**
- 1.7.1 Record information on set of Contract Drawings, provided by Consultant.
 - 1.7.2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
 - 1.7.3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by change orders.
 - .4 Details not on original Contract Drawings.
 - .5 References to related shop drawings and modifications.
 - 1.7.4 Submit following drawings:
 - .1 Record changes in red. Mark on one set of prints and at completion of project prior to final inspection, produce electronic "as-built" records on disk using latest version of AutoCAD. Annotate "AS-BUILT RECORD" in each drawing title block.
 - .2 All changes shall be shown on a separate drawing layer named "as-built".
 - .3 At least 2 weeks prior to commencement of scheduled commissioning activities, submit one copy of the draft "As-built" Project Record Documents for Consultant's review and use during the commissioning activities. After the completion of the commissioning activities, the Agency will return to the Contractor the draft copy, with review comments, for revision. Prior to the Issuance of the Final Certificate of Completion, submit 2 copies of the final "As-built" Project Record Documents and disk of "as-built" record drawings.
 - 1.7.5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
 - 1.7.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
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- 1.8 **Equipment and Systems**
- 1.8.1 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.
 - 1.8.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
 - 1.8.3 Include installed colour coded wiring diagrams.
 - 1.8.4 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.
 - 1.8.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - 1.8.6 Provide servicing and lubrication schedule, and list of lubricants required.
 - 1.8.7 Include manufacturer's printed operation and maintenance instructions.
 - 1.8.8 Include sequence of operation by controls manufacturer.
 - 1.8.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - 1.8.10 Provide installed control diagrams by controls manufacturer.
 - 1.8.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
 - 1.8.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - 1.8.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - 1.8.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
 - 1.8.15 Additional requirements: as specified in individual specification sections.
- 1.9 **Materials and Finishes**
- 1.9.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - 1.9.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - 1.9.3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - 1.9.4 Additional Requirements: as specified in individual specifications sections.
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1.10 Spare Parts

- 1.10.1 Provide spare parts, in quantities specified in individual Specification sections.
- 1.10.2 Provide items of same manufacture and quality as items in Work.
- 1.10.3 Spare parts as identified in individual sections are to be delivered to the Agency prior to the Contractor's application for Substantial Performance.
- 1.10.4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- 1.10.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 Maintenance Materials

- 1.11.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- 1.11.2 Provide items of same manufacture and quality as items in Work.
- 1.11.3 Maintenance materials are to be delivered to the Agency prior to the Contractor's application for Substantial Performance.
- 1.11.4 Receive and catalogue items. Submit inventory listing to Agency. Include approved listings in Maintenance Manual.
- 1.11.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 Special Tools

- 1.12.1 Provide special tools, in quantities specified in individual specification section.
- 1.12.2 Provide items with tags identifying their associated function and equipment.
- 1.12.3 Special tools are to be delivered to the Agency prior to the application for Substantial Performance.
- 1.12.4 Receive and catalogue items. Submit inventory listing to Agency. Include approved listings in Maintenance Manual.

1.13 Storage, Handling and Protection

- 1.13.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- 1.13.2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- 1.13.3 Store components subject to damage from weather in weatherproof enclosures.
- 1.13.4 Store paints and freezable materials in a heated and ventilated room.
- 1.13.5 Remove and replace damaged products at own expense and to satisfaction of Agency.

1.14 Warranties and Guarantees

- 1.14.1 Separate each warranty or guarantee with index tab sheets keyed to Table of Contents listing.
 - 1.14.2 List subcontractor, supplier, and manufacturer, with name, address, and
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telephone number of responsible principal.

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

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

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

1.14.6 Co-execute submittals when required.

1.14.7 Retain warranties and guarantees until time specified for submittal.

1.15 **Independent Specialty Engineers Sign-Off**

1.15.1 Prior to Substantial Performance, provide copies of signed and stamped engineers review and sign-off letters stating that the work has been built in accordance with their drawings and designs. Conditional or vague letters of sign-off will not be accepted. All specialty design engineers for all subcontractors and suppliers will be required to review the work in progress at appropriate intervals to ensure compliance with their designs and drawings and shall provide final sign-off letters. Provide copies of all field reports issued by specialty engineers. Carry all costs associated with full compliance with this requirement.

1.16 **Closure of Building Permit**

1.6.1 The Contractor is responsible for closure of building permit and other permits issued on this project. Provide written conformation to the Consultant/Agency that all the permits are closed and other requirements to attain Ready-for-Takeover before final payment is released.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL

Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

1.1 Section Includes

1.1.1 Procedures for demonstration and instruction of equipment and systems to Agency's personnel.

1.2 Description

1.2.1 Demonstrate operation and maintenance of equipment and systems to Agency's personnel two weeks prior to date of Substantial Performance.

1.2.2 Agency will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed-upon times.

1.3 Submittals

1.3.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant/Agency's approval.

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

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

1.4 Quality Control

1.4.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Agency's personnel, and provide written report that demonstration and instructions have been completed.

1.5 Conditions for Demonstrations

1.5.1 Equipment has been inspected and put into operation.

1.5.2 Testing, adjusting, and balancing have been performed and equipment and systems are fully operational.

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

1.6 Preparation

1.6.1 Verify that conditions for demonstration and instructions comply with requirements.

1.6.2 Verify that designated personnel are present.

1.7 Demonstrations and Instructions

1.7.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times.

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- 1.7.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - 1.7.3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - 1.7.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.
2. **PRODUCTS** – NOT APPLICABLE
3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 General Requirements**

- 1.1.1 Comply with Section 01 00 00 “General Requirements”, Section 23 05 00 “Common Work Results for HVAC” and Section 26 60 02 “Testing and Commissioning of Electrical Systems” requirements and documents referred to therein as applicable.
- 1.1.2 Contractor shall be responsible for proper performance of Work.
- 1.1.3 Provide all labour, materials, products, equipment and services for commissioning of mechanical and electrical building systems to ensure building is operating according to requirements of contract documents.
- 1.1.4 The Contractor shall be responsible for assisting in the commissioning process identified herein and in the related documents in 1.2 below.
- 1.1.5 The Commissioning Authority (CxA) as directed by the Owner shall develop a Commissioning Plan (See Commissioning Plan included at the end of this section) which forms part of the specifications. This Commissioning Plan is a live document and will be modified throughout the design, construction and post occupancy stages.
- 1.1.6 Refer to Appendix: 8.6 – Commissioning Plan.

1.2 Related Sections

- 1.2.1 Refer to the following sections:
 - .1 Section 23 05 00 Common Work Results for HVAC
 - .2 Section 23 05 93 Testing, Adjusting and Balancing for HVAC
 - .3 Section 23 08 00 Commissioning of HVAC
 - .4 Section 25 05 11 EMCS: Start-Up and Check-Out

1.3 References

- 1.3.1 ASHRAE Guideline 0-2019: The Commissioning Process
- 1.3.2 ASHRAE Guideline 1.4-2019: Preparing Systems Manuals for Facilities
- 1.3.3 ASHRAE Standard 202-2018: Cx Process for Buildings & Systems
- 1.3.4 ASHRAE Guideline 1.1-2007: HVAC&R Technical Requirements for the Cx Process
- 1.3.5 ASHRAE Guideline 4-2019: Preparation of O&M Documentation for HVAC&R Systems
- 1.3.6 In case of discrepancies or conflicts between documents, documents will be governed in the order specified in Division 1.

1.4 Definitions and Acronyms

- 1.4.1 Commissioning: Is a systematic process of ensuring that all building systems are designed, installed, functionally tested, perform and are capable of being operated and maintained according to the design intent and owner’s operational needs.
- 1.4.2 Commissioning Authority (CxA): Owner’s appointed commissioning

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professional.

- 1.4.3 Commissioning Consultant: (See Commissioning Authority).
- 1.4.4 Consultant: Member of the professional design team.
- 1.4.5 MEP Coordinator: General Contractor appointed representative.
- 1.4.6 ME Contractor: Refers to mechanical and/or electrical contractor.
- 1.4.7 Commissioning Team: Consists of various participants involved in the commissioning process. The commissioning documentation and tasks of each team member will be coordinated through the Commissioning Authority.
- 1.4.8 TAB: Testing, Adjusting and Balancing.
- 1.4.9 BAS: Building Automation System.
- 1.4.10 FPT: Functional Performance Test
- 1.4.11 PFT: Pre-Functional Test

1.5 Commissioning Objectives

- 1.5.1 Objectives of the commissioning process are to:
 - .1 Support quality management through monitoring and checking of installation.
 - .2 Verify system performance through testing and commissioning of completed installation.
 - .3 Move the completed facility from 'static completion' state to optimal 'dynamic' operating state.
 - .4 Transfer the facility from Contractor to the Owner in such a manner that provision of a quality facility to Owner has been assured.
 - .5 Optimize operating and maintenance through delivery of comprehensive quality training and instruction to Owner's operating personnel.
 - .6 Assure provision of accurate and useful historical records, such as as-built drawings, test certificates, etc. to Owner. Such records provide important data for operating and maintaining systems as well as for future systems testing, maintenance or renovations and to trouble shoot and repair the components of systems.
 - .7 Extend commissioning into operational phase in order to verify performance levels under a range of operating conditions; such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on.
 - .8 Monitor operation, performance and maintenance programs; optimize system's performance under normal operating conditions and partial and full occupancy, under the direction and review of CxA. This phase lasts throughout warranty period. It may, however, involve activities to ensure completion of:
 - .1 system debugging and optimization
 - .2 completion of training and instruction for operating and maintenance personnel

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- .3 completion of all commissioning activities on defective, seasonally sensitive systems, for varying modes and periodic simulated emergency conditions.
 - .9 Commissioning shall be considered complete when all of the objectives of commissioning, as specified herein, have been achieved.
 - .10 Involvement of CxA does not void any guarantees or warranties nor does it relieve Contractor of any contractual responsibilities.
- 1.6 **Consultant Team**
- 1.6.1 The Consultant Team for the Project is responsible for developing a set of performance objectives and providing a design that meets those objectives. The Consultant team will be required to assist with developing and witnessing the system tests and integrated systems tests. Consultants are to advise the Contractor as to which tests require witnessing.
- 1.7 **Commissioning Team**
- 1.7.1 Members of the team should include the following as a minimum:
 - .1 Owner Representative(s)
 - .2 CxA
 - .3 Architect
 - .4 Mechanical Engineer
 - .5 Electrical Engineer
 - .6 General Contractor
 - .7 BAS Contractor / Vendor
 - .8 Mechanical Contractor
 - .9 Sheetmetal Contractor
 - .10 Electrical Contractor
 - .11 TAB Contractor
 - .12 Manufacturer's Representatives
- 1.8 **Commissioning Team Responsibilities**
- 1.8.1 Refer to the Commissioning Plan at the end of this specification section for a detailed list of team responsibilities.
- 1.9 **Products**
- 1.9.1 The Contractor shall provide all materials, equipment and instrumentation to complete the Contractors' commissioning process identified in this section and the mechanical and electrical specification sections.
- 1.10 **Submittals**
- 1.10.1 Submittal Drawings and Equipment Data – To be submitted by contractor – Refer to related specification sections. The CxA will review submittals to ensure the systems and equipment being supplied is consistent with the
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- required commissioning test procedures, and if not, that the variances are acceptable to the Team, and that commissioning checklists are revised accordingly.
- 1.10.2 As-Built Record Drawings – Refer to related specification sections. The various trades shall mark-up the Consultants' drawings to clearly indicate the approved changes in the design or layout that took place during construction.
- 1.10.3 O&M Manuals – Refer to related specification sections. The contractor shall compile as specified in the contract documents. O&M Manuals shall be reviewed by the CxA. Draft O&M Manuals shall be available and used during operator training.
- 1.10.4 Training Agendas and Training Material – Contractors, through the manufacturer's, will provide training agendas and training materials for each system.
- 1.11 **Manufacturer's Instructions**
- 1.11.1 Unless otherwise indicated in the specifications, operate Products in accordance with manufacturer's instructions. Obtain written instructions directly from the manufacturers.
- 1.11.2 Notify the Consultant in writing, of any conflicts between the specifications and manufacturer's instructions, so that the Consultant may establish the course of action.
- 1.11.3 Improper operation of Products, due to failure in complying with these requirements, authorizes the Consultant to require removal and re-installation at no change in Contract Price or Contract Time.
- 1.12 **Reports**
- 1.12.1 Submit field test reports for the Project's electrical and mechanical equipment / systems, including but not limited to: power distribution equipment, lighting control system, fire alarm system, sound masking system, lightning protection system, energy recovery ventilators, rooftop units, fans, condensing units, VRF fan coil units, split ac units, duct heaters, terminal units, BAS point-to-point verification, BAS field panel and device checkouts. Also provide system's megger testing, piping flushing, piping cleaning, piping pressurization and air duct leakage testing reports.
- 1.12.2 The CxA will issue commissioning reports following all commissioning activities on site. The Contractor is responsible for completion of deficiencies as listed in the Commissioning Reports and shall return signed-off copies of issued commissioning reports noting all action taken to address items.
- 1.12.3 All commissioning deficiencies will be tracked to resolve and final sign-off by the CxA.
- 1.12.4 Contractors to provide feedback on items listed in the commissioning issues log developed by the CxA
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1.13 Quality Assurance

- 1.13.1 Use knowledgeable personnel for starting equipment following testing procedures who have experience in mechanical and electrical equipment and systems commissioning. Ensure personnel are able to interpret results of readings and tests and report state of the system in a clear and concise manner.
- 1.13.2 Major mechanical and electrical equipment shall be started and checked by OEM certified personnel.
- 1.13.3 Maintain a file for all PFT and FPT sheets and make it ready for CxA review and approval.

1.14 Operation and Maintenance Manuals

- 1.14.1 Provide additional requested documentation prior to normal O&M manual submittals, to the CxA for development of start-up and functional testing procedures. Typically, this will include detailed manufacturer installation and start-up documentation, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, full factory testing reports (if any), and full warranty information including responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout material that are shipped inside the equipment and field checkout sheets to be used by the factory of field technicians shall be submitted to the CxA. These documents will also be included in the O&M Manuals.
- 1.14.2 The CxA may request further documentation necessary for the commissioning process. This data request may be made prior to normal submittals.

2. PRODUCTS: NOT APPLICABLE**3. EXECUTION****3.1 General**

- 3.1.1 In general terms, commissioning is the process of assuring and verifying that all building systems are designed, installed, functionally tested, perform and are capable of being operated and maintained according to the design intent and owner's operational needs.
- 3.1.2 Contractor shall be responsible for proper performance of Work.
- 3.1.3 The CxA shall plan, organize and implement the commissioning process.

3.2 Commissioning Process

- 3.2.1 The commissioning process can be defined as a series of actions and activities by the project participants at various times over the complete life cycle of the project. These actions and activities can be regarded as fundamental to the commissioning program and are included in the

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following phases of the commissioning process.

- 3.2.2 Pre-Construction / Design Phase
 - .1 Develop initial outline for the commissioning plan.
 - .2 Complete commissioning-focused design reviews.
 - .3 Review Owner's project requirements and basis of design documents.
 - .4 Develop commissioning requirements for the Specifications.
 - .5 Begin planning for verification checklists, functional tests, and training requirements.
- 3.2.3 Construction Phase
 - .1 Conduct commissioning meetings.
 - .2 Incorporate commissioning activities into the project master schedule.
 - .3 Review shop drawings and submittals for the commissioning related equipment and systems.
 - .4 Witness static and dynamic tests for the various systems.
 - .5 Conduct installation inspections.
 - .6 Witness equipment start-ups.
 - .7 Witness / review air and water balancing process.
 - .8 Review air and water balancing report.
 - .9 Review O&M manuals.
 - .10 Complete verification checklists.
 - .11 Issue site commissioning reports.
 - .12 Conduct functional / performance tests
 - .13 Witness Contractor's Functional Performance Verification tests on various equipment and systems.
 - .14 Witness / verify training for the facility operation staff.
 - .15 Develop final commissioning report.
- 3.2.4 Occupancy and Operation Phase
 - .1 Assist in resolving outstanding commissioning issues.
 - .2 Perform seasonal and deferred testing to verify the operation during different seasons.
 - .3 Issue summary reports for seasonal and year end reviews.

3.3 Witnessing of Tests

- 3.3.1 Commissioning Authority may witness selected starting, testing, adjusting, balancing and cleaning procedures.
 - 3.3.2 Advise the Commissioning Authority in advance that starting, testing, adjusting, balancing or cleaning processes are ready to commence. Consult with the Commissioning Authority to determine which procedures they may elect/decide to witness the test. Provide advanced notice prior to commencement of each procedure or series of procedures to allow the Commissioning Authority to arrange for witnessing of tests as required.
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3.4 Start Up and Testing Costs

3.4.1 Contractors shall pay any costs associated with starting, testing, adjusting, preparation for balancing and cleaning, including supply of calibrated instruments, equipment, supplies and consumable materials.

3.5 Manufacturer's Recommendations

3.5.1 Prior to starting equipment or systems, obtain and review manufacturer's installation, starting and operating instructions. Read in conjunction with procedures specified herein.

3.5.2 Use manufacturers' and supplier's trained personnel where necessary to maintain validity of manufacturer's warranty.

3.5.3 Compare actual installation with manufacturer's recommended installation. Record discrepancies. Correct deviations detrimental to equipment performance prior to starting equipment.

3.6 Testing Instruments and Equipment

3.6.1 Provide calibrated testing instruments and equipment, and ancillary equipment such as two-way radios and ladders required to perform starting of mechanical equipment and systems.

3.6.2 Instruments used in equipment start-up must be calibrated and accurate. Provide valid calibration certificates if requested by the Commissioning Authority.

3.7 Built-In Controls

3.7.1 The built-in controls of all equipment will be tested by the respective Supplier/Contractor to prove its intended sequence of operation in presence of the CxA/Consultant. This testing will be carried out in appropriate weather condition as specified for all system equipment being commissioned.

3.8 BAS Controls Testing

3.8.1 The Controls Contractor will submit a point-to-point checklist and calibration verification to CxA for review. The CxA may suggest addition/changes to the checklists and the reviewed checklist will be utilized by the Contractor to complete the control's testing.

3.8.2 Contractor will test and record results for each equipment and component of the building automation system. On completion of the test, Contractor will submit a detailed test and calibration report to the Consultant and CxA for verification. CxA will physically verify the test report for at least one of each type of system/equipment commissioned. The non-conformities will be corrected by the Contractor and the test and verification procedure will be repeated for that system.

3.8.3 The controls contractor will test the sequence of operation for all HVAC

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equipment and devices and submit test reports accordingly. Complete sequence of operation shall be submitted as part of the controls shop drawings for engineer's approval and the review of the commissioning authority.

3.9 Commissioning Review

3.9.1 Provide access to all system equipment being commissioned.

3.9.2 Do not conceal or cover equipment or systems prior to scheduling commissioning reviews.

3.10 Pre-Functional and Functional Check Sheets

3.10.1 Record all data gathered on site on PFT sheets and commissioning check sheets.

3.10.2 Make copies of all starting and testing data before equipment and system start-up personnel leave site. Maintain one copy of all data taken during starting on site.

3.10.3 Maintain one copy of all final starting, testing, adjusting and balancing reports on site up to Substantial Completion of the Work for reference purposes.

3.10.4 Make copies of all red-line record drawings available for Commissioning Agents to review.

3.10.5 Complete and Sign off all PFT sheets and make it ready for CxA review and approval.

3.11 Commissioning Schedule

3.11.1 The Commissioning Authority will prepare a Draft Commissioning Schedule prior to the start-up of building systems. The Contractor shall provide tentative dates for when each system will be ready for commissioning activities to commence.

3.11.2 The General Contractor will ensure all commissioning related activities and milestones are inserted in the project schedule.

3.11.3 During the construction phase, commissioning meetings will be scheduled by the Commissioning Authority on site for coordination of commissioning activities and schedule.

3.11.4 Prior to commencement of each particular testing procedure, coordinate all subtrades, manufacturers, suppliers and other specialties to ensure all phases of work are properly completed. Establish necessary manpower requirements.

3.12 Start-Ups

3.12.1 The installing contractor shall under their own direction, plan, execute and document the installation verification and perform start up and checkout (Major systems /equipment start-up by OEM personnel). The contractor shall verify that other building systems being installed will not compromise the operation and functional performance of the commissioned systems.

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Notify the CxA minimum of 5 days in advance of equipment and system start up and/or installation verification testing. The CxA verifies the completed checklists and the start-up checks.

3.12.2 Complete and sign-off all start up test sheets and make it ready for CxA review and approval.

3.13 Performance Verification

3.13.1 The contractor(s) and vendor(s) shall be fully responsible for 100% actual system(s) functional performance tests and documentation of testing. Changes to approved test procedures must be approved by the CxA. The CxA will conduct verification on tested systems after the Contractor and Controls Vendor have completed their complete Functional Performance Test (FPT).

3.13.2 The CxA will provide Functional Performance Test sheets for each equipment/system.

3.13.3 Provide skilled technicians to execute starting of equipment and to execute the functional performance tests.

3.13.4 Testing shall include all system and equipment FPT.

3.13.5 Testing shall include 100% BAS point to point verification, programming, sequence of operation, calibration, scheduling, trending, graphics, commands and any other required test deemed necessary to complete the FPT process.

3.13.6 Contractor(s) and BAS vendor(s) shall provide completed and signed FPT sheets and make them ready for CxA review and approval.

3.14 Re-Testing

3.14.1 Deficiency Resolution & Warranty Review: Items of non-compliance in material, installation or setup shall be corrected at the contractor's expense and the system shall be retested. Failed tests will be repeated as required. Deficiencies once identified are to be corrected expeditiously. Warranty issues will be identified and resolved by the contractor with the Owner.

3.14.2 Contractor(s) and vendor(s) shall bear all required costs for deficiency correction and retesting.

3.15 Training of Owner's Staff

3.15.1 Training is to be led by an OEM factory trained technician directly involved and familiar with the site. Training materials, agenda and O+M manuals are to be provided at least 5 business days prior to training. Training sessions are to occur prior to substantial completion. Time to be used at owner's discretion.

3.15.2 Provide on-site training sessions including classroom and hands on for personnel designated by the owner prior to substantial completion, or when systems start affecting conditions in tenant spaces that owner must respond to.

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- 3.15.3 Train the designated owner's staff to enable them to perform the following:
 - .1 Day-to-day operations,
 - .2 Proficiently operate the system,
 - .3 Understand control system architecture and configuration,
 - .4 Operate the BAS workstation, peripherals and other interface terminals,
 - .5 System troubleshooting
 - .6 Conduct routine maintenance
 - .7 Understand system drawings and Operation and Maintenance manuals
 - .8 Start-up, normal operation, shut down, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting and alarm

 - 3.16 **Testing, Adjusting and Balancing**
 - 3.16.1 Comply with the TAB Specifications and related sections in the contract documents.
 - 3.16.2 Contractor shall submit a preliminary TAB report and correct all deficiencies prior to start the balancing process.
 - 3.16.3 Contractor shall submit a final balancing report for all air and systems.

 - 3.17 **Completion of Commissioning Requirements**
 - 3.17.1 Upon completion of commissioning, the CxA shall ensure the contractor leaves all systems in normal operating mode.
 - 3.17.2 Except for identified seasonal commissioning activities to be conducted during the first year of operation, all commissioning shall be complete prior to Substantial performance of the work.
 - 3.17.3 Commissioning shall be considered complete only when the final Commissioning Report has been received and approved by the client.

 - 3.18 **Systems To Be Commissioned**
 - 3.18.1 Systems shall include but not limited to following:
 - .1 HVAC Systems:
 - .1 VRF Fan Coil Units
 - .1 Condensers, evaporators and piping
 - .2 Air Distribution Systems
 - .1 Energy Recovery Ventilators, Rooftop units, duct systems, and air terminals
 - .3 Supply and Exhaust Systems
 - .1 Fans and duct systems
 - .4 Radiant Panels
 - .5 Electric Duct Heaters
 - .6 Electric Heaters
 - .7 Split AC Units
 - .2 Plumbing Systems:
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- .1 Domestic Hot Water System
- .2 Domestic Cold Water System
- .3 Electrical Systems:
 - .1 Electrical Power Distribution
 - .2 Lighting Control System
 - .3 Lightning Protection System
 - .4 Sound Masking System
- .4 Building Automation Systems:
 - .1 Automatic Temperature Control System
 - .1 Control devices, general building controls, energy management and system integration

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to complete selective building demolition/ building components as indicated on the Contract Drawings and specified in this Section of Specification.

1.2.2 All materials removed must be legally disposed of off-site at the end of each day.

1.3 References

1.3.1 The National Building Code of Canada 2020, Part 8-Safety Measures on Construction and Demolition Sites.

1.3.2 CSA Group (CSA)

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

1.3.3 ASTM International (ASTM)

.1 ASTM F710-22 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.3.4 Ontario Provincial Regulations

.1 Ontario Regulation 102/94 Waste Audits and Waste Reduction Work Plans.

.2 Ontario Regulation 103/94 Environmental Protection Act.

.3 Ontario Regulation 213/07 The Fire Code.

.4 Ontario Regulation 232/98 Landfilling Sites.

.5 Ontario Regulation 278/05 Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.

.6 Ontario Regulation 347 Environmental Protection Act, General — Waste Management.

.7 Ontario Regulation 332/12 The Building Code.

1.3.5 The Workplace Health and Safety Act, and Regulations for Construction Projects.

1.3.6 The Contractors Health and Safety Policy.

1.3.7 Laws, rules and regulations of other authorities having jurisdiction.

1.4 Submittals

1.4.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4.2 Submit detailed written schedule, methodology and proposed procedures for demolition, including a Safe Work Plan for review prior to commencement of demolition.

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- 1.4.3 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details clearly showing sequence of disassembly work or supporting structures and underpinning.
 - 1.4.4 Drawings for structural elements of the demolition process including shoring, underpinning and installation of new lintels or beams in existing load bearing walls, shall bear signature and stamp of qualified professional engineer registered in the Province of Ontario.
 - 1.4.5 Submit proposed dust-control measures.
 - 1.4.6 Submit proposed noise-control measures.
 - 1.4.7 Submit schedule of demolition activities indicating the following:
 - .1 Detailed sequence of demolition and removal work, including start and end dates for each activity.
 - .2 Dates for shutoff, capping, and continuation of utility services.
 - 1.4.8 If hazardous materials are encountered and disposed of, landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - 1.4.9 At Project Closeout: Submit record drawings in accordance with Section 01 78 00.
- 1.5 **Permits**
- 1.5.1 The Agency will provide Building Permit. Contractor to obtain and pay for all other permits and comply with all laws, rules, ordinances, and regulations relating to Demolition of Building and preservation of Public Health and Safety.
 - 1.5.2 The Consultant will complete General Review during demolition in accordance with the Ontario Building Code. All other engineering required for shoring design and for other structural elements of the demolition work will be completed by the Contractor's own engineer and paid for by the Contractor.
- 1.6 **Waste Management Plan**
- 1.6.1 All work of this section shall be completed in accordance with the contractors approved Waste Management Plan specified in Section 01 74 19.
- 1.7 **Definitions**
- 1.7.1 Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.
 - 1.7.2 Demolition Waste: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard
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and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel.

- 1.7.3 Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human or animal life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural or historical purposes.
- 1.7.4 Inert Fill: A permitted facility that accepts inert waste such as asphalt and concrete exclusively for the purpose of disposal.
- 1.7.5 Inert Solids/Inert Waste: Non-liquid solid waste including, but not limited to, soil and concrete that does not contain hazardous substances or soluble pollutants at concentrations in excess of water-quality standards established by a regional water board and does not contain significant quantities of decomposable solid waste.
- 1.7.6 Landfill: A landfill that accepts non-hazardous materials such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A landfill must have a solid waste facilities permit from the Ministry of the Environment and be in conformance to O. Reg 232/98.
- 1.7.7 Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- 1.7.8 Remove: Remove and legally dispose of items, except those identified for use in recycling, re-use, and salvage programs.
- 1.7.9 Reuse: The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- 1.7.10 Solid Waste: All putrescible and non-putrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by law.

1.8 Quality Assurance

- 1.8.1 Demolition Firm Qualifications: Demolition contractor shall be an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.

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- 1.8.2 Regulatory Requirements: Comply with governing regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Obtain and pay for all permits required.
 - 1.8.3 Pre-demolition Conference: Conduct a conference at Project site.
 - .1 Review the environmental goals of this Project and make a proactive effort to increase awareness of these goals among all labor forces on site.
 - .2 Review schedule and scheduling procedures.
 - .3 Review health and safety procedures.
 - .4 Review of Project conditions including review of record photographs.
 - 1.9 **Project Conditions**
 - 1.9.1 Construct safety barriers, barricades, fencing and hoarding to separate public from work areas as described in Section 01 56 00 - Temporary Barriers and Enclosures.
 - 1.9.2 The Consultant/Agency assumes no responsibility for the actual condition of the structures to be demolished.
 - 1.9.3 Conditions existing at the time of inspection for bidding purposes will be maintained by the Agency so far as practicable.
 - 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Provide all materials necessary for temporary shoring. On completion, remove temporary materials from site.
 - 2.1.2 All building materials removed from the building shall become the property of the Contractor and shall be removed from the Site.
 - 2.2 **Recycle**
 - 2.2.1 All materials from demolition and land clearing which can be recycled through local municipal programs, and which is not scheduled for salvage shall be sorted and separated in accordance with Regional, Provincial and Municipal standards and regulations.
 - 2.2.2 Provide recycling receptacles for the duration of construction activities at the construction site.
 - 3. **EXECUTION**
 - 3.1 **Examination**
 - 3.1.1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition, salvage and recycling required.
 - 3.1.2 Verify that utilities have been disconnected and capped.
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- 3.1.3 Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
 - 3.1.4 Retain a licensed and qualified civil or structural engineer to provide analysis, including calculations, necessary to ensure the safe execution of the demolition work.
 - 3.1.5 Perform surveys and tests as the Work progresses to detect hazards resulting from demolition activities.
 - 3.1.6 Preliminary Survey:
 - .1 The Demolition Plans indicate the general extent of existing conditions based upon drawings provided by the Agency and existing site conditions. Review all areas of work to determine full extent of areas to be demolished, altered or renovated and become familiar with actual conditions and extent of work required.
 - .2 Before commencing demolition operations, examine Site and provide engineering survey to determine type of construction, condition of structure, and Site conditions. Assess strength and stability of damaged or deteriorated structures.
 - .3 Assess potential effect of removal of any part or parts on the remainder of structure before such part(s) are removed.
 - .4 Assess effects of demolition at adjacent structures and consider need for underpinning, shoring and/or bracing.
 - .5 Investigate for following conditions:
 - .1 load bearing walls and floors
 - .2 structure suspended from another.
 - .3 effects of soils, water, lateral pressures on retaining or foundations walls
 - .4 presence of tanks and other piping systems
 - .5 presence of designated substances and hazardous materials.
 - 3.1.7 After determining demolition methods, determine area of possible vibration. Carefully inspect beyond those adjacent areas. List potential damage areas and photograph each for record purposes before starting work.
- 3.2 **Preparation**
- 3.2.1 Erect and maintain dustproof and weatherproof partitions as required to prevent spread of dust, fumes and smoke to other parts of building. Maintain fire exits. On completion, remove partitions and make good surfaces to match adjacent surfaces of building.
 - 3.2.2 Provide all shoring and bracing required for the execution of the work.
 - 3.2.3 Before commencing demolition, verify that existing water, gas, electrical and other services in areas being demolished are cut off, capped diverted
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or removed as required. Post warning signs on electrical lines and equipment which must remain energized to serve adjacent areas during period of demolition.

3.2.4 Conduct demolition operations and remove materials from demolition to ensure minimum interference with roads, streets, walks, and other adjacent occupied and utilized facilities.

3.2.5 Do not close or obstruct streets, walks, or other adjacent occupied or utilized facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.3 Utilities

3.3.1 Contact authorities or utility companies for assistance in locating and marking services passing under, through, overhead or adjacent to structure to be demolished. Such services include:

- .1 Electrical power lines
- .2 Gas mains
- .3 Communication cables
- .4 Fibre optic cables
- .5 Water lines.
- .6 Drainage piping (storm and sanitary).

3.3.2 Before disconnecting, removing, plugging or abandoning any existing utilities serving the building:

- .1 Notify the Consultant/Agency, applicable utility companies, and local authorities having jurisdiction.
- .2 Remove, cut off and plug, or cap all utilities within the existing building areas to be demolished, except those designated to remain.

3.4 Protection

3.4.1 Erect and maintain temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Maintain such areas free of snow, ice, water and debris. Lighting levels shall be equal to that prior to erection.

3.4.2 Provide safe access and egress from working areas using entrances, hallways, stairways or ladder runs, protected to safeguard personnel using them from falling debris.

3.4.3 Do not interfere with use and activities of adjacent buildings and site. Maintain free and safe passage to and from buildings.

3.4.4 Where demolition operations prevent normal access to adjacent properties, provide and maintain suitable alternative access.

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- 3.4.5 Provide flagmen where necessary or appropriate, to provide effective and safe access to site to vehicular traffic and protection to Agency's personnel. Refer to Division 1 for safety requirements.
 - 3.4.6 Protect existing site improvements, appurtenances, and landscaping that are designated to remain in place.
 - 3.4.7 Ensure that all necessary controls are in place at the beginning of each work period which will prevent the spread of contaminated material beyond the work area limits. Stop work immediately if there exists any possibility of the spread of contaminated materials.
 - 3.4.8 Keep dust from entering existing facilities and areas of building not affected by the Work. Comply with Ministry of Health requirements regarding debris control.
 - 3.4.9 Ensure scaffolds, ladders, equipment and other such equipment are not accessible to public. Protect with adequate fencing or remove and dismantle at end of each day or when no longer required.
 - 3.4.10 Take precautions to guard against movement, settlement or collapse of adjacent structures, services or driveways. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.
 - 3.4.11 If Agency considers additional bracing and shoring necessary to safeguard and prevent such movement or settlement, install bracing or shoring upon Agency's orders.
 - 3.4.12 Particular attention shall be paid to prevention of fire and elimination of fire hazards which would endanger new work or existing premises.
 - 3.4.13 Protect existing adjacent work against damages which might occur from falling debris or other causes due to work of this Section.
 - 3.4.14 At all times protect the structure from overloading.
 - 3.4.15 Provide protection around floor and/or roof openings.
 - 3.4.16 Protect from weather, parts of adjoining structures not previously exposed.
 - 3.4.17 Protect interiors of building parts not to be demolished from exterior elements at all times.
 - 3.4.18 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling.
- 3.5 **Temporary Ventilation**
- 3.5.1 Provide all required temporary ventilation for demolition work.
- 3.6 **Environmental Controls**
- 3.6.1 Comply with provincial and municipal regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment and noise pollution.
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- 3.6.2 Dust Control, Air Pollution, and Odour Control: Prevent creation of dust, air pollution and odors.
 - .1 Use temporary enclosures and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - .2 Store volatile liquids, including fuels and solvents, in closed containers.
 - .3 Properly maintain equipment to reduce gaseous pollutant emissions.
 - 3.6.3 Noise Control: Perform demolition operations to minimize noise.
 - .1 Provide equipment, sound deadening devices, and take noise abatement measures that are necessary to comply with municipal regulations.
 - 3.6.4 Salvage, Re-Use, and Recycling Procedures:
 - .1 Identify re-use, salvage, and recycling facilities.
 - .2 Develop and implement procedures to re-use, salvage, and recycle demolition materials.
 - .3 Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
 - .4 Source-separate clean and uncontaminated demolition materials including, but not limited to the following types:
 - .1 Concrete, Concrete Block, Concrete Masonry Units (CMU), Brick.
 - .2 Metal (ferrous and non-ferrous).
 - .3 Wood.
 - .4 Glass.
 - .5 Plastics and Insulation.
 - .6 Gypsum Board.
 - .7 Porcelain Plumbing Fixtures.
 - .8 Fluorescent Light Tubes.
 - .9 Paper: Bond, Newsprint, Cardboard, Paper, Packaging Materials.
 - .10 Other materials as appropriate.
 - 3.7 **Performance**
 - 3.7.1 Ensure demolition work is supervised by competent foreman at all times.
 - 3.7.2 Demolition shall proceed safely in systematic manner. Work on each floor level shall be complete before commencing work on supporting structure and safety of its supports are impaired. Parts of building which would otherwise collapse prematurely shall be securely shored. Walls and piers shall not be undermined.
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- 3.7.3 Until acceptance, maintain and preserve active utilities traversing premises.
- 3.7.4 Provide enclosed chutes for disposal of debris from heights more than 1 storey in accordance with CSA S350.

3.8 Demolition

- 3.8.1 Review demolition procedures to ensure no personnel or equipment are located or working without additional safe working platforms or working surface adequate to support the operations.
- 3.8.2 Any damage caused to the adjacent buildings or properties by the neglect of the Contractor or any of his forces shall be made good at the expense of the Contractor including all costs and charges which may be claimed by the Agency for damages suffered.
- 3.8.3 Demolish in a manner to minimize dusting. Keep dusty materials wetted at all times.
- 3.8.4 Demolition: Use methods required to complete Work within limitations of governing regulations and as follows:
 - .1 Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - .2 Demolish concrete and masonry in sizes that will be suitable for acceptance at recycling or disposal facilities.
 - .3 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - .4 Break up and remove concrete slabs on grade in small sizes, suitable for acceptance at recycling or disposal facilities, unless otherwise shown to remain.
 - .5 Remove all disconnected, abandoned utilities.
 - .6 Remove all finishes, fixtures, fittings and services as indicated.
 - .7 Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
 - .8 Prevent access to excavations by means of fences or hoardings.

3.9 Selective Demolition

- 3.9.1 Carefully dismantle and remove all items as shown and as necessary to complete the work.
- 3.9.2 Salvage items scheduled for reuse or to be handed over to the Agency. Particular attention shall be paid to the prevention of fire and elimination of fire hazards which would endanger the existing buildings.
- 3.9.3 Where existing flooring or existing roofing membranes are to be removed from floor and roof slabs to remain, including flooring, roof membranes,

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vapour barriers and adhesives, carefully remove flooring, grout, vapour retarders adhesives, waterproofing membranes and the like down to the base slab.

- 3.9.4 Return areas to condition existing prior to the start of the work unless indicated otherwise.

3.10 **Handling of Demolished Materials**

3.10.1 Conform to the approved Waste Management Plan.

3.10.2 Do not allow demolished materials to accumulate or be stored on-site for more than 5 days.

3.10.3 Do not burn, bury or otherwise dispose of rubbish and waste materials on project site.

3.10.4 Pallet and shrink-wrap materials scheduled for re-use and stockpile where directed on site.

3.10.5 Disposal: Transport demolished materials off Agency's property and legally reuse, salvage, recycle, or dispose of materials. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

3.10.6 Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.

3.11 **Cleaning**

3.11.1 Clean adjacent streets and driveways of dust, dirt and materials caused by demolition operations.

3.11.2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.

3.11.3 Upon completion of demolition work, remove debris, trim surfaces and leave work site clean.

3.11.4 Video storm and sanitary sewers and jet clean where debris may have accumulated

END OF SECTION

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PROJECT 22701****Appendix 8.2, Division 03, Section 03 10 00, Concrete Forming and Accessories**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install concrete formwork and accessories as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 03 20 00 Concrete Reinforcing

1.3.2 Section 03 30 00 Cast-in-Place Concrete

1.4 References

1.4.1 American Concrete Institute (ACI)

.1 ACI 117-10 Specifications for Tolerances for Concrete Construction and Materials.

.2 ACI 347R-14 Guide to Formwork for Concrete

.3 ACI SP-4-14 Formwork for Concrete

1.4.2 CSA Group (CSA)

.1 CSA A23.1:19/A23.2:19 Concrete Materials and Methods of Concrete Construction/ Methods of Test Methods and Standard Practice for Concrete

.2 CSA B111-1974 (R2003) Wire Nails, Spikes and Staples

.3 CSA O86:19 Engineering Design in Wood

.4 CSA O121-2017 (R2022) Douglas Fir Plywood

.5 CSA O141:23 Canadian Standard Lumber

.6 CSA S269.1-16 (R2021) Falsework and Formwork

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Shop Drawings:

.1 Submit shop drawings showing type, extent and locations of items to be built into concrete.

.2 Sleeving Drawings: Submit drawings showing sleeves required through floors, roof and other structural members.

.3 Submit drawings showing size and spacing of conduits and piping.

.4 Coordinate with other Divisions prior to submittal.

.5 Prior to submission to Consultant, review all submitted drawings. By this review, Contractor represents to have determined and verified field measurements, site

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- conditions, materials, catalogue number and similar data and to have checked and coordinated each drawing with the requirements of Work and of Contract Documents.
- .6 Contractor's review of each drawing shall be indicated by stamp, date and signature of a responsible person.
 - .7 At time of submission, notify Consultant in writing of any deviations in shop drawings from the requirements of the Contract Documents.
 - .8 Consultant will review and return submitted drawings in accordance with an agreed schedule. Consultant's review will be for conformity to design concept and for general arrangement and shall not relieve Contractor of responsibility for errors or omissions in submitted drawings or of responsibility for meeting requirements of Contract Documents.
 - .9 Make any changes in submitted drawings which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, notify Agency in writing of any revisions other than those requested by Consultant.
 - .10 Do not commence placing sleeves, conduits, or piping before drawings have been reviewed and Consultant's comments incorporated on drawings issued to site.
 - .11 Assume responsibility for accuracy of Work. Review of submitted shop drawings does not relieve Contractor from compliance with requirements of Contract Documents.
- 1.5.3 Required by Regulatory Agencies: Submit shop drawings bearing signature and seal of Professional Engineer responsible for formwork design, as may be required by regulatory Agencies. Proceed with construction of formwork only with their approval.
- 1.6 **Quality Assurance**
- 1.6.1 Obtain a copy of CSA A23.1/A23.2 and maintain on site
 - 1.6.2 Design of Formwork: Assume full responsibility for complete structural design and construction of formwork in accordance with CSA S269.1 and CSA O86, as applicable.
 - .1 The design and engineering of the formwork, as well as its' construction, shall be the responsibility of the Contractor.
 - 1.6.3 Formwork shall be designed for the loads and lateral pressures outlined in the ACI publication "SP-4 Formwork for Concrete" and wind pressures and allowable stresses as set down in the National Building Code and in accordance with CSA A23.1 and A23.2. Formwork shall be of sufficient strength and rigidity to support all concrete and construction loads, taking into account proposed rate and method of pouring concrete so that the
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resultant finished concrete shall conform to the shapes, lines and dimensions of the members shown on the Contract Drawings.

1.7 Shipping, Handling and Storage

1.7.1 Refer to Section 01 61 00 – Common Product Requirements.

1.7.2 Protect formwork to prevent functional damage and damage to faces affecting appearance of concrete surfaces exposed to view.

2. PRODUCTS**2.1 Materials**

2.1.1 All materials shall be new, in accordance with referenced standards.

2.1.2 Plywood: Douglas Fir, conforming to CSA O121. Sound undamaged sheets finished one side, fabricated especially for use as concrete form panels, with sealed edges. Minimum 17mm thickness.

2.1.3 Lumber: Conforming to CSA O141, with grade stamp clearly visible.

2.1.4 Chamfers: Cut from 19mm x 19mm wood, smooth with no open defects.

2.1.5 Form Ties: snap ties, with spreader washer and 25mm break back.

2.1.6 Joint Tape: non-staining, water impermeable, self-release.

2.1.7 Nails, Spikes and Staples: Galvanized, conforming to CSA B111.

2.1.8 Form Release Agent: Colourless mineral oil which will not stain concrete.

3. EXECUTION**3.1 Examination**

3.1.1 Before starting this work, examine work done by others which affects this work.

3.1.2 Notify the Consultant of any conditions which would prevent proper completion of this work.

3.1.3 Commencement of work implies acceptance of existing conditions.

3.2 Erection

3.2.1 Verify lines, levels and centres before proceeding with formwork. Ensure dimensions agree with Contract Drawings.

3.2.2 Align joints and make watertight, to prevent leakage of cement paste and disfiguration of concrete.

3.2.3 Construct formwork to produce concrete with dimensions, lines and levels within tolerances specified in ACI 347R-14.

3.2.4 Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through concrete members.

3.2.5 Install chamfers at all external corners exposed to view.

3.2.6 Adequately brace and shore formwork to sustain loads (both concrete and working loads) applied during construction. Be responsible for safety of the structure both before and after the removal of forms, until the concrete has reached its specified 28 day strength.

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3.3 Built-In Work

- 3.3.1 Form openings and build in anchors, inserts, sub-frames, key-ways, sleeves, miscellaneous metal items, reglets and similar items furnished under Work of other Sections, which are indicated on Contract Drawings and on shop drawings of other trades, and as required for proper completion of Work.
- 3.3.2 Do not embed wood in concrete.
- 3.3.3 Anchor Bolts: Tie anchor bolts securely in position to prevent movement during concrete placing. Use template to locate bolts. Verify that bolts have specified projection above concrete.
- 3.3.4 Openings or Sleeves Not Shown on Structural Contract Drawings:
 - .1 Obtain Consultant's written approval before forming openings of sleeves through columns and beams, or through slabs within 1800 mm of their supports.
 - .2 Obtain Consultant's written approval before forming openings or sleeves larger than 200mm square in any location.
- 3.3.5 Embedded Pipe or Conduit Not Shown or Detailed on Structural Contract Drawings:
 - .1 Obtain Consultant's written approval before placing conduit or pipe which would be embedded in finished structure.
- 3.3.6 Confirm that built-in items that penetrate surface waterproofing are installed to meet requirements of waterproofing trade.

3.4 Construction Joints

- 3.4.1 Form construction and expansion joints with bulkheads to ensure straight lines. Immediately before subsequent pour at construction joint, remove bulkhead and tighten forms so that concrete surfaces will be on same plane with no overlapping of concrete.
- 3.4.2 Review with Consultant proposed location and details of construction joints in walls, columns, beams and slabs.
 - .1 Construction joints shall present appearance of normal form panel joint.
 - .2 Install continuous shear key in construction joints in walls and framed floors which are 152mm or more thick.
 - .3 Provide vertical construction joints in walls at not more than 20 meters centre to centre.
 - .4 Provide waterstops in accordance with manufacturer's instructions at construction joints in walls which retain earth. Waterstops shall be continuous.

3.5 Treatment of Formwork Surfaces

- 3.5.1 Form Release Agent:
 - .1 Coat formwork with form release agent before reinforcement,

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- anchors, accessories, and other built in items are installed.
 - .2 Do not coat plywood forms pre-treated with release agent.
 - .3 On surfaces to receive finish materials, adhesives, sealers, paint or other coatings or materials, use a compatible release agent.
- 3.6 **Stripping of Formwork**
- 3.6.1 Strip formwork on vertical surfaces when concrete has hardened sufficiently that no damage will result from stripping operations.
 - 3.6.2 Do not remove plywood formwork by jerking loose or by metal pinch bars. Use wood wedges and gradually force panels loose. Leave plywood forms in place as long as possible to permit maximum shrinkage away from concrete.
 - 3.6.3 Take particular care not to damage external corners when stripping formwork.
 - 3.6.4 When forms are stripped during curing period, cure and protect exposed concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- 3.7 **Defective Work**
- 3.7.1 Movement and displacement of formwork during construction, variations in excess of specified tolerances, marked and disfigured surfaces, and failure of materials or workmanship to meet requirements of this specification, and which cannot be repaired by approved methods, will be considered defective work.
 - 3.7.2 Replace defective work, as directed by Consultant.
 - 3.7.3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses, if work has proven to be deficient.
 - 3.7.4 Reconstruct defective formwork and replace concrete and reinforcement placed in defective formwork at no additional cost.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 03, Section 03 20 00, Concrete Reinforcing**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install concrete reinforcing as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

1.3.1 Section 03 10 00 Concrete Forming and Accessories

1.3.2 Section 03 30 00 Cast-in-Place Concrete

1.4 References

1.4.1 ASTM International (ASTM)

.1 ASTM A143/A143M-07(2020) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement

.2 ASTM A1064/A1064M-22 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

1.4.2 American Concrete Institute (ACI)

.1 ACI SP-66 (04) ACI Detailing Manual

1.4.3 CSA Group (CSA)

.1 CSA A23.1:19/A23.2:19 Concrete Materials and Methods of Concrete Construction/ Methods of Test Methods and Standard Practice for Concrete

.2 CSA A23.3:19 Design of Concrete Structures

.3 CSA G30.18:21 Carbon Steel Bars for Concrete Reinforcement

.4 CSA G40.20-13/G40.21-13 (R2018) General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

.5 CSA W186:21 Welding of Reinforcing Bars in Reinforced Concrete Construction

1.4.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC Reinforcing Steel Manual of Standard Practice

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Shop Drawings:

.1 Submit shop drawings, including placing drawings and bar lists.

.2 Prepare placing drawings and bar lists in accordance with the American Concrete Institute (ACI) Detailing Manual, and the

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Reinforcing Steel Institute of Canada (RSIC) Reinforcing Steel Manual of Standard Practice and the typical details included with Contract Documents.

- .3 Prepare placing drawings to minimum scale of 1:50.
 - .4 Submit placing drawings and bar lists sufficiently detailed and dimensioned to permit correct placement of reinforcement and accessories without reference to architectural or structural Contract Drawings.
 - .5 Show reinforcement, including dowels, in elevation on placing drawings for wall reinforcement.
 - .6 Show concrete cover to reinforcement.
 - .7 Show location of construction joints.
- 1.5.3 Inspection Reports: Inspection and Testing Company shall:
- .1 Submit written reports of inspection and tests.
 - .2 Distribute reports as follows:
 - .1 Consultant.
 - .2 Contractor.
- 1.5.4 Quality Assurance Submittals:
- .1 Mill Test Report: provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Submit in writing proposed source of reinforcement material to be supplied.

1.6 Quality Assurance

- 1.6.1 Obtain a copy of CSA A23.1/A23.2 and maintain on site.
- 1.6.2 Qualifications: Welding: Undertake welding of reinforcement only by a fabricator or Subcontractor approved by Canadian Welding Bureau to requirements of CSA W186.
- 1.6.3 Source Quality Control: Source Quality Control may be performed by an Inspection and Testing Company appointed by Consultant/ Agency.
- 1.6.4 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.
- 1.6.5 Identify and correlate reinforcing steel from Canadian mills with test reports for compliance with requirements specified.
- 1.6.6 Test unidentified reinforcing steel at expense of Contractor. Perform testing for each 1 tonne or part thereof supplied for incorporation in Work.

1.7 Shipping, Handling and Storage

- 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

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2. PRODUCTS**2.1 Materials**

- 2.1.1 In accordance with reference standards.
- 2.1.2 Substitute different size bars only if permitted in writing by Consultant.
- 2.1.3 Bar Reinforcing Steel:
 - .1 Bars which are to be welded by arc-welding process: to CSA G30.18, Grade 400W.
 - .2 Other bars: to CSA G30.18, Grade 400R.
- 2.1.4 Plain round bars: to CSA G40.20-04/G40.21.
- 2.1.5 Welded Wire Fabric: to ASTM A1064/A1064M and in flat sheets, not rolls.
- 2.1.6 Cold-drawn annealed steel wire ties: to ASTM A497.
- 2.1.7 Chairs, bolsters, bar supports, spacers: to CSA A23.1.
- 2.1.8 Mechanical splices: subject to approval of Agency.

2.2 Fabrication

- 2.2.1 Fabricate reinforcing steel only in permanent fabricating shop.
- 2.2.2 Fabricate reinforcing steel in accordance with shop drawings.
- 2.2.3 Tag reinforcing bars to indicate placement as designated on shop drawings.
- 2.2.4 Splices:
 - .1 Provide splices only where specifically indicated on Contract Drawings.
 - .2 Stagger alternate mechanical splices 750mm apart.
 - .3 Stagger alternate end bearing splices 750mm apart.
 - .4 Install on threaded splices, plastic internal coupler thread protector and plastic bar end thread protector.

3. EXECUTION**3.1 Examination**

- 3.1.1 Before starting this work, examine work done by others which affects this work.
- 3.1.2 Examine formwork to verify that it has been completed, and adequately braced in place.
- 3.1.3 Notify the Consultant of any conditions which would prejudice proper completion of this work.
- 3.1.4 Commencement of work implies acceptance of existing conditions.

3.2 Installation

- 3.2.1 Place reinforcing steel in accordance with reviewed placing drawings, typical details, and CSA A23.3.
- 3.2.2 Adequately support reinforcing and secure against displacement within tolerances permitted.
- 3.2.3 Place reinforcing steel to provide minimum spacing and proper concrete cover as noted on Contract Drawings.

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- 3.2.4 Do not cut reinforcement to incorporate other Work.
- 3.2.5 Relocate or rebend bars only on written instructions of Consultant.
- 3.2.6 Tie reinforcement in place. Do not weld.

- 3.3 **Adjusting**
 - 3.3.1 Adjust and secure reinforcement in correct position immediately before concrete is placed.
 - 3.3.2 Remove contaminants which lessen bond between concrete and reinforcement.

- 3.4 **Field Quality Control**
 - 3.4.1 Provide competent supervisor, with at least three years of experience in reinforcement placement, to direct placement of reinforcement.
 - 3.4.2 Inspect placement of reinforcement for conformance with Contract Drawings and Specifications, before each concrete placement, and correct as necessary.
 - 3.4.3 Consultant's periodic review of selected areas of reinforcement are for verification of conformity to design concept and general arrangement only and shall not relieve Contractor of responsibility for quality control, errors, or omissions, or conformance with requirements of Contract Documents.

- 3.5 **Defective Work**
 - 3.5.1 Incorrectly fabricated, misplaced or omitted reinforcement will be considered defective Work.
 - 3.5.2 Replace or adjust defective reinforcement before concrete is placed as directed by Consultant.
 - 3.5.3 Replace or strengthen concrete work which is deficient as a result of incorrectly fabricated, misplaced, or omitted reinforcement, which was not corrected before concrete was placed.
 - 3.5.4 Pay for additional inspection and testing, redesign, corrective measures, and related expenses, if Work has proven to be deficient.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 03, Section 03 30 00, Cast-in-Place Concrete**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply, place and finish cast-in-place concrete as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

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| 1.3.1 | Section 03 10 00 | Concrete Forming and Accessories |
| 1.3.2 | Section 03 20 00 | Concrete Reinforcing |
| 1.3.3 | Section 05 50 00 | Metal Fabrications |
| 1.3.4 | Section 07 92 10 | Joint Sealing |

1.4 References

1.4.1 ASTM International (ASTM)

- .1 ASTM C260/C260M-10a (2016) Standard Specification for Air Entraining Admixtures for Concrete
- .2 ASTM C295/C295M-19 Standard Guide for Petrographic Examination of Aggregates for Concrete
- .3 ASTM C309-19 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
- .4 ASTM C330/C330M-17a Standard Specification for Lightweight Aggregates for Structural Concrete
- .5 ASTM C494/C494M-19 Standard Specification for Chemical Admixtures for Concrete
- .6 ASTM C881/C881M-20a Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
- .7 ASTM C1017/C1017M-13e1 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .8 ASTM C1107/C1107M-20 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- .9 ASTM D412-16 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- .10 ASTM D570-98(2018) Standard Test Method for Water Absorption of Plastics
- .11 ASTM D624-00(2020) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .12 ASTM D638-14 Standard Test Method for Tensile Properties of Plastics

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- .13 ASTM D1259-06(2018) Standard Test Methods for Nonvolatile Content of Resin Solutions
 - .14 ASTM D2240-15e1 Standard Test Method for Rubber Property—Durometer Hardness.
 - 1.4.2 American Concrete Institute (ACI)
 - .1 ACI 117-10 Specifications for Tolerances for Concrete Construction and Materials.
 - .2 ACI 232.1R-12 Report on the Use of Raw or Processed Natural Pozzolans in Concrete
 - 1.4.3 CSA Group (CSA)
 - .1 CSA A23.1:19/A23.2:19 Concrete Materials and Methods of Concrete Construction/ Methods of Test Methods and Standard Practice for Concrete.
 - .2 CSA A283:19 Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-18 Cementitious Materials Compendium
 - 1.4.4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1010 Material Specification for Aggregates - Granular A, B, M and Select Subgrade Material.
 - .2 OPSS 1212 Material Specification for Hot-Poured Rubberized Asphalt Joint Sealing Compound.
 - 1.4.5 Government of Canada Treasury Board Secretariat (TBS)
 - .1 Standard on Embodied Carbon in Construction
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Samples: Submit for inspection, material samples of specified mix designs.
 - 1.5.3 Concrete Mix Designs:
 - .1 Submit concrete mix designs for review. Specify intended use for each mix design.
 - .2 Review of mix design does not relieve Contractor from responsibility for compliance with Contract Documents.
 - .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA A23.1. Mix design shall be adjusted to prevent alkali aggregate reactivity problems.
 - .4 Provide certification that plant, equipment, and all materials to be used in concrete comply with the requirements of CSA A23.1.
 - .5 Submit written requests for use of admixtures not specified, for site mixing of concrete, and for use of bonding agents.
 - .6 Submit in writing, proposed method of in-situ strength testing.
 - 1.5.4 Inspection Reports: Inspection and Testing Company shall:
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- .1 Submit written reports of inspection and tests.
 - .2 Distribute reports as follows:
 - .1 Consultant.
 - .2 Contractor.
 - 1.5.5 On concrete cylinder test reports, include:
 - .1 Specific location of concrete represented by sample.
 - .2 Design strength.
 - .3 Unit weight of sample
 - .4 Class of exposure
 - .5 Aggregate size and mixtures incorporated.
 - .6 Date, hour and temperature at time sample taken.
 - .7 Percentage air content
 - .8 Test strength of cylinder
 - .9 Type of failure if test fails to meet specification.
 - 1.6 **Quality Assurance**
 - 1.6.1 Obtain a copy of CSA A23.1/A23.2 and maintain on site.
 - 1.6.2 Pre-Construction Conference:
 - .1 At least 35 days prior to the start of concrete construction schedule, conduct a meeting to review proposed mix designs and to discuss detailed requirements of the proposed concrete operations. Review requirements for submittals, coordination, and availability of materials. Establish work progress and sequencing schedules and procedures for material testing, inspection and certifications.
 - 1.6.3 Source Quality Control:
 - .1 Both source quality control, and field quality control specified in Article 1.5.4, may be performed by an Inspection and Testing Company appointed by Consultant/Agency.
 - .2 Review provided by Inspection and Testing Company does not relieve the Contractor of his sole responsibility for quality control over Work. Performance or non- performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.
 - .3 Inspection and Testing Company shall be certified under CSA A283, Qualification Code for Concrete Testing Laboratories, for Category 1 Certification.
 - .4 Payment for specified Work performed by Inspection and Testing Company will be made from Cash Allowance.
 - .5 Payment for additional tests (including testing of structure and its performance and load testing) required by changes of materials or mix design requested by Contractor, and failure of completed Work
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- to meet specified requirements, shall be made at Contractor's expense.
6. Perform Work of source quality control in accordance with CSA A23.2 and to include:
 - .1 Verification that ready-mix supplier is qualified to supply concrete in accordance with Specification.
 - .2 Review of proposed concrete mix designs.
 - .3 Sampling, inspection, and testing of materials as may be required.
- 1.6.4 Field Quality Control:
- .1 Inspection and Testing Company, when appointed as specified for Source Quality Control, shall perform sampling, inspection and testing of concrete work at site.
 - .2 Perform sampling, inspection and testing in accordance with CSA A23.2, and to include:
 - .1 Making of standard slump tests.
 - .2 Obtaining of three standard specimens for strength tests from each 100 m of concrete, or fraction thereof, of each mix design of concrete placed in any one day. In addition, for slabs-on-grade, obtain beam specimens for determination of modulus of rupture.
 - .3 Verification that test specimens are stored within an enclosure, maintained at specified temperatures.
 - .4 Making compression tests of each set of three specimens, one at 7 days and two at 28 days; modulus of rupture tests at 90 days.
 - .5 Verification of air content of air-entrained concrete.
 - .1 For Class of exposure F-1, and C-2, test at frequency in accordance with CSA A23.1.
 - .2 Make first test before placing any concrete.
 - .3 After stable air content has been established, frequency of tests will be determined by Agency.
 - .4 For other Classes of exposure, test at time of obtaining strength test specimens.
- 1.6.5 Inspection for Tolerances:
- .1 Confirm that concrete work meets specified tolerance requirements.
 - .2 Use the elevation survey records of elevations of finished concrete surfaces specified in Section 03 10 00 and this Section as basis for judging compliance.
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- .3 Use approved aluminum straightedge to judge compliance with specified slab tolerances, except use dipstick equipment where F-number tolerance is specified.
- 1.6.6 Slabs-on-Grade:
- .1 Observe application of curing compound to sample slab, recording rate of application.
 - .2 Monitor on a random basis acceptable to the Consultant, that slab is being saw cut before slab temperature starts to fall.
 - .3 Qualifications: Floor finishing shall be undertaken only by contractors with at least 10 years of experience.
 - .4 Sample of Finish Flooring:
 - .1 Finish an area of floor slab where directed by Consultant to provide sample of finish for approval.
 - .2 Protect new sample area until finish is approved.
 - .3 If liquid membrane curing compound is to be used on Project, determine and apply correct quantity required to meet rate of coverage recommended by manufacturer for measured test area.
 - .4 Approved sample will provide standard by which subsequent finishing will be judged and will be incorporated into Work.
- 1.7 **Tolerances**
- 1.7.1 In accordance with ACI 117 and CSA A23.1.
 - 1.7.2 Difference between elevation of high point and low point in specified area not to exceed:
 - .1 In any bay up to 100 m²: 12 mm.
 - .2 In any bay up to 400 m²: 25 mm.
 - 1.7.3 Straightedge method: Finish floor slabs to meet following tolerances when measured at 72 +/- 12 hours after completion of floor finishing, before shores are removed from formed slabs, by placing a freestanding unlevelled straight edge anywhere on slab and allowing it to rest on two high points. Gap between straightedge placed on two high points and slab not to exceed:
 - .1 3 meter straightedge: 8 mm (Class A).
 - .2 2 meter straightedge: 4 mm.
- 1.8 **Job Conditions**
- 1.8.1 Protect floor slabs, and concrete surfaces exposed to view or on which finishes are to be applied, from grease, oil, and other soil which will affect the appearance of the concrete or impair the bond of finish material.
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- 1.8.2 Environmental Conditions: In addition to Cold Weather and Hot Weather Requirements of CSA A23.1, the following shall apply to Work of this Section:
- .1 Provide protection or heat, or both, so that temperature of concrete at surfaces is maintained at not less than 21 ° C for three days after placing, not less than 10 ° C for the next two days and above freezing for the next two days.
 - .2 Do not permit alternate freezing and thawing for fourteen days after placing.
 - .3 Vent exhaust gases from combustion type heaters to atmosphere outside protection enclosures.
 - .4 Provide protection to maintain concrete continuously moist during curing period.
 - .5 For field cured cylinders representing strength development of in-situ concrete, provide same specified hot and cold weather protection for storage of each concrete compression specimen as for concrete from which it was taken, until it is sent to testing laboratory.
 - .6 Do not place concrete during rain. Should rain commence during placing, cover freshly placed concrete.
 - .7 Do not place bonded toppings on rough slabs that are less than 15 °C.
 - .8 Do not grout at ambient air temperatures or concrete surface temperatures less than 5 ° C, or when temperature is forecast to fall to less than 5 ° C within 24 hours of grouting.
 - .9 Do not apply sealants at ambient air temperatures or concrete surface temperatures less than 5 ° C.

1.9 Project Records

- 1.9.1 Maintain record of all concrete pour related to time, date, delivery slip serial number and location of each concrete pour and identify related test cylinders. Keep records on site until project is completed.
- 1.9.2 Delivery Records: File duplicate copies of concrete delivery slips on which shall be recorded: supplier, serial number of slip, date, truck number, contractor, Project, Class of exposure, cementing materials content, air content, volume in load, and time of first mixing of aggregate, cementing materials and water.

2. PRODUCTS**2.1 Materials**

- 2.1.1 To meet specified requirements of referenced Standards.
- 2.1.2 Cement:

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- .1 Portland Cement: to CSA A3000.
 - .2 Cementitious Hydraulic Slag: to ACI 232.1R
 - 2.1.3 Fine Aggregate: For slabs-on-grade, fineness modulus of fine aggregate to be between 2.7 and 3.1.
 - 2.1.4 Coarse Aggregates:
 - .1 20 mm to 5 mm (No. 4 sieve) except as specified below.
 - .2 For slabs-on-grade 125mm and thicker: 40mm to 5 mm (No. 4 sieve); combine at least two of the single sizes specified in Table 5 Group II of CSA A23.1, one of which is to be 40mm, to obtain maximum bulk density (unit weight) and optimum grading, in accordance with an approved procedure.
 - .3 For slabs-on-grade: Abrasion loss not to exceed 35%. Petrographic number of aggregate not to exceed 125 when tested in accordance with ASTM C295.
 - .4 For toppings 50mm thick and less and for slabs over open web steel joists: 12mm to 5mm (No. 4 sieve).
 - 2.1.5 Admixtures:
 - .1 Conform to Reference Standards for chemical and air-entraining admixtures.
 - .2 Provide only admixtures that are free of chlorides.
 - .3 When requested, provide evidence acceptable to Agency that superplasticizer does no increase shrinkage of concrete.
 - 2.1.6 Curing-Sealing Compound: Membrane curing-sealing compound formulated from chlorinated rubber resins, or acrylic emulsion, solvent free for use in occupied buildings, to ASTM C309, type 1.
 - .1 Basis-of-Design Product: Euclid Chemical Company; Diamond Clear 350 or a comparable product by one of the following:
 - .1 BASF Corporation - Construction Systems.
 - .2 Sika Corporation
 - .3 W.R. Meadows
 - 2.1.7 Bonding Agent: To ASTM C881, 100% reactive, 2 component, low viscosity, high modulus bonding adhesive.
 - 2.1.8 Saw Cut Filler: Semi-rigid epoxy or polyurea in accordance with ACI 302.1R for joint fillers used in control and construction joints.
 - .1 Basis of Design Product: Euco 700 or Euco QWIKjoint UVR by Euclid Chemical.
 - 2.1.9 Premoulded Joint Fillers: Bituminous impregnated fiber board: to ASTM D1751.
 - 2.1.10 Sealant: Refer to Section 07 92 10 – Joint Sealing.
 - 2.1.11 Mechanical Anchors: 'Kwik' Bolts, 'Cinch' Anchors or Parabolts.
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2.2 Concrete Mixes

- 2.2.1 Ready Mix, with 28 day compressive strength as indicated on Contract Drawings.
- 2.2.2 Design concrete mix in conformance with CSA A23.1, Tables 1, 2, 5 (Alternative 1) and 17, and as follows. Provide concrete meeting water/cementing materials ratio and air content of Table 14 in accordance with Class of exposure specified in following sub-paragraphs, and minimum strength specified on Contract Drawings. Note that concrete designed in accordance with water/cementing materials ratio of Table 14 may yield strength exceeding minimum strength specified on Contract Drawings.
 - .1 Interior Concrete, other than specified above, and not exposed to freezing and thawing or the application of deicing chemicals: select water/cementing materials ratio and cementing materials content on basis of strength, workability, and finishing requirements.
- 2.2.3 Submit evidence, and material samples, if requested, acceptable to the Inspection and Testing Company, to verify that the proposed concrete mix design will produce specified quality of concrete.
- 2.2.4 List all proposed admixtures in mix design submission. Do not change or add admixtures to approved design mixes without Consultant's approval.
- 2.2.5 Concrete Weight: Air dry unit weight: minimum 2,300 kg/m³; adjusted proportionally for maximum air content listed in CSA A23.1, Clause 15, Table 10.
- 2.2.6 Concrete supplier to provide documentation indicating the requirements of TBS Standard on Embodied Carbon in Construction have been met.

2.3 Admixtures

- 2.3.1 Chemical Admixture: To ASTM C494. Incorporate water-reducing admixture, type WN, in all concrete.
- 2.3.2 Air Entraining Agent: To ASTM C260. Incorporate air-entraining agent in addition to chemical admixture in concrete of relevant Class of exposure, in accordance with CSA A23.1, Clause 15, Table 10.
- 2.3.3 Chloride: Do not use calcium chloride or admixtures containing chloride in concrete.

2.4 Concrete Toppings

- 2.4.1 Provide topping with minimum 28 day compressive strength of 32 MPa.

2.5 Premixed Grout

- 2.5.1 Non-Shrink Metallic: Non-catalyzed metallic grout to ASTM C1107, Compressive strength at 28 days: 48 MPa.
- 2.5.2 Non-Shrink, Non Stain, Non-Metallic: to ASTM C1107. Compressive strength at 28 days: 59 MPa.

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- 2.5.3 Flowable Grout: High-tolerance Non-shrink, Non-metallic shrinkage compensating grout to ASTM C1107. Compressive strength at 28 days: 59 MPa.

3. EXECUTION**3.1 Examination**

- 3.1.1 Before starting this work, examine work done by others which effects this work.
- 3.1.2 Notify Consultant of any condition which would prejudice proper completion of this work.
- 3.1.3 Confirm that surfaces on which concrete is to be placed are free of frost and water before placing.
- 3.1.4 Confirm that reinforcement, dowels, control joints, inserts and all other built in work are in place and secured.
- 3.1.5 Commencement of work implies acceptance of existing conditions.

3.2 Treatment of Formed Surfaces

- 3.2.1 Conform to the requirements of CSA A23.1, and as additionally specified herein.
- 3.2.2 Treat concrete surfaces which will be exposed or painted in the completed building to provide a "Smooth Rubbed Finish" in accordance with CSA A23.1, uniform in colour and texture.
- 3.2.3 Plugs at Recessed Ties:
.1 Clean tie holes to remove all foreign matter.
.2 Coat plugs by dipping in adhesive and insert in hole.
.3 Remove excess adhesive immediately with thinner which will not stain concrete, as recommended by manufacturer.
- 3.2.4 Obtain Consultant's approval of finished exposed concrete and grind or otherwise correct to the satisfaction of the Consultant.

3.3 Placing Concrete

- 3.3.1 Place concrete in accordance with requirements CSA A23.1/A23.2.
- 3.3.2 Notify Consultant and inspection and testing firm at least 24 hours prior to commencement of concrete placing operation and 24 hours before wall forms are closed in.
- 3.3.3 Do not place concrete in water or open frozen surfaces.
- 3.3.4 Remove contaminants which lessen concrete bond to reinforcement before concrete is placed.
- 3.3.5 Maintain accurate records of cast in place concrete items. Record date, location of pour, quantity, air temperature and test samples taken.
- 3.3.6 Ensure that reinforcement, inserts, embedded items, formed expansion joints and the like, are not disturbed during concrete placement.

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3.3.7 Joint fillers:

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant.
- .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form isolation, construction and expansion joints as indicated.
- .4 Install joint filler.
- .5 Use 12mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12mm of finished slab surface unless indicated otherwise.

3.3.8 Provide construction joint as indicated on the Contract Drawings. Ensure dowels are adequately anchored and placed at right angles to the joint before placing concrete.

3.3.9 Sloping Surfaces and Slabs: commence concrete placement at bottom of sloping surfaces.

3.4 **Finishing Concrete**

3.4.1 Perform finishing operations on plastic concrete surfaces in accordance with CSA A23.1, and as specified herein.

3.4.2 Refer to the Contract Drawings for floor finishes and coverings.

3.4.3 Screed the top of rough floor slabs to an even level or sloping surface at the proper elevation to receive the finish or topping specified on the Contract Drawings and in finish schedule.

3.4.4 Provide a smooth steel trowel finish on all areas scheduled to receive a covering, or painted finish.

3.4.5 Exposed Floor Surfaces: Provide hard, smooth, dense, steel troweled surface, free from blemishes, and of uniform appearance.

3.4.6 Non-slip Surfaces: Provide swirl trowel or broom finish of texture acceptable to Agency.

3.4.7 Curb Edging: Finish external corners of curbs rounded and smooth.

3.5 **Curing**

3.5.1 Cure concrete in accordance with CSA A23.1 and as specified herein.

3.5.2 Curing Compound Method:

- .1 Use curing and sealing compound specified except:
 - .1 On surfaces to receive epoxy or similar paint finish.
 - .2 On surfaces to which architectural finishes will be adhered, the adhesives for which are incompatible with the curing compound.

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- 3.5.3 Select acrylic water compound except that if ambient conditions extend drying time unduly and if area is well ventilated and unoccupied by other workers, solvent based compound may be used.
 - 3.5.4 Apply curing compound in accordance with manufacturer's instructions, increasing application rate as necessary to cover surface completely.
 - 3.5.5 Cure finished concrete surface with an approved curing and sealing compound which will leave the surface with a uniform appearance and with a minimum of discolouration after drying. Ensure that the curing compound will be compatible with the architectural finishes or adhesives for finishes to be applied later. Apply the compound in strict accordance with the manufacturer's instructions.
 - 3.5.6 Protect surface which will be exposed to direct sunlight during the curing period, with a light coloured, laminated waterproof paper immediately after the curing and sealing compound has hardened sufficiently for the paper to be placed without damage to the sealed surface. Lap the paper a minimum of 100mm and seal the laps. Leave the paper in place for at least seven days.
- 3.6 **Grouting**
- 3.6.1 Mix prepackaged grout with water in accordance with manufacturer's printed instructions.
 - 3.6.2 Dampen concrete surfaces immediately before installing grout.
 - 3.6.3 Use non-shrink and shrinkage-compensating grouts only when grout will be contained against expansion and self-disintegration.
 - 3.6.4 Slope grout beyond edge of plate at 45 degrees.
 - 3.6.5 Provide same environmental protection and curing as specified for concrete.
- 3.7 **Joint Sealant**
- 3.7.1 Apply sealant specified in Section 07 92 00 – Joint Sealing to thoroughly dry surfaces only, at ambient air temperatures above 5 ° C.
 - 3.7.2 Provide sealant on top of joint filler with a polyethylene bond breaker between joint filler and joint sealant applied in accordance with manufacturer's direction.
 - 3.7.3 Confirm that preformed joint filler and backer rod are compatible with sealant.
 - 3.7.4 Caulk joints in accordance with the following:
 - .1 Do not commence joint preparation until concrete is at least 28 days old.
 - .2 Thoroughly clean sides of joints with mason's router, or power saw, equipped with double blade where necessary to suit joint width.
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- .3 Blow clean with compressed air with oil trap on line, or vacuum clean.
 - .4 Install backer rod of diameter 25 percent greater than joint width, and type recommended by sealant manufacturer to be compatible with sealant. Locate backer rod to provide for sealant depth of one-half joint width, but not less than 12mm.
 - .5 Prime joint if required, as recommended by sealant manufacturer.
- 3.8 **Defective Work**
- 3.8.1 Variations in excess of specified tolerances and marked and disfigured surfaces that cannot be repaired by approved methods will be considered defective work.
 - 3.8.2 Replace or modify concrete that is out of place or does not conform to lines, detail or grade as directed by the Consultant.
 - 3.8.3 Replace or repair defectively placed or finished concrete as directed by the Consultant.
 - 3.8.4 Testing and Replacement of Deficient Concrete in Place:
 - .1 Pay for additional testing and related expenses if concrete has proven to be deficient.
 - .2 Replace or strengthen deficient concrete work as directed by the Consultant and pay for all testing and related expenses for replaced work until approved by the Consultant.
- 3.9 **Cleaning**
- 3.9.1 Clear away from the building site excess and waste materials and debris resulting from Work of this Section.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install structural steel as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

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| 1.3.1 | Section 05 21 00 | Steel Joist Framing |
| 1.3.2 | Section 05 31 00 | Steel Decking |
| 1.3.3 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.4 | Section 05 50 00 | Metal Fabrications |
| 1.3.5 | Section 07 81 16 | Cementitious Fireproofing |
| 1.3.6 | Section 07 81 23 | Intumescent Fireproofing |

1.4 References**1.4.1 ASTM International, (ASTM)**

- .1 ASTM A108-18 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
- .2 ASTM A123/A123M-17 Standard Specification for Zinc (Hot-Dip .3 Galvanized) Coatings on Iron and Steel Products
- .3 ASTM A153/A153M-23 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- .4 ASTM A307-21 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
- .5 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .6 ASTM A1011/A1011M-23 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
- .7 ASTM F3125/F3125M-22 Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

1.4.2 CSA Group (CSA)

- .1 CSA G40.20/G40.21-13 (R2018) General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

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- .2 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16:19 Design of Steel Structures.
 - .4 CSA S136-16 North American Specification for the Design of Cold Formed Steel Structural Members
 - .5 CSA W47.1:19 Certification of Companies for Fusion Welding of Steel Structures.
 - .6 CSA-W48.1-M1991 (R1998) Carbon Steel Covered Electrodes for Shielded Metal Arc Welding
 - .7 CSA-W55.3-08 (R2013) Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59-18 Welded Steel Construction (Metal Arc Welding).
 - .9 CSA W178.1-18 Certification of Welding Inspection Organizations.
 - .10 CSA W178.2-18 Certification of Welding Inspectors.
 - 1.4.3 American Welding Society (AWS)
 - .1 AWS A2.4:2020 Standard Symbols for Welding, Brazing, and Nondestructive Examination
 - 1.4.4 Structural Steel Painting Council
 - .1 SSPC-SP 6-91 Commercial Blast Cleaning.
 - 1.4.5 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
 - .1 CISC/CPMA 1-73a Quick-Drying, One-Coat Paint for Use on Structural Steel.
 - 1.4.6 American Institute of Steel Construction (AISC)
 - .1 Code of Standard Practice for Steel Buildings and Bridges, Section 10, Architectural Exposed Structural Steel, latest edition.
 - 1.4.7 The National Building Code of Canada.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit shop and erection drawings. Submit typical details of connections and any special connections for review before preparation of shop drawings. Assume responsibility for the accuracy of Work. Review of submitted shop drawings is to ensure only that the Contract Documents are being correctly interpreted.
 - 1.5.3 Professional Engineer responsible for connection design shall sign and seal each shop drawing.
 - 1.5.4 Show on shop drawings the size, spacing, and the location of structural steel members; connections; attachments; reinforcing; anchorage and required inserts; and all necessary plans, elevations and details.
 - 1.5.5 Show splice locations and details.
 - 1.5.6 Welded connections shall be designated by welding symbols in compliance with AWS A2.4 and indicate clearly net weld lengths.
 - 1.5.7 Submit design calculations if requested by the Consultant.
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- 1.5.8 Submit diagrams showing methods of erection.
- 1.5.9 Field Work Drawings shall be submitted as shop drawings.
- 1.5.10 Notify Consultant in writing of any deviations in shop drawings from the requirements of the Contract Documents.
- 1.5.11 Submit a schedule of fabrication to the Consultant and the Testing Agency, prior to commencement of fabrication.

1.6 Qualifications

- 1.6.1 Undertake welding and/or welding inspection by welders fully approved to one or more of the reference codes and standards where applicable.

1.7 Quality Assurance

- 1.7.1 Connections:
 - .1 Connections designed by Engineer: Submission of shop drawings for connection which have been detailed on Contract Drawings shall represent acceptance by Contractor that connection can be executed successfully.
 - .2 Design of other connections which cannot be selected from standard designs tabulated in CISC Handbook of Steel Construction shall be by a Professional Engineer, licensed in the Province of Ontario, experienced in structural steel connection design.
 - .3 Consultant will review connection arrangement to verify general conformance with overall design concept of structure.
 - .4 Connection design engineer shall be insured for professional liability in accordance with section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.
 - .5 Provide connections adequate to resist reaction of beam, when beam is loaded to maximum flexural capacity under uniformly distributed load, unless reaction or connection detail is shown on Contract Drawings.
 - .1 Provide flexible beam connections for unrestrained members in accordance with CSA S16.1, unless shown otherwise on Contract Drawings.
 - .2 Select connections, wherever possible, from standard designs tabulated in current edition of CISC Handbook of Steel Construction, except that length of beam web angles shall not be less than half the depth of beam, and single angles shall not be used.
 - .3 Provide direct connections to flanges of spandrel beams (exterior perimeter beams) to restrain twisting.
 - 1.7.2 Design:
 - .1 Connections:
-

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- .1 Provide bolted or welded connections, unless shown otherwise on Contract Drawings.
 - .2 Use high strength bolts to ASTM F3125 for all connections.
 - .3 Use slip resistant (friction-type) connections for bolted joints designed to resist reversible forces.
 - .4 Provide tension adjustment hardware at rod type bracing and at flat bar type bracing.
 - .5 Do not permit connections to encroach on clearance lines required for installation of Work of other Sections.
- 1.7.3 Random Splicing: Obtain in writing from Consultant, prior to commencement of shop drawings, special requirements that will be imposed as a necessary condition of acceptance of members with randomly located butt welded splices.
- 1.7.4 All edge perimeter angles and bent plates installed at roof framing level shall be joined by butt weld splices designed for full tension capacity of members being joined.
- 1.8 **Tolerances**
- 1.8.1 In addition to tolerances specified in CSA S16, erect shelf angles and sash angles attached to steel frame within a tolerance of 3mm plus or minus, with abutting ends of members at the same level.
- 1.9 **Inspection and Testing**
- 1.9.1 Refer to Section 01 45 00 – Quality Control.
- 1.9.2 Inspection and testing of materials and shop fabrication of Work of this Section, and field quality control, will be performed by an independent Inspection and Testing Company. Refer to Section 01 45 00 - Quality Control.
- 1.9.3 The Inspection and Testing Company shall meet qualification requirements of CSA W178.1 and shall be certified by the Canadian Welding Bureau in Category 1 Buildings.
- 1.9.4 Welding Inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2, to minimum level 2 certification.
- 1.9.5 Provide free access for inspectors to all places work is being performed, whether on site or off.
- 1.9.6 Mill inspection shall ensure that materials conform to specified requirements. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests.
- 1.9.7 Shop inspection shall ensure that structural steel is fabricated in accordance with the shop drawings, and the specified fabrication and welding procedures.
- 1.9.8 The cost of inspection and testing of splices introduced by the fabricator and not required on the Contract Documents will be paid by the Contractor.
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- 1.9.9 Inspection and Testing Company when appointed shall carry out shop inspection to verify:
 - .1 Structural materials and paint conform to Specifications. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests of structural materials.
 - .2 Fabrication and welding conforms to Specifications and dimensioned shop drawings.
 - .3 Shop cleaning and preparation and prime painting to conform to specified requirements.
 - .4 Surfaces inaccessible for cleaning and painting after assembly are treated before assembly.
 - .5 For surfaces painted with zinc rich paint or zinc primer, specified surface preparation is followed and specified paint thickness is applied.
 - 1.9.10 Non-destructive Testing of Welded Connections: Carry out non-destructive testing of welded connections chosen at random as follows:
 - .1 Check and record steel member sizes for 20% of columns, beams and girders.
 - .2 Check 5% of all welds by magnetic particle inspection.
 - .3 Check 25% of moment connections and all connections subject to direct tension involving use of full penetration groove welds by ultrasonic testing.
 - .4 Check 10% (minimum 2 per connection) in accordance with Section 23 of CSA S16 of pretensioned connections including main building bracing connections.
 - 1.9.11 More frequent testing and inspection shall be completed if random tests described above are not satisfactory. These costs are to be paid by the Contractor.
 - 1.10 **Shipping, Handling and Storage**
 - 1.10.1 Deliver products that are only supplied under work of this Section to those who are responsible for their installation, to the work site as directed and to meet construction schedule.
 - 1.10.2 Handle and store structural steel in such a manner that no damage, including corrosion, is caused to the stored or erected work, or to other property.
 - 1.10.3 Store structural steel off of ground on timber supports.
 - 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Rolled shapes, hollow structural sections, plates and rods: new steel, in compliance with CSA and/or ASTM Standards indicated on Structural Contract Drawings.
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- 2.1.2 Welding Electrodes: to meet the requirements set forth in the applicable standard of the CSA W48 Series on welding electrodes. (Any process which produces deposited weld metal meeting the requirements of the applicable W48 Series Standard for any grade of arc welding electrodes shall be accepted as equivalent to the use of such electrodes.)
- 2.1.3 High Strength Bolts: to meet specified requirements of ASTM F3125
- 2.1.4 Machine Bolts: to meet specified requirements of ASTM A307.
- 2.1.5 Anchor Bolts: To CSA-G40.20/G40.21, Grade 300W.
- 2.1.6 Shop Coat Paint:
 - .1 Interior structural steel: To meet specified requirements of CISC/CPMA 1-73a and compatible with Master Painters Institute INT 5.1S or 5.1X Institutional low odour/low VOC semi-gloss finish. Colour to be grey.
- 2.1.7 Galvanizing: hot dipped with zinc coating to CSA G164, ASTM A123 or ASTM A153.

3. EXECUTION**3.1 Fabrication**

- 3.1.1 Fabricate work of this Section in compliance with CSA S16, and as specified following.
- 3.1.2 Connections:
 - .1 Make bolted or welded connections.
 - .2 Use high strength bolts unless otherwise noted on Contract Drawings.
 - .3 Use friction type high strength bolts for the connections of bracing members (diagonal kickers) resisting the effects of applied lateral loads. Provide tension adjustment at flat bar and rod type lateral bracing.
 - .4 Do not permit connections to encroach on the clearance lines required for the installation of work of this Section.
- 3.1.3 Beam Connections:
 - .1 Provide beam connections adequate to resist the reactions produced by the framing or load conditions.
 - .2 Provide beam to column connections that apply vertical reaction with negligible eccentricity at the connecting face of the column, such as single or double beam web connections, end plate connections or un-stiffened seats, unless otherwise shown on Contract Drawings. Submit for review, in advance of the preparation of shop drawings, connections which do not meet these requirements.
 - .3 Provide connections complying with the requirements of the CISC Handbook of Steel Construction, except that the length of beam

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- web angles shall not be less than half the depth of the beam and single angles shall not be used.
- .4 Provide direct connections to flanges of spandrel beams to restrain twisting.
- 3.1.4 Holes in Structural Members:
- .1 Punch holes 11mm to 27mm in diameter as required for attaching the work of other Sections to structural steel members. Locate holes so that no appreciable reduction of the strength of members is caused.
- .2 Provide holes for pipes and ducts, and reinforce openings as indicated on Contract Drawings. Cutting of holes in structural members in the field will not be permitted except with written approval of the Consultant.
- .3 Provide effective drainage holes to prevent the accumulation of water in tubular members.
- 3.1.5 Member Separators: Provide separators at approximate spacing of 1200mm o.c. for double beams and channels as follows:
- .1 For beams and channels 225mm or less in depth: one or two rows of pipe separators.
- .2 For beams and channels over 225mm in depth: channel separators, unless otherwise detailed on Contract Drawings.
- 3.1.6 Built up Compression Members General Requirements: Comply with the requirements of CSA-S16, for all built up compression members.
- 3.1.7 Column Bearing Plates: Mill column bearing plates under column bearing unless plate is sufficiently flat to give adequate contact bearing between column and plate.
- 3.1.8 Structural Steel Painting: All prime painting shall be shop applied and the responsibility of the steel fabricator. Refer to specific priming requirements specified in Section 09 91 23 - Interior Painting.
- .1 Paint in accordance with manufacturer's published directions.
- .2 Paint steel in the shop under cover. Keep painted members under cover until the paint has dried.
- .3 Clean and prepare surfaces, as appropriate for paint specified, in accordance with Commercial Blast Cleaning is only required where zinc rich paint is to be applied. All other steel to be or clean steel in compliance with SSPC SP6 where zinc rich paint is shop applied.
- .4 Where paint is applied adjacent to welded joints, remove it to bare metal for a distance of at least 50mm beyond sides of joints.
- .5 Do not paint surfaces and edges to be field welded, contact surfaces of friction type connections assembled by high strength bolts, surfaces encased in or in contact with concrete.
- .6 Do not paint surfaces to receive cementitious fireproofing.
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- .7 Prime steel members to receive Intumescent Fireproofing in accordance with fireproofing manufacturer's recommendations. Refer to Section 07 81 23.
 - 3.1.9 Galvanizing: Galvanize members as indicated and in accordance with reference standards, after shop welding is complete.
 - .1 Steel members, fabrications, and assemblies shall be galvanized after fabrication by the hot dip process in accordance with CSA G164 or ASTM A123.
 - .2 Bolts, nuts, washers, iron, and steel hardware components shall be galvanized in accordance with CSA G164 or ASTM A153.
Coating Requirements:
 - .1 Weight: the weight of the galvanized coating shall conform with Table 1 of CSA G164 or paragraph 6.1 of ASTM A123 and Table 1 of ASTM A153 (as appropriate).
 - .2 Surface Finish: The galvanized coating shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect that is detrimental to the stated end use of the coated article.
 - .3 The integrity of the coating shall be determined by visual inspection and coating thickness measurements.
 - .4 Adhesion: the galvanized coating shall be sufficiently adherent to withstand normal handling.
 - 3.2 **Examination**
 - 3.2.1 Verify, before delivery of structural steel, that work of other Sections on which work of this Section is dependent is correctly installed and located.
 - 3.3 **Preparation**
 - 3.3.1 Supply anchor bolts, base and bearing plates and other members to be built in under work of other Sections as the work progresses. Cooperate with installers of this work and provide instructions for setting items to be built in.
 - 3.4 **Erection**
 - 3.4.1 Comply with CSA S16 and work site safety plans in erection of work of this Section.
 - 3.4.2 Make adequate provision for horizontal and vertical erection loads and for sufficient temporary bracing to keep structural frame plumb and in true alignment until the completion of erection, and the installation of masonry, concrete work, and floor and roof decks which provide the necessary permanent bracing.
 - 3.4.3 Provide temporary steel members as may be required for erection purposes and remove them when no longer required.
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- 3.4.4 Installation of Bearing and Column Base Plates: Install bearing plates and standard wall anchors for beams bearing on masonry or concrete.
 - .1 Set loose beam bearing plates and column base plates, at proper elevation, true and level, with steel shims, ready for grouting as specified under work of other Sections.
 - .2 Set loose bearing plates and/or levelling plates to be cast into concrete.

 - 3.5 **Coating Touch-Up**
 - 3.5.1 Clean welds with wire brushes and wash down with clean water to ensure no residue from electrodes is present.
 - 3.5.2 After erection, give one coat of prime coat or zinc rich paint as applicable and specified for shop coat to field bolts, field connections, burnt areas, and abrasions or damage to shop coats.
 - 3.5.3 Touch up all areas with a specified paint film thickness.
 - 3.5.4 Give areas of bare metal on galvanized members two coats of zinc-rich paint. Replace any materials where damage cannot be repaired to the satisfaction of the Consultant.

 - 3.6 **Field Quality Control**
 - 3.6.1 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Inspection of erection and fit-up, including placing, plumbing, levelling and temporary bracing and conformance with specified tolerances.
 - .2 Inspection of bolted connections, including verification that ASTM A307, ASTM F3125 snug tight only bolts, and ASTM F3125 pre-tensioned bolts have been installed and used appropriately, and that threads are excluded from shear plane where required.
 - .3 Inspection of welded joints, including slag removal.
 - .4 General inspection of field cutting and alterations; report immediately to Consultant, any alterations or cutting not shown on reviewed shop drawings.
 - .5 General inspection of shop coating touch-up.
 - .6 Inspection of zinc primer and zinc-rich paint, including surface preparation and coating thickness.
 - .7 Review adequacy of temporary bracing to keep the structure in true alignment and provide stability to the structural steel frame during erection with drawings prepared by Contractor
 - .8 Report any failure of the members to come together properly before any corrective measures are taken. If requested, make specific recommendations to the Consultant for remedial action. Corrective measures to be reviewed by the Consultant.
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- .9 Check individual pieces of the frame for twisting, sweeping and local damage and to ensure that the specified tolerances do not exceed the limits specified in S16.
 - .10 Check all beam/column moment connections for compliance with reviewed shop details.
 - .11 Check all permanent bracing for correct installation and for application of nominal pretension for tension braces.
 - .12 Check grouting of column base plates and bearing plates to ensure that the specifications are being followed. Inspect at least three columns to ensure correct grouting procedure used.
- 3.7 **Defective Work**
- 3.7.1 Variations in excess of specified tolerances, and failure of materials or workmanship to meet requirements of this specification, and which cannot be repaired by approved methods, will be considered defective Work performed by this Section.
 - 3.7.2 Replace defective Work, as directed by the Consultant.
 - 3.7.3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work has proven to be deficient.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install steel joists as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

1.3.1 Section 05 12 23 Structural Steel for Buildings

1.3.2 Section 05 31 00 Steel Decking

1.4 References

1.4.1 ASTM International, (ASTM)

.1 ASTM A108-18 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

.2 ASTM A1011/A1011M-23 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

1.4.2 CSA Group (CSA)

.1 CSA S16:19 Design of Steel Structures

.2 CSA S136-16 North American Specification for the Design of Cold Formed Steel Structural Members

.3 CSA W47.1:19 Certification of Companies for Fusion Welding of Steel

.4 CSA-W48.1-M1991 (R1998) Carbon Steel Covered Electrodes for Shielded Metal Arc Welding

.5 CSA W59-18 Welded Steel Construction (Metal Arc Welding)

.6 CSA W55.3-08 (R2018) Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

.7 CSA W178.1-18 Certification of Welding Inspection Organizations

.8 CSA W178.2-18 Certification of Welding Inspectors

1.4.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)

.1 CISC/CPMA 2-75 Quick-Drying, Primer for Use on Structural Steel

.2 CISC/CPMA 1-73a Quick-Drying, One-Coat Paint for Use on Structural Steel

1.4.4 The National Building Code of Canada.

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1.5 **Submittals**

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Shop Drawings:

- .1 Submit steel joist shop drawings as defined in reference standards. Shop drawings shall be stamped by a Professional Engineer registered in the Province of Ontario. Each submission of the shop drawings shall bear the seal of the Engineer.
- .2 Indicate, in addition, dimensioned intersections of members, critical bending moments due to eccentricities, joist spacing, framing for openings, and slopes.
- .3 Detail welded connections using standard symbols for welding joints as published in the current CISC Handbook of Steel Construction.
- .4 Indicate on erection drawings, for each type of joist and bearing condition, the centre of bearing assumed in design and the maximum allowable distance from this point to the intersection of the axes of the chord and the end diagonal.
- .5 Review all shop drawings prior to submission. By this review, the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue number and similar data or will do so and that he has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a responsible person.
- .6 At time of submission, notify the Consultant in writing of any deviations in the shop drawings from the requirements of the Contract Documents.
- .7 The Consultant will review and return shop drawings in accordance with any schedule agreed on, or otherwise with reasonable promptness. The Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Consultant.
- .8 Make any changes in shop drawings which the Consultant may require and resubmit unless otherwise directed by Consultant. When resubmitting the Contractor shall notify the Consultant in writing of any revisions other than those requested by Consultant.

1.6 **Quality Assurance**1.6.1 Design Criteria

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- .1 Design joists to carry loads indicated on structural Contract Drawings.
 - .2 Design joist to ensure that total load deflection does not exceed 1/240 of the span and live load deflection does not exceed 1/360 of the span.
 - .3 Analyze joists composed wholly or in part of cold formed structural members as rigidly connected linear elastic frame works, including all joint eccentricities. Design cold formed members for combined axial loads and bending moments predicted by analysis. Design hot rolled members for combined axial load and bending moment if eccentricity at one or both ends exceeds limits of reference standards above.
 - .4 Tie Joists: Where tie joists are used, design tie joist, columns and connections to resist the member forces predicted by a linear elastic analysis.
 - .5 Design special joist components to allow the passage of mechanical and electrical services through webs of joists, where so indicated on the Contract Drawings.
 - .6 Design of joists shall be by a Professional Engineer licensed in the Province of Ontario and experienced in steel joist design.
 - .7 Design framing members to meet minimum requirements of ULC for listed assemblies
- 1.6.2 Source Quality Control
- .1 Inspection and testing of materials and shop fabrication of work of this Section, and field quality control specified elsewhere in this Section, will be performed by an Inspection and Testing Company appointed by the Consultant.
 - .2 The Inspection and Testing Company, and welding inspectors and supervisors shall meet qualification requirements of CSA W178 and shall be certified by the Canadian Welding Bureau in Category (1), Buildings.
 - .3 Provide free access for inspectors to all places work is being performed.
 - .4 Shop Inspection shall ensure that materials conform to specified requirements. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests. Inspection shall ensure that fit up, fabrication, and shop painting conform to specified requirements and dimensioned shop drawings.

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1.7 Shipping, Handling and Storage

- 1.7.1 Deliver products that are supplied only under work of this Section to those who are responsible for their installation, to the place they direct and to meet construction schedule.
- 1.7.2 Handle and store joists in such a manner that no damage, including corrosion, is caused to the stored or erected work, or to other property.
- 1.7.3 Store all steel joists off of the ground on timber supports.

2. PRODUCTS**2.1 Materials**

- 2.1.1 Steel Joists: Formed of hot rolled or cold formed shapes, hollow structural sections, plates and rods meeting requirements of specified reference standards.
- 2.1.2 Shop Coat Paint: To meet specified requirements of CISC/CPMA Standard 1-73a and compatible with Master Painters Institute INT 5.1S Institutional low odour/low VOC semi-gloss finish. Colour to be grey

2.2 Fabrication

- 2.2.1 Fabricate joists with their attachments and accessories in accordance with the reference standards.
- 2.2.2 Provide top chords of sufficient width and material thickness to permit 20mm diameter arc spot welds of deck to joist to be formed, in accordance with CSA S136.
- 2.2.3 Prepare joists for attachment of other work as indicated on Contract Drawings and required for construction.
- 2.2.4 Fabricate bridging not less than 3mm in thickness.
- 2.2.5 Extend bottom chords of joists where required to support ceiling or walls as shown on Contract Drawings.
- 2.2.6 Fabricate joists and shoes to accommodate roof slopes shown on Contract Drawings.
- 2.2.7 Fabricate web systems to allow clearances for transverse mechanical and electrical services to pass through where so indicated on structural Contract Drawings.
- 2.2.8 Provide shoe depths to suit elevations of bearings in each location.
- 2.2.9 Fabricate joists of uniform appearance for erection in areas where they are exposed to view.

2.3 Cleaning and Painting

- 2.3.1 Painting: All prime painting shall be shop applied and the responsibility of the fabricator.
 - .1 Paint in accordance with manufacturer's published directions.
 - .2 Paint steel in the shop under cover. Keep painted members under cover until the paint has dried.

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- .3 Clean and prepare surfaces, as appropriate for paint specified, in accordance with CISC/CPMA 2-75 or clean steel in compliance with SSPC SP6 where zinc rich paint is shop applied.
 - .4 Where paint is applied adjacent to welded joints, remove it to bare metal for a distance of at least 50mm beyond sides of joints.
 - .5 Do not paint surfaces and edges to be field welded, surfaces encased in or in contact with concrete or masonry.
 - 2.3.2 Mark joists to indicate erection orientation when they are fabricated to special design or loading requirements.
 - 2.3.3 Identify each joist with mark corresponding to shop drawing designation.
3. **EXECUTION**
- 3.1 **Examination**
 - 3.1.1 Verify, before delivery of joists, that work to receive joists is located correctly and at proper levels.
 - 3.2 **Preparation**
 - 3.2.1 Provide necessary instructions to other trades for installation of bearings and anchors installed under work of other Sections. Assist in installation if requested.
 - 3.2.2 If steel surfaces are painted where connections are made by welding at the site, remove paint to bare metal for a distance of at least 50mm beyond sides of joints.
 - 3.3 **Erection**
 - 3.3.1 Comply with CSA S16 and work site safety plans in erection of work of this Section.
 - 3.3.2 Refer to Contract Drawings for the work of other Sections and locate joists to avoid interference with ceiling construction, recessed lights, mechanical and electrical services, and similar work.
 - 3.3.3 Install shims, packing or special shoes to support joists at proper elevation.
 - 3.3.4 Carry joists to centre line of beams, with a tolerance of +0mm and 25mm for beams with joists bearing from both sides, and +25mm and 0mm for beams with joists bearing from one side only.
 - 3.3.5 Weld each joist at bearings on structural steel members and bearing plates, or as indicated on Contract Drawings.
 - 3.3.6 Install framing for openings between joists as indicated on Contract Drawings.
 - 3.3.7 Bridging:
 - .1 Install steel bridging, transverse to joist spans to meet specified requirements of reference standards.
 - .2 Locate bridging at panel points wherever possible.
 - .3 Locate bridging to ensure no interference with recessed lights, and mechanical and electrical services.
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- .4 Top chord load distributing bridging may be used in lieu of normal top chord bridging specified above.

3.4 Field Quality Control

3.4.1 Perform field inspection by Inspection and Testing Company to meet requirements specified under Source Quality Control of this Section, and to include:

- .1 Inspection of erection and fit up, including placing joist beaming, plumbing, levelling and temporary and permanent bracing.
- .2 Verification for each end of each joist that the distance from the centre of bearing to the end tension web member does not exceed the maximum dimension given on the Contract Drawings.
- .3 Inspection of welded and bolted connections.
- .4 General inspection of shop coating touch up.
- .5 Review adequacy of temporary bracing to keep the structure in true alignment and provide stability to the structural steel frame during erection with drawings prepared by Contractor
- .6 Report any failure of the members to come together properly before any corrective measures are taken. If requested, make specific recommendations to the Consultant for remedial action. Corrective measures to be reviewed by the Consultant.
- .7 Check individual pieces of the frame for twisting, sweeping and local damage and to ensure that the specified tolerances do not exceed the limits specified in S16.
- .8 Check all beam/column moment connections for compliance with reviewed shop details.
- .9 Check all permanent bracing for correct installation and for application of nominal pretension for tension braces.
- .10 Check grouting of column base plates and bearing plates to ensure that the specifications are being followed. Inspect at least three columns to ensure correct grouting procedure used.

3.4.2 Inspection & Testing Company shall:

- .1 Submit reports at least weekly when shop and site work is in progress.
- .2 Distribute inspection reports as follows:
 - .1 2 copies to Consultant, 1 copy to Contractor and 2 copies to fabricator;
 - .2 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.
 - .3 Include deficiency list of outstanding items from previous reports, and comment on status.

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3.5 **Coating Touch Up**

3.5.1 After erection, give one coat of paint specified for shop coat to field bolts, field connections, burnt areas, and abrasions or damage to shop coats.

3.6 **Defective Work**

3.6.1 Variations in excess of specified tolerances, and failure of materials or workmanship to meet requirements of this specification, and which cannot be repaired by approved methods, will be considered defective Work performed by this Section.

3.6.2 Replace defective Work, as directed by Consultant.

3.6.3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work has proven to be deficient.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 31 00, Steel Decking**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install metal roof deck as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 03 30 00 | Cast-in-Place Concrete |
| 1.3.2 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.3 | Section 05 21 00 | Steel Joist Framing |
| 1.3.4 | Section 05 50 00 | Metal Fabrications |
| 1.3.5 | Section 06 10 10 | Rough Carpentry |
| 1.3.6 | Section 07 81 16 | Cementitious Fireproofing |

1.4 References**1.4.1 ASTM International, (ASTM)**

.1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.4.2 CSA Group (CSA)

- .1 CSA S16:19 Design of Steel Structures
- .2 CSA S136-16 North American Specification for the Design of Cold Formed Steel Structural Members, Includes Update No. 1 (2009), Update No. 2 (2010)
- .3 CSA W47.1:19 Certification of Companies for Fusion Welding of Steel Structures.
- .4 CSA W48:23 Filler Metals and Allied Materials for Metal Arc Welding
- .5 CSA W55.3-08 Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .6 CSA W59-18 Welded Steel Construction (Metal Arc Welding)

1.4.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181-99 Ready-Mixed Organic Zinc-Rich Coating

1.4.4 Canadian Sheet Steel Building Institute (CSSBI)

- .1 CSSBI 10M Standard for Steel Roof Deck.
- .2 CSSBI 12M Standard for Composite Steel Deck.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 31 00, Steel Decking**

Procedures.

- 1.5.2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Ontario, Canada. Each submission of the shop drawings shall bear the seal of the Engineer.
 - .1 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.
 - .2 Indicate details of temporary shoring of steel deck.
- 1.5.3 Submit design calculations if requested by Consultant.

1.6 Design Requirements

- 1.6.1 Design steel deck using limit states design in accordance with CSA S136 and CSSBI 10M.
- 1.6.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, and uplift as indicated.
- 1.6.3 Deflection under specified live load not to exceed 1/240 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.
- 1.6.4 Design composite deck sections in accordance with the National Building Code of Canada for concrete strength indicated on Contract Drawings.
- 1.6.5 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CSA S16.

1.7 Shipping, Handling and Storage

- 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

2. PRODUCTS**2.1 Materials**

- 2.1.1 Sheet Steel: ASTM A653 minimum Grade 230 with a base steel design thickness of 0.76mm or greater and a minimum zinc-iron alloy coating designation of ZF75.
- 2.1.2 Closures: in accordance with manufacturer's recommendations.
- 2.1.3 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76mm. Metallic coating same as deck material.
- 2.1.4 Primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.2 Types of Decking

- 2.2.1 Deck shall conform to the depths noted on the Contract Drawings.
 - 2.2.2 Steel roof deck: to CSSBI 10M non-cellular, interlocking side laps. Base steel thickness, depth & profile as shown on the Contract Drawings.
 - 2.2.3 Composite steel floor deck: to CSSBI 12M non-cellular, upright embossed fluted profile, interlocking side lap, base steel thickness, depth & profile as
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 31 00, Steel Decking**

shown on the drawings. Flat sheet for cellular deck, 0.76mm minimum base steel thickness or as noted on drawings.

3. EXECUTION**3.1 General**

- 3.1.1 Structural steel work: in accordance with CSA S136 and CSSBI 10M.
- 3.1.2 Welding: in accordance with CSA W59, except where specified otherwise.
- 3.1.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

3.2 Erection

- 3.2.1 Erect steel deck as indicated and in accordance with CSA S136, CSSBI 10M, CSSBI 12M and with reviewed erection drawings.
- 3.2.2 Lap ends: to 50mm minimum.
- 3.2.3 Place and support reinforcing steel as indicated.
- 3.2.4 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- 3.2.5 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.
- 3.2.6 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

3.3 Closures

- 3.3.1 Install closures in accordance with approved details.

3.4 Openings and Areas of Concentrated Loads

- 3.4.1 No reinforcement required for openings cut in deck which are smaller than 150mm square.
- 3.4.2 Frame deck openings with any one dimension between 150 to 300mm as recommended by manufacturer, except as otherwise indicated.
- 3.4.3 For deck openings with any one dimension greater than 300mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 Connections

- 3.5.1 Install connections in accordance with CSSBI recommendations as indicated.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 41 00, Structural Metal Stud Framing**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install wind bearing structural metal stud framing as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 07 21 13 | Building Insulation |
| 1.3.3 | Section 07 26 00 | Vapour Retarders |
| 1.3.4 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.5 | Section 07 42 43 | Composite Wall Panels |
| 1.3.6 | Section 07 92 10 | Joint Sealing |
| 1.3.7 | Section 08 44 13 | Glazed Aluminum Curtain Walls |
| 1.3.8 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References

1.4.1 The National Building Code of Canada.

1.4.2 The Ontario Building Code.

1.4.3 ASTM International (ASTM)

- .1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .2 ASTM A792/A792M-22 Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
- .3 ASTM A879/A879M-22 Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
- .4 ASTM A1003/A1003M-15 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
- .5 ASTM C955-18e1 Standard Specification for Cold-Formed Steel Structural Framing Members
- .6 ASTM C1007-20 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories

1.4.4 American National Standards Institute (ANSI)

- .1 ANSI/AWSD1.3 Structural Welding Code-Sheet Steel.

1.4.5 CSA Group (CSA)

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 41 00, Structural Metal Stud Framing**

- .1 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA S16.1:19 Design of Steel Structures.
 - .3 CSA S136:16 North American Specification for the Design of Cold-Formed Steel Structural Members
 - .4 CSA W47.1:19 Certification of Companies for Fusion Welding of Steel Structures.
 - .5 CSA W59-18 Welded Steel Construction (Metal-Arc Welding).
 - .6 CSA W178.1-18 Certification of Welding Inspection Organizations
 - .7 CSA W178.2-18 Certification of Welding Inspectors
 - 1.4.6 Canadian General Services Board (CGSB)
 - .1 CGSB 1-GP-181M Standard for Coating, Zinc Rich, Organic Ready Mix.
 - 1.4.7 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 51-06 Lightweight Steel Framing Design Manual.
 - .2 CSSBI S6-90 Guide Specification for Lightweight Steel Framing.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit shop drawings indicating layout and details of fabrication and erection. Indicate member sizes and gauges of materials, framing, method of fastenings, spacing of all members, bridging and bracing. Indicate design loads.
 - 1.5.3 Indicate all framing systems including exterior and interior framing and soffits.
 - 1.5.4 Lightweight steel framing systems shall be designed by, and each shop drawing shall bear the stamp of a registered Professional Engineer licensed to practice in the Province of Ontario. Each submission of the shop drawings shall bear the seal of the Engineer.
 - 1.5.5 Submit engineering design calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements.
 - 1.5.6 Detail welded connections using standards symbols for welded joints as published in current CISC Handbook of Steel Construction.
 - 1.5.7 Submit field review reports specified in Section 3.7 within 3 working days of each inspection. Reports shall be submitted directly from the Design Engineer to the Consultant.
 - 1.5.8 Submit mill test reports covering chemical and mechanical properties of steel, and coating designation.
 - 1.5.9 Inspection Reports: Inspection and Testing company shall:
 - .1 Submit reports at least weekly when the work of this Section is in progress.
 - .2 Distribute inspection reports as follows:
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 41 00, Structural Metal Stud Framing**

- .1 General Contractor.
 - .2 Consultant.
 - .3 Lightweight Steel Framing fabricator.
 - .3 Sign report by inspector who performs inspection, describing progress of work, deficiencies observed and corrective action taken.
 - .4 Include deficiency list of outstanding items from previous reports, and comment on status.
- 1.6 **Qualifications**
- 1.6.1 Contractor undertaking work of this Section shall have a minimum of 5 years of experience in lightweight steel framing.
 - 1.6.2 Design of lightweight steel framing shall be by a Professional Engineer licensed in the Province of Ontario, experienced in lightweight steel framing design.
 - .1 Lightweight steel framing design engineer shall be insured against professional liability in accordance with section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.
 - 1.6.3 Consultant will review lightweight steel framing to verify general conformance with overall design concept of the structure.
 - 1.6.4 Companies engaged in welding shall be certified by the Canadian Welding Bureau to CSA Standard W47.1. Companies shall have welding procedures approved and welders qualified for the base material types and thicknesses that are to be welded.
 - 1.6.5 Undertake welding only by fabricators certified by Canadian Welding Bureau under Division 1 or 2.1. Use welders qualified for the base material types and thicknesses that are to be welded.
- 1.7 **Design**
- 1.7.1 Design shall be based on Limit States Design Principles using factored loads and resistances.
 - 1.7.2 Loads and load factors shall be in accordance with the National Building Code of Canada.
 - 1.7.3 Resistances and resistance factors shall be determined in accordance with the National Building Code and CSA S136.
 - 1.7.4 Maximum allowable deflection of metal studs under specified loads shall be L/240.
 - 1.7.5 Design bridging as necessary to align members during erection, and to provide necessary structural integrity during construction and in the completed structure. Design bridging to prevent member rotation and translation perpendicular to the minor axis.
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- 1.7.6 Design lintels over all openings in accordance with the National Building Code.
 - 1.7.7 Design components or assemblies to accommodate specified erection tolerances.
 - 1.7.8 Member spacing shall not exceed the spacing indicated on the Contract Drawings.
 - 1.7.9 Allow for movement of the structure. Design wind bearing stud end connections to accommodate floor/roof deflections such that the studs are not loaded axially.
 - 1.7.10 Connections between lightweight steel framing members shall be by bolts, welding or sheet metal screws.
 - 1.7.11 Resistances for sheet metal screws shall be based on the manufacturer's lower bound test values multiplied by the appropriate resistance factor, ϕ_c , given in CSA S136.
 - 1.7.12 Provide bridging at spacing to satisfy structural requirements, but not at greater than the following: at the lesser of 1500 mm or 1/4 of span, for joists and rafters.
 - 1.7.13 Neglect contribution of sheathing to restrain member rotation and translation perpendicular to the minor access.
 - 1.7.14 Design bracing system to limit lateral deflections of building components under wind or seismic load to height/500.
 - 1.7.15 Use bolts, welding or sheet metal screws to make connections between lightweight framing members.
 - 1.7.16 Determine sheet metal screw capacities in accordance with CSA S136.
 - 1.7.17 Design top and bottom tracks to transfer joint and member loads, but not less than one gauge size thicker than the wall stud thickness.
 - 1.7.18 Design connections to masonry walls to stabilize the walls and resist lateral forces due to wind and seismic forces.
- 1.8 **Protection**
- 1.8.1 Provide and maintain adequate temporary bracing for all work of this Section until permanent lateral support is in place.
- 1.9 **Shipping, Handling and Storage**
- 1.9.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.9.2 Use all means necessary to protect all materials before, during and after installation and to protect the installed work and materials of other trades affected by this work.
 - 1.9.3 In the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to the Agency.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 41 00, Structural Metal Stud Framing**

- 1.9.4 Store lightweight steel framing members on site, flat. Protect from contact with ground.

2. PRODUCTS**2.1 Metal Stud Framing**

- 2.1.1 Steel to ASTM A1003 Minimum grade, Grade 'D', 50 ksi yield, galvanized Z180 coating.
- 2.1.2 Thickness, exclusive of coating: not less than 1.22mm. Use thicker material where required by Engineered design to satisfy structural requirements. Comply with thickness tolerance requirements of CSA S136. Material thicknesses shall be greater than or equal to the specified thicknesses with underruns not to exceed the tolerance requirements of CSA S136.
 - .1 Thicknesses of framing members specified or indicated on Contract Drawings is exclusive of galvanized coating.
- 2.1.3 Stud sizes as indicated on the Contract Drawings.
- 2.1.4 Provide all necessary tracks, bridging, fasteners, hardware and other accessories as required for a complete installation.
- 2.1.5 Provide double or triple stud arrangements at locations where support of interior or exterior fixtures, fittings and accessories is required.
- 2.1.6 Zinc Rich Paint: zinc rich, organic, ready mix to CAN/CGSB 1.181. Low VOC type.

2.2 Fastenings

- 2.2.1 Sheet Metal Screws: self-tapping with a minimum coating thickness of 0.008 microns of zinc or cadmium. Screws shall have low profile heads where covered by sheathing.
- 2.2.2 Sheathing Screws: As specified in Section 09 21 16 – Gypsum Board Assemblies.
- 2.2.3 Welding Electrodes: to CSA W59, 480 mPa minimum tensile strength series.
- 2.2.4 Anchors: appropriate anchors sized to suit loads, substrate material, and edge distances, manufactured by Hilti Canada or Confast, installed as per manufacturer's recommendations.

2.3 Accessories

- 2.3.1 Deflections Tracks and Slide Clips: Manufacturer's standard telescoping or slotted tracks to suit design and load conditions.

2.4 Sheathing

- 2.4.1 As specified in Section 09 21 16 – Gypsum Board Assemblies.

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3. EXECUTION**3.1 General**

- 3.1.1 Fabrication and erection shall conform to the reviewed shop drawings. Modifications required to accommodate as-built conditions (other than minor dimensional changes) shall be submitted for review.
- 3.1.2 Provide Lightweight Steel Framing systems at exterior wall locations where indicated.

3.2 Welding

- 3.2.1 Welds shall conform to CSA W59.
- 3.2.2 For metal less than 3.0mm thick, shop drawings may show nominal weld leg sizes. For such material, the effective throats of welds shall not be less than the thickness of the thinnest connected part.
- 3.2.3 Touch-up welds with zinc rich paint.

3.3 Screws

- 3.3.1 Steel screws shall equal or exceed the minimum diameter indicated on the shop drawings.
- 3.3.2 Penetration beyond joined materials shall be not less than 3 exposed threads.

3.4 Fabrication

- 3.4.1 Where specified, provide cut-outs centered in the webs of members to accommodate services. Unreinforced cut-outs shall be limited to the dimensions in CSSBI 51-06. The effect of cut-outs on the strength and stiffness of the member shall be considered.
- 3.4.2 Fabrication tolerances for members shall conform CSSBI 51.
- 3.4.3 The steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

3.5 Erection

- 3.5.1 Comply with requirements of ASTM C1007.
- 3.5.2 Lightweight steel framing shall be erected true and plumb within the specified tolerances.
- 3.5.3 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. Ensure that during erection, a margin of safety consistent with the requirements of the National Building Code and CSA S136 exists in the uncompleted structure.
- 3.5.4 Erection Tolerances:
 - .1 For the purposes of this Section, camber is defined as the deviation from straightness of a member or any portion of a member with

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- 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 axial load bearing studs, out of plumbness and out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
 - .3 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length.
 - .4 For track, camber shall not exceed 1/1000th of the member length.
 - .5 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 1.6mm for axial load bearing studs or 5mm for wind bearing studs.
 - .6 Spacing of studs shall not be more than 3.0mm from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.
- 3.5.5 Make all field measurements necessary to insure the proper fit of all members.
- 3.5.6 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- 3.5.7 All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- 3.5.8 Completed bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. Any discrepancy shall be brought to the attention of the Consultant.
- 3.5.9 Holes that are field cut into lightweight steel framing members shall conform to the requirements of CSSBI 51.
- 3.5.10 Splicing of axial load bearing members is not permitted.
- 3.5.11 Insulation shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Ensure that insulation is kept dry and not compressed. Use fibrous fill insulation as specified under Section 07 21 13 – Building Insulation.
- 3.5.12 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.
- 3.5.13 Thoroughly inspect installation prior to application of covering materials and touch up all scratched or otherwise damaged surfaces with a heavy coating of zinc rich paint.
- 3.6 **Sheathing**
- 3.6.1 Water resistant gypsum sheathing shall be installed horizontally on all walls. Refer to Section 09 21 16 – Gypsum Board Assemblies.
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PROJECT 22701****Appendix 8.2, Division 05, Section 05 41 00, Structural Metal Stud Framing**

3.7 Inspection

3.7.1 The lightweight steel framing Design Engineer, responsible for the production of the shop drawings, shall provide periodic field review during construction and shall submit reports in accordance with Section 1.4.

.1 The cost of this field review shall be paid for by the Contractor.

3.7.2 Additional inspection and testing of materials and workmanship shall be carried out by a qualified Independent Inspection Agency appointed by the Consultant/Agency.

.1 The cost of this additional inspection shall be paid for out of the Cash Allowances for Inspection and Testing.

.2 Any testing or inspection required by the Consultant because of an error by the Contractor or due to departure from the contract documents by the Contractor, shall be paid for by the Contractor.

.3 Inspection shall include:

.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 this specification.

.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 or erection.

.8 Additional inspection and testing of welded connections as required by CSA W59.

.9 General inspection of field cutting, and alterations required by other trades.

.10 Submission of reports to the Agency, the Contractor and the authorities having jurisdiction covering the work inspected with details of deficiencies discovered.

.4 Provide the necessary cooperation to ensure that the inspection can proceed.

.5 The inspection provided in this section does not relieve the Contractor of his responsibility for the performance of the contract. The Contractor is solely responsible for quality control and he shall implement his own supervisory and quality control procedures.

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- .6 Materials or workmanship not conforming to the requirements of the contract documents may be rejected at any time during the progress or work.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 05, Section 05 50 00, Metal Fabrications**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install metal fabrications as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 05 31 00 | Steel Decking |
| 1.3.3 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.4 | Section 06 10 10 | Rough Carpentry |
| 1.3.5 | Section 06 20 00 | Finish Carpentry |
| 1.3.6 | Section 09 21 23 | Interior Painting |

1.4 References

1.4.1 The Ontario Building Code.

.1 MMAH Supplementary Standard SB-8, September 14, 2012. Design, Construction and Installation of Anchorage Systems for Fixed Access Ladders.

1.4.2 ASTM International (ASTM)

.1 ASTM A53/A53M-22 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

.2 ASTM A123/A123M-17 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A153/A153M-16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

.4 ASTM A307-21 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.5 ASTM A385/A385M-22 Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)

.6 ASTM A1008/A1008M-21a 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

.7 ASTM A1011/A1011M-18a 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

.8 ASTM C1107/C1107M-20 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

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- .9 ASTM D1187/D1187M-97(2018) Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
 - .10 ASTM D6386-22 Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
 - .11 ASTM F3125/F3125M-22 Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
 - 1.4.3 CSA Group (CSA)
 - .1 CSA G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA-S16.1-M Limit States Design of Steel Structures.
 - .4 CSA S136-12 Cold Formed Steel Structural Members.
 - .5 CSA W47.1-09 (R2014) Certification of Companies for Fusion Welding of Steel Structures.
 - .6 CSA W59-18 Welded Steel Construction
 - .7 CSA W178.1-18 Certification of Welding Inspection Organizations
 - .8 CSA W178.2-18 Certification of Welding Inspectors
 - 1.4.4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.40-97 Anticorrosive Structural Steel Alkyd Primer
 - .2 CAN/CGSB 1.181-99 Ready Mixed, Organic Zinc Rich Coating.
 - 1.4.5 Canadian Sheet Steel Building Institute (CSSBI)
 - 1.4.6 Steel Structures Painting Council, Systems and Specifications Manual.
 - .1 CISC/CPMA 1-73a-1975 A Quick drying One-coat Paint for Use on Structural Steel.
 - .2 CISC/CPMA 2-75-1975 A Quick Drying Primer for Use on Structural Steel.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Shop Drawings:
 - .1 Submit Shop and Erection Drawings for review.
 - .2 Verify site dimensions before proceeding with shop fabrication and to suit field conditions and field openings.
 - .3 Show and describe in detail all the work of this Section including large scale detail of members and materials, of connection and jointing details, and of anchorage devices, dimensions, thicknesses, description of materials, metal finishing, as well as all other pertinent data and information, including type, size and description of all fasteners and anchors.
 - .4 Indicate connections to building structure.
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- .5 Shop drawings for all metal fabrications shall be stamped and signed by a Professional Engineer registered in the Province of Ontario. Each submission of the shop drawings shall bear the seal of the Engineer.
- 1.6 **Design Requirements**
- 1.6.1 Design metal ladder construction and connections to OBC vertical and horizontal live load requirements.
- 1.6.2 Design service access ladders, stairs and guards to Ministry of Labour requirements.
- 1.6.3 All access ladders shall be designed to the minimum requirements noted on the drawings and MMAH Supplementary Standard SB-8, whichever is more stringent. This shall include through-bolting anchors at masonry walls.
- 1.7 **Qualifications**
- 1.7.1 Work of this Section shall be executed by a firm thoroughly conversant with laws and regulations which govern and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturers specializing in this work and having a minimum ten (10) years proven experience in the fabrication of high quality metal fabrications. Use workmen skilled in work of this Section.
- 1.7.2 Welding shall be performed by trades persons certified by The Canadian Welding Bureau under CSA Standard W47.1.
- 1.8 **Examination**
- 1.8.1 All dimensions shall be taken from the Contract Drawings and checked against the building. Be responsible for the correctness of such measurements and report to the Consultant in writing all discrepancies between measurements at building and those shown on Contract Drawings prior to commencing work. Verify location of anchor bolts and embedded steel and ensure that work prepared by other trades is at a proper elevation, online, level and true.
- 1.9 **Shipping, Handling and Storage**
- 1.9.1 Label, tag or otherwise mark work supplied for installation by other Sections to indicate its function, location and shop drawing description.
- 1.9.2 Protect work from damage and deliver to a location at the site in order to meet the scheduling requirements.
- 1.9.3 Protect architecturally exposed materials during fabrication, delivery, handling, storage and erection to prevent marring of surfaces exposed to view, by marking, bending, denting or coarse grinding.
2. **PRODUCTS**
- 2.1 **Materials**
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- 2.1.1 Structural Steel Sections and Steel Plate: CSA G40.20-13/G40.21-13, Grade 350W.
 - 2.1.2 Architectural and Miscellaneous Mild Steel: CSA G40.20-13/G40.21-13, Grade 300W.
 - 2.1.3 Machine Bolts and Nuts: ASTM Standard A307-10 low carbon steel externally and internally threaded standard fasteners. Dimensions, sizes, thread, strength, quality and type of items shall be designed for the work intended. Exposed fasteners and anchors shall be same material, colour and finish as the metal to which they are applied.
 - 2.1.4 High Strength Bolts and Nuts: ASTM F3125. Dimensions, sizes, thread, strength, quality and type of items shall be designed for the work intended. Exposed fasteners and anchors shall be same material, colour and finish as the metal to which they are applied.
 - 2.1.5 Sheet Steel: (Commercial Quality) ASTM A1008 stretcher leveled or temper rolled.
 - 2.1.6 Steel Pipe: ASTM A53 Schedule 40, Grade B.
 - 2.1.7 Welding Materials: CSA W59.
 - 2.1.8 Welding Electrodes: CSA W48 Series.
 - 2.1.9 Grout: non-shrink, non-metallic, non-stain, flowable, to ASTM C1107, 15 MPa at 24 hours.
 - 2.1.10 Isolation Coating: Alkali resistant bituminous paint to ASTM D1187.
 - 2.1.11 Adhesive Anchors: HILTI or Rawl Epoxy Adhesive Anchors sized to suit loading conditions, suitable for substrate. Adhesive to be low VOC type (maximum 250 g/l) to SCAQMD Rule 1168-03, Adhesives and Sealants Applications.
 - 2.1.12 Gratings: Welded steel type WB, galvanized. Bearing bars shall be 38 x 4.5 mm at 29 mm centres.
- 2.2 **Finishes**
- 2.2.1 Primers: All primers for metal fabrications are to be factory applied under the requirements of this Section. Refer to Finish Schedules in Section 09 91 23 for types of primers required for each application. Colour to be grey.
 - 2.2.2 Pre Paint Finish: For galvanized surfaces to be exposed and finish painted, to ASTM D6386.
 - 2.2.3 Galvanizing: hot dipped with zinc coating to CSA G164, ASTM A123 or ASTM A385.
 - .1 Bolts, nuts, washers, iron, and steel hardware components shall be galvanized in accordance with CSA G164 or ASTM A153.
 - .2 Galvanized coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips: Galvanized after all welding and grinding complete. No welding or grinding of galvanized products allowed.
 - 2.2.4 Zinc Rich Primer: zinc rich, organic, ready mix to CAN/CGSB 1.181. Low VOC type.
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3. EXECUTION**3.1 Fabrication**

- 3.1.1 Fabricate to reviewed shop drawings and in general to details, sizes and materials indicated on Contract Drawings and specified herein.
- 3.1.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- 3.1.3 Fabricate work complete with all components required for anchoring; bolting or welding to structural frame; standing free or resting in frames or sockets; in a safe and sure manner.
- 3.1.4 Where possible fit and shop assemble various sections of the work and deliver to site in largest practicable sections. Where shop fabricating is not possible, make trial assembly in shop.
- 3.1.5 Ensure exposed welds are continuous for length of each joint.
- 3.1.6 Grind and fill all welds after inspection and acceptance and leave ready for prime painting.
- 3.1.7 Fill all open joints, depressions, seams with metallic paste filler or by continuous brazing or welding and grind smooth to true sharp arises and profiles.
- 3.1.8 Fit joints and intersecting members accurately. Make work in true planes with adequate fastenings.
- 3.1.9 Supply all fastenings, anchors, accessories required for fabrication and erection of work of this Section. Make thread dimensions such that nuts and bolts will fit without re-threading or chasing threads.
- 3.1.10 Welding shall be done by the shielded metal-arc method in accordance with the requirements CSA W59. The welding operators shall be currently certified under CSA W47.1 for the work they are performing.
- 3.1.11 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.
- 3.1.12 Surfaces to be welded shall be free from loose scale, rust, paint, or other foreign matter. Where weld material is deposited in two or more layers, each layer shall be cleaned before the next layer is deposited. Care shall be taken to minimize stresses due to heat expansion, contraction and distortion by using proper sequence in welding and by approved methods.
- 3.1.13 Appearance, quality of welds made, methods of correcting defective work shall be in accordance with CSA W59.

3.2 Shop Painting**3.2.1 Cleaning Steel:**

- .1 Clean steel, whether it is to be painted or not, to the degree required by CISC/CPMA 1-73a, except as specified below.
 - .2 Prepare galvanized items scheduled to be painted in accordance with the requirements of Section 09 91 23, and ASTM D6386.
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- .3 Steel to receive a shop or field paint finish shall be cleaned in accordance with Sections 09 91 23 – Interior Painting or SSPC SP6, whichever produces a surface which has less rust and mill scale.
 - .4 Clean steel which is specified to be painted to CISC/CPMA 2-75 in accordance with that Standard.
 - .5 Clean steel which is specified to receive an organic zinc-filled epoxy primer, or zinc-rich paint, or inorganic zinc primer, in accordance with SSPC-SP 6, Commercial Blast Cleaning.
 - .6 Clean welds by wire brushing and wash down with clean water, to remove the chemical residues left by the electrodes, prior to painting.
- 3.2.2 The following surfaces shall not be painted:
- .1 Surfaces and edges to be field welded. If painted, remove paint for field welding for a distance of at least 50mm on all sides of the joint, to ensure proper fusion of the metal.
 - .2 The contact surfaces of friction type connections assembled by high strength bolts.
 - .3 Portions of steel members which are to be encased in or in contact with concrete or masonry.
 - .4 Galvanized items not specifically indicated to be painted.
- 3.2.3 Preparation and priming of all metal work which will be exposed to view and which is scheduled to be finish painted, shall be in accordance with the requirements of Section 09 91 23 – Interior Painting.
- 3.2.4 All other concealed or unpainted ferrous metal work shall be given one prime paint coat type CGSB 1.40 and in accordance with CISC/CPMA 2-75. Work paint into all corners and all joints. Metal parts in contact shall be primed before shop assembly. Priming damaged during erection or through lack of protection shall be cleaned and touched up.
- 3.2.5 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 ° C.
- 3.2.6 Metals in contact with other dissimilar metals, concrete or masonry materials shall be insulated or separated from one another to prevent corrosion, staining or electrolysis by use of bituminous paint.
- 3.3 **Galvanizing**
- 3.3.1 Steel members, fabrications, and assemblies shall be galvanized after fabrication by the hot dip process in accordance with CSA G164 or ASTM A123.
 - 3.3.2 Galvanizing of architecturally exposed steel shall be completed by a company recognized in the application of High Quality galvanized finishes and in accordance with ASTM A385.
 - 3.3.3 Prepare metals to be galvanized and painted in accordance with requirements of ASTM D6386.
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- 3.3.4 Bolts, nuts, washers, iron, and steel hardware components shall be galvanized in accordance with CSA G164 or ASTM A153.
 - 3.3.5 Coating Requirements:
 - .1 Weight: the weight of the galvanized coating shall conform to Table 1 of CSA G164, ASTM A123 or ASTM A153 (as appropriate).
 - .2 Surface Finish: The galvanized coating shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect that is detrimental to the stated end use of the coated article. The integrity of the coating shall be determined by visual inspection and coating thickness measurements.
 - .3 Adhesion: the galvanized coating shall be sufficiently adherent to withstand normal handling.
 - 3.4 **Miscellaneous Framing and Supports**
 - 3.4.1 General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
 - 3.4.2 Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - .1 Furnish inserts for units installed after concrete is placed.
 - 3.4.3 Galvanize miscellaneous framing and supports where indicated.
 - 3.4.4 Prime miscellaneous framing and supports with primer specified in Section 09 91 23 - Interior Painting.
 - 3.5 **Angle Lintels**
 - 3.5.1 Provide all loose steel angle lintels required to support openings and recesses in masonry walls, whether indicated on the Contract Drawings or not. Refer to Architectural, Structural and Mechanical Contract Drawings for locations of openings. Lintels shall be as scheduled on the Structural Contract Drawings.
 - 3.5.2 Steel angles: CSA G40.21, Grade 300W, sizes indicated for openings. Provide 150 mm minimum bearing at ends unless otherwise indicated.
 - 3.5.3 Weld or bolt back-to-back angles to profiles as indicated.
 - 3.5.4 Lintels shall be prime painted unless otherwise indicated.
 - 3.6 **Ladders**
 - 3.6.1 Conform to Ministry of Labour and Ontario Building Code requirements where applicable.
 - 3.6.2 Unless otherwise detailed, construct ladders as follows:
 - .1 Stringers shall be minimum 19 x 38 mm steel bar extending from 150 mm above floor or roof, to minimum 1220 mm above top rung.
 - .2 Rungs shall be 19 mm solid steel bars with non-slip finish, 400 mm long, spaced at 300 mm o.c. vertically and welded to stringers.
 - .3 Attach stringers to walls with 10 mm x 38 mm steel bar yokes, U-shaped, spaced at maximum 1220 mm o.c. vertically. Locate centre
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- line of rungs not less than 150 mm from face of walls.
- .4 Provide safety cages to Ministry of Labour standard details and as indicated.
 - .5 Where indicated, provide horizontal and vertical returns or stringers.
 - .6 Ladder access platform shall be steel grating type
 - .7 Rungs shall have non-slip finish.
 - .8 Exterior ladders shall be galvanized.
- 3.7 **Miscellaneous Steel Trim**
- 3.7.1 Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
 - 3.7.2 Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - .1 Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
 - 3.7.3 Galvanize exterior miscellaneous steel trim.
- 3.8 **Steel Weld Plates and Angles**
- 3.8.1 Provide steel weld plates and angles not specified in other Sections, for items supported from concrete or masonry construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete or masonry.
- 3.9 **Installation**
- 3.9.1 Supervise the setting of bases, anchor bolts, and other steel to concrete connections. Cutting of base plates to accommodate anchor bolts is cause for rejection of base plates.
 - 3.9.2 Provide all bracing and shoring required to support the work of this Section during installation.
 - 3.9.3 Work shall be fabricated and erected square, plumb and true, straight, level and accurately fitted to size detailed on reviewed shop drawings. All joints shall be welded unless otherwise indicated. Exposed welds shall be ground smooth and/or flush. Exposed work shall be finished smooth and even, close joints and neat connections. Exposed welds continuous for full length of joints.
 - 3.9.4 Where anchors or fastenings, sleeves, have to be built in by other trades, supply all necessary templates, instructions and supervision to ensure satisfactory installation.
 - 3.9.5 Do all drilling, cutting and fitting necessary to attach this work to adjoining work and make it complete.
 - 3.9.6 Provide all components required for anchoring. Make anchoring in concealed manner where possible. Exposed anchors shall be approved by the Consultant, shall be neat, and of the same material, colour, texture and
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finish of base metal on which they occur. Exposed fastenings shall be evenly spaced.

- 3.9.7 Grind all field welds smooth.
- 3.9.8 Touch up shop coat of prime paint where damaged by field erection.
- 3.9.9 Touch up galvanized finishes with zinc rich paint.

3.10 Fasteners and Anchors

- 3.10.1 Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
- 3.10.2 Securely anchor components in place. Unless otherwise indicated, anchor components as follows:
 - .1 To concrete and solid masonry with expansion or epoxy adhesive type anchors.
 - .2 To hollow construction with toggle bolts.
 - .3 To thin metal with screws or bolts.
 - .4 To thick metal with bolts or by welding.
 - .5 Fill space between railing members and sleeves with non-shrink grout.
- 3.10.3 Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
- 3.10.4 Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
- 3.10.5 Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
- 3.10.6 Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

3.11 Schedule

- 3.11.1 General:
 - .1 Supply and install all metal fabrications indicated on Contract Drawings, and not included in the work of other Sections.
 - .2 Coordinate and sequence the work to ensure timely delivery to the site of all items to be built in.
 - .3 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.
 - .4 All items shall be of sizes and as detailed on Contract Drawings.
 - .5 Coordinate with Section 09 91 23 for preparation of exposed metal items required to have finish coatings applied in the field.
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- .6 Review all coordination drawings prior to installation of materials, to ensure that no interferences with the work of other Sections will occur.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 06, Section 06 10 00, Rough Carpentry**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install rough carpentry work as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|----------------------------------|
| 1.3.1 | Section 03 10 00 | Concrete Forming and Accessories |
| 1.3.2 | Section 03 30 00 | Cast-In-Place Concrete |
| 1.3.3 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.4 | Section 05 50 00 | Metal Fabrications |
| 1.3.5 | Section 06 20 00 | Finish Carpentry |
| 1.3.6 | Section 07 21 13 | Building Insulation |
| 1.3.7 | Section 07 26 00 | Vapour Retarders |
| 1.3.8 | Section 07 54 19 | Polyvinyl Chloride Roofing |
| 1.3.9 | Section 08 11 14 | Metal Doors and Frames |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM A123/A123M-17 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .2 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .3 ASTM D2559 - 12a(2018) Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions
- .4 ASTM F1667-21a Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

1.4.2 CSA Group (CSA)

- .1 CSA A247- M86 (R1996) Insulating Fiberboard.
 - .2 CSA B111-1974(R2003) Wire Nails, Spikes and Staples.
 - .3 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .4 CSA O80 SERIES-15 Wood Preservation
 - .5 CSA O86-14 Engineering Design in Wood
 - .6 CSA O121-17 Douglas Fir Plywood.
 - .7 CSA O141:23 Canadian Standard Lumber.
 - .8 CSA O151-17 Canadian Softwood Plywood
 - .9 CSA O437 Series-93 (R2011) Standards on OSB and Waferboard
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- .10 CSA Z809-08 Sustainable Forest Management
- 1.4.3 Underwriters Laboratories Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- 1.4.4 National Lumber Grading Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber, Latest Edition.
- 1.4.5 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004 FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004 Structure and Content of Forest Stewardship Standards V2-1
 - .3 FSC Accredited Certified Bodies.
- 1.5 **Submittals**
 - 1.5.1 Certified Wood: Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.
- 1.6 **Quality Assurance**
 - 1.6.1 Sawn lumber shall be identified by the grade stamp of an association or independent grading agency certified by the Canadian Lumber Standards Accreditation Board.
- 1.7 **Shipping, Handling and Storage**
 - 1.7.1 Protect materials, under cover, both in transit and on the site.
 - 1.7.2 Store materials to prevent deterioration or the loss or impairment of their structural and other essential properties. Do not store materials in areas subject to high humidity and areas where masonry and concrete work are not completely dried out.
 - 1.7.3 Store sheathing materials level and flat, in a dry location. Protect panel edges from moisture at all times.
- 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Timber Material shall be 'Grade Stamped'.
 - 2.1.2 CSA Z809 or FSC Certified.
 - 2.1.3 Construction Lumber: To CSA O141 Softwood Lumber graded to NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. All lumber shall bear grade stamps. Moisture content of softwood lumber not to exceed 19% at time of installation.
 - .1 Framing lumber, plates, furring, blocking, No. 1 SPF.
 - .2 Nailing strips, furring and strapping: No. 4 S-P-F.

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- .3 Fitment framing: No. 1 S-P-F.
- 2.1.4 Canadian Softwood Plywood: to CSA O151-M, standard construction, good one or both sides as required, thickness as shown or specified.
 - .1 Douglas Fir Plywood: To CSA O121-M, standard construction, good one side, thickness as shown on the Contract Drawings.
 - .2 Plywood used for exposed interior work shall have select grade veneer, one or both faces where exposed, with fire retardant finish. Fire retardant shall be in accordance with CAN/CSA-080.1, and all treated materials shall bear a ULC approval stamp.
- 2.1.5 Nails, Spikes and Staples: To ASTM F1667.
- 2.1.6 Bolts: 12.5mm diameter, galvanized, complete with nuts and washers.
- 2.1.7 Proprietary Fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.
- 2.1.8 Wood Preservative to CSA O80 SERIES.
- 2.1.9 Adhesive: Contractors gun grade cartridge loaded wood adhesive, general purpose, to ASTM D2559.
- 2.1.10 Galvanizing: to CSA-G164. Use galvanized fasteners, and hardware for exterior work, preservative treated lumber, and materials in contact with concrete or masonry.

3. EXECUTION**3.1 Installation**

- 3.1.1 Workmanship
 - .1 Execute work using skilled mechanics according to best practice, as specified here.
 - .2 Lay out work carefully and to accommodate work of other trades.
 - .3 Accurately cut and fit; erect in proper position true to dimensions; align, level, square, plumb, adequately brace, and secure permanently in place. Join work only over solid backing.
 - 3.1.2 Rough Hardware: Include rough hardware such as nails, bolts, nuts, washers, screws, clips, hangers, connectors, strap iron, and operating hardware for temporary enclosures.
 - 3.1.3 Provide treated_wood nailers, blocking, cants, grounds, furring and similar members where shown and where required for screeding or attachment of other work and surface applied items. Attach to substrate as required to support applied loading.
 - 3.1.4 Electrical Equipment Backboard: provide backboards for mounting electrical equipment as indicated. Use 19mm thick fir face veneer fire retardant softwood plywood on 19 x 38mm furring around perimeter and at maximum of 305mm intermediate spacing.
 - .1 Install plywood backboards with countersunk screws.
 - 3.1.5 Wallboard assemblies or similar assemblies shall be adequately supported.
 - .1 Provide solid wood blocking in all partitions where wall stops are
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- specified in the hardware schedule.
- 3.1.6 Roof Blocking, Curbs and Copings:
- .1 Provide and install framing, blocking, curbs and copings as indicated on the Contract Drawings. Anchor blocking securely in permanent manner.
 - .2 Provide minimum 10mm Douglas Fir plywood copings on all built-up wood copings and curbs as detailed.
 - .3 All wood curbs shall be filled with fibrous insulation specified in Section 07 21 13.
 - .4 Provide shims and blocking necessary for levelling of equipment curbs.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 06, Section 06 20 00, Finish Carpentry**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install finished carpentry work as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------|
| 1.3.1 | Section 06 10 00 | Rough Carpentry |
| 1.3.2 | Section 06 40 00 | Architectural Woodwork |
| 1.3.3 | Section 07 92 10 | Joint Sealing |
| 1.3.4 | Section 08 11 00 | Metal Doors and Frames |
| 1.3.5 | Section 08 71 10 | Door Hardware |
| 1.3.6 | Section 09 21 16 | Gypsum Board Assemblies |
| 1.3.7 | Section 09 91 23 | Interior Painting |

1.4 References

- 1.4.1 ASTM International (ASTM)
- .1 ASTM E1333-22 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
 - .2 ASTM F1667-21a Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- 1.4.2 American National Standards Institute (ANSI)
- .1 ANSI A208.1-2009 Particleboard.
 - .2 ANSI/NEMA LD 3-2005 High Pressure Decorative Laminates
- 1.4.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards Illustrated.
- 1.4.4 Canadian Plywood Association (CanPly)
- .1 The Plywood Handbook 2005.
- 1.4.5 CSA Group (CSA)
- .1 CSA B111-1974 (R2003) Wire Nails, Spikes and Staples.
 - .2 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O112 SERIES-M1977 (R2006) Standards for Wood Adhesives
 - .4 CSA O141:23 Canadian Standard Lumber.
 - .5 CSA O151-17 (R2022) Canadian Softwood Plywood
 - ..6 CSA Z760-94 (R2001) Life Cycle Assessment
- 1.4.6 Forest Stewardship Council (FSC)
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PROJECT 22701****Appendix 8.2, Division 06, Section 06 20 00, Finish Carpentry**

- .1 FSC-STD-01-001-V4-0 FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1
 - .3 FSC Accredited Certified Bodies.
 - 1.4.7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2005.
 - 1.4.8 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1168-03 Adhesives and Sealants Applications
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit shop drawings.
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .2 Indicate materials, thicknesses, finishes and hardware.
 - 1.5.3 Submit samples of plastic laminate materials.
 - 1.6 **Quality Assurance**
 - 1.6.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
 - 1.6.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.
 - 1.6.3 Wood materials certified by Forestry Stewardship Council.
 - 1.7 **Shipping, Handling and Storage**
 - 1.7.1 Protect materials against dampness during and after delivery.
 - 1.7.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.
 - 2. **PRODUCTS**
 - 2.1 **Lumber Materials**
 - 2.1.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom premium grade, moisture content as specified.
 - .4 Machine stress-rated lumber is acceptable.
 - 2.2 **Panel Materials**
 - 2.2.1 Canadian Softwood Plywood (CSP): to CSA O151, standard construction.
 - .1 Forestry Stewardship Council (FSC) certified.
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- .2 Urea-formaldehyde free.
- 2.2.2 Medium density fiberboard: to ANSI A208.2, density 640-800 kg/m³.
 - .1 Forestry Stewardship Council (FSC) certified.
 - .2 Urea-formaldehyde free.

2.3 Plastic Laminate

- 2.3.1 Plastic laminate facing sheet: ANSI/NEMA LD 3-2005 High-Pressure Decorative Laminates (HPDL) PF-S and GP-S;
 - .1 Backing sheet: BK Grade by manufacturer of facing sheet.
 - .2 Core: CSA O151
 - .3 Laminating adhesive: CSA O112.
 - .4 Core sealer: clear water resistant synthetic resin sealer.
 - .5 Colours, pattern, gloss and texture will be selected by Agency from full range of products by one of the following:
 - .1 Formica,
 - .2 Arborite,
 - .3 Nevamar
 - .4 Wilsonart.
 - .5 Or Agency approved equivalent.
 - .6 Up to three colours and patterns will be selected by the Agency.

2.4 Accessories

- 2.4.1 Rough Hardware: Bolts, lag screws, anchors, nails and expansion shields required to secure this portion of work. Rough hardware hot dip galvanized conforming to latest edition of CSA G164. All fasteners used in damp or wet areas to be suitable for use in corrosive environment. Use hot dipped galvanized or other material approved by the Agency.
- 2.4.2 Nails and staples: to ASTM F1667 galvanized.
- 2.4.3 Wood screws: to CSA B35.4 plain type and size to suit application.
- 2.4.4 Stainless Steel hardware: Type 316 Stainless steel for exposed or wet locations, tamper proof.
- 2.4.5 Splines: wood or metal to suit application.
- 2.4.6 Adhesive: recommended by manufacturer, waterproof type, maximum VOC limit 30 g/L SCAQMD Rule 1168 - Adhesives and Sealants Applications.

3. EXECUTION**3.1 Construction**

- 3.1.1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by
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- manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- 3.1.2 Interior and exterior frames: Set frames with plumb sides, level heads and sills, and secure.
- 3.2 **Fabrication**
- 3.2.1 General:
- .1 Field measure all dimensions.
 - .2 Fabricate all finish carpentry items to AWMAC premium grade, and in accordance with the reviewed shop drawings.
 - .3 Set nails and screws, apply stained plain wood filler to indentations, sand smooth and leave ready to receive finish.
 - .4 Provide 10mm thick solid matching wood strip on plywood and particle board edges 13mm or thicker, exposed in final assembly.
 - .5 Ease edges of solid lumber components to 1.6mm radius.
- 3.2.2 Plastic Laminate Components
- .1 Fabricate plastic laminate window stools as detailed. Stools shall be minimum 19mm thick plastic laminate plywood, with edge banding on all exposed faces. Fabricate in one piece, without joints, wherever as possible. Where necessary, joints shall be centered on window mullions and tightly butted together with concealed splines.
 - .2 Unless otherwise specified herein, comply with requirements of ANSI/NEMA LD 3 Annex 'A'.
 - .3 Assembly: Bond plastic laminate to core with adhesive, under pressure.
 - .4 Core: unless otherwise indicated: 19mm thick.
 - .5 Balanced construction: plastic laminate covered components shall be of balanced construction, with plastic laminate on both faces of core. Seal core edges not covered with plastic laminate.
 - .6 Use largest practicable plastic laminate sheet size.
 - .7 Provide joints symmetrically; provide joints as corners and at changes in superficial areas; provide concealed draw bolt anchors and joints. All butt joints shall have a blind spine.
- 3.3 **Installation**
- 3.3.1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- 3.3.2 All fastenings shall be concealed.
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- 3.3.3 Provide heavy duty grounds as necessary for secure installation of finish carpentry work.
 - 3.3.4 All wood surfaces shall be sanded smooth, ready to receive finish.
 - 3.3.5 Scribe and cut as required, fit to abutting walls and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
 - 3.3.6 Form joints to conceal shrinkage.
 - 3.3.7 Set and secure materials and components in place, rigid plumb and square.
 - 3.3.8 Design and select fasteners to suit the size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - 3.3.9 Set finishing nails to receive filler. Where screws are used to secure members, countersink screws in round, cleanly cut hole and plug with wood plug to match material being secured.
 - 3.3.10 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
 - 3.3.11 Install window stools with wood levelling shims, after installation of windows and interior finishing is complete. Screw levelling shims to metal stud framing with self-tapping sheet metal screws. Bond stools to shims with waterproof adhesive. Tightly butt all joints and bond together with adhesive and concealed splines. Cut to fit tight to all penetrations.
 - 3.3.12 Apply mildew resistant sealant to perimeter of all window stools as specified in Section 07 92 00 – Joint Sealing.
- 3.4 **Door Installation**
- 3.4.1 Install doors in accordance with instructions in Section 08 11 00 – Metal Doors and Frames and manufacturer’s printed instructions.
- 3.5 **Finish Hardware Installation**
- 3.5.1 Finish hardware will be supplied for installation under this Section.
 - 3.5.2 Prepare doors and frames in accordance with manufacturer’s instructions and templates. Install finish hardware complete in all respects, hang doors and make adjustments necessary.
 - 3.5.3 Doors shall swing freely.
 - 3.5.4 Where indicated on door schedules or Contract Drawings, under-cut doors.
- 3.6 **Miscellaneous**
- 3.6.1 Install Toilet and Bath Accessories as specified in Section 10 28 10 – Toilet and Bath Accessories, including all accessories.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install architectural woodwork as indicated on the Contract Drawings and Specified in this Section of the Specification.

1.3 Related Sections

- 1.3.1 Section 06 10 00 Rough Carpentry
- 1.3.2 Section 06 20 00 Finish Carpentry
- 1.3.3 Section 06 61 16 Solid Surfacing
- 1.3.4 Section 07 92 00 Joint Sealing
- 1.3.5 Section 09 21 16 Gypsum Board Assemblies

1.4 References

- 1.4.1 ASTM International (ASTM)
 - .1 ASTM F1667/F1667M-21a Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- 1.4.2 Architectural Woodwork Manufacturer's Association of Canada (AWMAC)
 - .1 Architectural Woodwork Standards Manual
- 1.4.3 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009 Particleboard
 - .2 ANSI/NPA A208.2-2009 Medium Density Fiberboard (MDF)
 - .3 ANSI/NEMA LD 3-2005 High-Pressure Decorative Laminates (HPDL)
 - .4 ANSI/HPVA HP-1-2009 Standard for Hardwood and Decorative Plywood
- 1.4.4 CSA Group (CSA)
 - .1 CSA O112 SERIES-M1977 (R2006) Wood Adhesives
 - .2 CSA O121-08 (R2013) Douglas Fir Plywood
 - .3 CSA O151-17 (R2022) Canadian Softwood Plywood
 - .4 CSA O153:19 Poplar Plywood
 - .5 CSA Z809-08 Sustainable Forest Management
- 1.4.5 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004 FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004 Structure and Content of Forest Stewardship Standards V2-1
 - .3 FSC Accredited Certified Bodies.

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- 1.5 **Submittals**
- 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- 1.5.2 Submit shop drawings conforming to AWMAC's STANDARDS (NAAWS).
- .1 Show proposed assembly, connections, anchorage, materials, dimensions, thickness, and finishes.
- .2 On casework and countertop elevations show location of backing required for attachment within walls.
- 1.5.3 Samples:
- .1 Submit full range of manufacturer's standard plastic laminates for selection by the Agency.
- .2 Submit sample of each type of cabinet hardware component used.
- 1.6 **Quality Assurance**
- 1.6.1 Unless otherwise specified, carry out finish carpentry work in accordance with the requirements of "Millwork Standards" (latest issue) of Architectural Woodwork Manufacturers' Association of Canada (AWMAC), Custom Grade.
- 1.6.2 Woodwork Manufacturer Qualifications:
Minimum 5 years of production experience similar to this project, whose qualifications indicate ability to comply with requirements of this Section.
- 1.6.3 Preinstallation Conference:
- .1 Before framing is completed hold a meeting with the Contractor, casework manufacturer, casework installer, and framing sub-contractor.
- .2 Review locations of backing required for casework installation as shown on casework shop drawings.
- .3 Review method of attachment for backing to wall system as shown on Contract Drawings.
- 1.7 **Definition**
- 1.7.1 "Exposed" when referred to in this Section, shall mean all parts which can be viewed and shall include interiors of cabinets, backs of doors, shelving and gables.
- 1.8 **Shipping, Handling and Storage**
- 1.8.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.8.2 Protect against damage, including damage by excessive changes in moisture content, during delivery and storage. Maintain minimum storage temperature of 16 ° C, and relative humidity of 25% to 55%.
- 1.8.3 Cover plastic laminate faces at shop with heavy Kraft paper.
- 1.8.4 Do not deliver finish carpentry components to site before all wet trades are completed, the building is closed in and humidity conditions on site are acceptable. Do not deliver during rain or damp weather.
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1.8.5 Store materials on site in such a way as to prevent deterioration or loss or impairment of essential properties. Prevent excessive moisture gain of materials.

1.9 **Protection**

1.9.1 Provide coverings as necessary to protect finish carpentry components from damage of any kind during storage and after installation.

2. **PRODUCTS**

2.1 **Materials**

2.1.1 All materials CSA Z809 or FSC Certified.

2.1.2 Solid Wood:

- .1 Unless otherwise indicated, provide AWMAC Custom Grade.
- .2 All wood materials shall be new, straight and clean, free of sap, knots, pitch, and other defects, except as permitted by applicable grading rules.
- .3 All wood shall be kiln dried to a maximum moisture content of 7%.
- .4 Softwood: to CSA O141, dressed all sides used in concealed locations.

2.1.3 Plywood:

- .1 Soft Plywood: to CSA O151-M Standard Grade, solid two sides.
- .3 Use in concealed locations only, except as indicated.

2.1.4 Particleboard: Meeting requirements of AWMAC's STANDARDS (NAAWS). To ANSI A208.1 , minimum density of 720kg/m3 Grade "R".

2.1.5 MDF: Medium Density Fiberboard meeting requirements of AWMAC's STANDARDS (NAAWS).

2.1.6 Edgeband

- .1 For plastic laminate casework: High Pressure Decorative Laminate (HPDL).

2.1.8 Plastic laminate facing sheet: ANSI/NEMA LD 3 High-Pressure Decorative Laminates (HPDL) PF-S and GP-S;

- .1 Backing sheet: BK Grade by manufacturer of facing sheet.
- .2 Core: CAN3-0188.1M, Grade R.
- .3 Laminating adhesive: CAN3-O112 Series M.
- .4 Core sealer: clear water resistant synthetic resin sealer.
- .5 Colours, pattern, gloss and texture will be selected by Consultant/Agency from full range of products by one of the following:
 - .1 Formica,
 - .2 Arborite,
 - .3 Pionite,
 - .4 Nevamar
 - .5 Wilsonart.
 - .6 Or Agency approved equal.

2.1.9 Melamine Overlaid Panels:

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- .1 Melamine overlay, heat and pressure laminated with phenolic resin to 12.7mm thick particle board.
 - .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain balancing sheet.
 - .3 Furniture finish: solid colour as selected by the Agency.
 - .4 Edge Finishing: matching melamine and polyester overlay edge strip with self-adhesive.
- 2.1.10 Fasteners and Adhesive:
- .1 Nails and staples: ASTM F1667, galvanized, spiral head nails.
 - .2 Screws: Zinc, cadmium or chrome plated steel.
 - .3 Splines: wood or metal, to suit application.
 - .4 Adhesive: Type 1 waterproof. To CSA O112-M, type as appropriate for the intended application. Complying with ANSI/WDMA I.S-1 series. Contact bond not acceptable.
 - .5 Avoid the use of adhesives, preservatives, synthesizing agents and finish coatings that contain formaldehyde and high V.O.C. content.
- 2.1.11 Cabinet Hardware: Products listed are a standard of acceptance. Products by other manufacturers, of equal quality and similar appearance may also be accepted subject to review and approval by Agency.
- .1 Draw bolt fasteners: Knapé & Vogt KV 516
 - .2 Recessed Shelf Standard:
 - .1 Knapé & Vogt KV 255, Zinc, finish.
 - .2 Knapé & Vogt KV 256AL Series Aluminum Shelf Support Clip
 - .3 Hinges: Blum concealed hinges, 125° clip and 125° opening with self-closing spring. Soft close. Full or half overlay. Nickel plated steel.
 - .4 Cabinet Pulls: Richelieu D-Pull No: 30134-170, 96mm c.c. brushed stainless steel.
 - .5 Cabinet Locks: CCL 0737 pin tumbler MK & KA by room.
 - .6 Catches: Type optional with manufacturer.
 - .7 Drawer Slides: Knapé & Vogt 8450FM Soft-Close Full-Extension Drawer Slide
 - .8 Door and Drawer Bumpers: “Quietex” bumpers.
 - .9 Provide other hardware and hardware accessories as detailed or required.
 - .10 All exposed hardware to have Platinum (Mica) finish by Teknion or equivalent unless noted otherwise.
- 2.2 **Fabrication**
- 2.2.1 Materials and methods of construction to meet requirements of AWMAC's STANDARDS (NAAWS) for grade or grades specified.
- .1 If there is conflict between plans and/or specifications and
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AWMAC's STANDARDS (NAAWS), plans and specifications shall govern.

- 2.2.2 Wood Casework: AWMAC Custom Grade.
- 2.2.3 Construction Type: Frameless
- 2.2.4 Cabinet and door interface: Flush overlay.
- 2.2.5 Exposed joints and edges:
 - .1 Uniformly space exposed joints unless otherwise indicated.
 - .2 No edge grain shall be visible; mitre external corners, house internal fasteners. Glue mitred corners.
 - .3 All exposed edges of plywood and particle board shall have solid wood edging, pressure glued. AWMAC No. 3 edge.
 - .4 Ease edges of solid lumber components to 1.6mm radius.
- 2.2.5 Mechanical Fasteners:
 - .1 Inconspicuously locate mechanical fasteners. Wherever possible, conceal fastenings.
 - .2 Countersink nail heads.
 - .3 Where exposed to view, countersink screw and bolt heads and fill holes with matching wood plugs.
 - .4 Cutting and fitting: make cut-outs in work of this Section as required to accommodate work of other Sections.
 - .5 Make provisions in cabinetwork to accept built-in appliances, provided by others.

2.3 Plastic Laminate Casework

- 2.3.1 Construct cabinetwork components of plastic laminate faced particle board as indicated and in accordance with AWMAC Custom grade.
- 2.3.2 Tenon, dado, dowel, or rabbet interior construction with all parts well glued. Shoulder mitre all exposed corners. Open ends or skeleton frames against walls are not permitted. Unless otherwise permitted by Agency, use unitized construction system for all components.
- 2.3.3 Exposed Surfaces: High Pressure Decorative Laminate (HPDL), meeting requirements of AWMAC's Standards (NAAWS) for Grade specified.
- 2.3.4 Construct door and drawer fronts of 19 mm plastic laminate faced MDF.
- 2.3.5 Exposed interior surfaces: LPDL of a colour and pattern compatible with exposed surfaces.
- 2.3.6 Semi-exposed surfaces: LPDL
- 2.3.7 Rout gables for pilaster strips where adjustable shelving is required.
- 2.3.8 Construct shelving with edge moulding to match. Shelving to cabinetwork to be adjustable unless otherwise noted.
- 2.3.9 Apply moisture repellent sealer to concealed backs of cabinetwork.
- 2.3.10 Install cabinet hardware in accord with hardware manufacturer's directions. Unless otherwise indicated, provide each door with pull and with minimum two hinges. Provide locks where indicated.

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- 2.4 **Drawers**
 - 2.4.1 Sides: Particle board with melamine surfaces.
 - 2.4.2 Bottoms: MDF or hardboard with melamine surfaces
 - 2.4.3 Joinery: Meeting requirements of AWMAC's STANDARDS (NAAWS) for Grade specified.

 - 2.5 **Solid Surface Countertops**
 - 2.5.1 As specified in Section 06 61 16 – Solid Surfacing

 - 2.6 **Finishes**
 - 2.6.1 All exposed exterior surfaces: plastic laminate as indicated. Colours selected by the Agency.
 - 2.6.2 All exposed interior surfaces: melamine unless indicated otherwise.
 - 2.6.3 Cabinet and case backs unexposed to view shall be back primed with one coat of moisture repellent sealer.
 - 2.6.4 Apply finishes in accordance with the Architectural Woodwork Manufacturers Association of Canada (AWMAC) Manual.

 - 3. **EXECUTION**
 - 3.1 **Examination**
 - 3.1.1 Verify mechanical, electrical, plumbing, HVAC and other building components, affecting work in this Section are in place and ready.
 - 3.1.2 Verify HVAC controls and systems are operating properly.
 - 3.1.3 Verify adequacy of backing and support framing. Advise Contractor of areas and surfaces requiring further modifications for plumb, level, even or square fitting.

 - 3.2 **Installation**
 - 3.2.1 Install work in accordance with AWMAC Installation Manual, Custom Grade.
 - 3.2.2 Secure all work in place, square, plumb, and level.
 - 3.2.3 Accurately scribe and closely fit components to irregularities of adjacent surfaces.
 - 3.2.4 Accurately fit joints in true plane, locate joints overbearing or supporting surfaces.
 - 3.2.5 Countersink mechanical fasteners used at exposed and semi-exposed surfaces, excluding installation attachment screws and those securing cabinets end to end.
 - 3.2.6 Where permitted, nail with small headed finishing nails. Countersink nail heads with nail setter.
 - 3.2.7 Install plastic laminate components using concealed fastening devices.
 - 3.2.8 Where components are fastened with screws or bolts, countersink screw and bolt heads and provide wood plugs matching surrounding wood.
 - 3.2.9 Where cabinetwork abuts other building elements, provide wood trim matching cabinetwork except where otherwise detailed.
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- 3.2.10 Cut equipment cutouts shown on plans using templates provided.
 - .1 Radius internal corners at least 3 mm and chamfer edges.
 - .2 Where core edge is to remain exposed, cover with plastic laminate edging.
 - .3 Where core edge is to be concealed, seal with sealer.
- 3.2.11 Where access is required to valves and other mechanical and electrical components, located behind cabinetwork, provide removable plywood access panels of size required and secure with four brass screws.
- 3.2.12 Apply mildew resistant silicone sealant to perimeter of all countertops as specified in Section 07 92 00 – Joint Sealing.
- 3.3 **Adjustment**
 - 3.3.1 Adjust all moving and operating parts to function smoothly and correctly.
 - 3.3.2 Fill and retouch all nicks, chips and scratches. Replace all un-repairable damaged items.
 - 3.3.3 Replace damaged components which, in the opinion of the Consultant, cannot be satisfactorily repaired.
- 3.4 **Cleaning**
 - 3.4.1 Upon completion of installation, clean installed items of pencil and ink marks and broom clean the area of operation.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 06, Section 06 61 16, Solid Surfacing**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, product, equipment and services necessary to supply and install solid surface countertops as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 06 40 00 Architectural Woodwork
1.3.2 Section 07 92 00 Joint Sealing

1.4 References

1.4.1 ASTM International (ASTM).
.1 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials.
.2 CSA Group (CSA).
1.4.2 CSA O151-17 Canadian Softwood Plywood.
1.4.3 Architectural Woodwork Institute (AWI).
.1 AWI/AWMAC/WI's Architectural Woodwork Standards.
1.4.4 International Surface Fabricators Association (ISFA).
.1 ISFA 2-01 (2013) Classification and Standards for Solid Surfacing Material.
1.4.5 American National Standards Institute (ANSI).
.1 ANSI ICPA-SS-1 (2001) Performance Standard for Solid Surface Materials.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
1.5.2 Product Data: Include detailed specification of construction and fabrication, manufacturer's installation instructions, and manufacturer's detailed recommendations for handling, storage, installation, protection, and maintenance.
1.5.3 Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, terminations, and cutouts.
.1 Show locations and details of joints.
.2 Show direction of directional pattern, if any.
1.5.4 Samples:
.1 Full range of colours and patterns for initial selection by Agency.
.2 Samples of three colours, 76 x 76mm for final selection by Agency.

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- 1.5.5 Certificates: For the following certifications:
 - .1 United States Food and Drug Administration (FDA) compliance for food contact materials described in 21 CFR 174 to 21 CFR 190.
 - .2 ANSI/NSF 51 "food zone" and FDA "direct-food contact" compliant.
- 1.5.6 Provide maintenance data for solid surface material countertops for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.

1.6 Quality Assurance

- 1.6.1 Source Limitations: Obtain materials and products from single source.
- 1.6.2 Fabricator Qualifications: Certified solid surface fabricator/installer.
- 1.6.3 Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, including specific requirements indicated.
 - .1 Acceptable to or licensed by manufacturer.

1.7 Field Conditions

- 1.7.1 Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.
- 1.7.2 Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.8 Shipping, Handling and Storage

- 1.8.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.8.2 Handle in a manner to prevent breakage. Brace parts if necessary. Transport in the near vertical position with finished face toward finished face. Do not allow finished surfaces to rub during shipping and handling.
- 1.8.3 Store in racks in near vertical position. Prevent warpage and breakage. Store Inside away from direct exposure to sunlight.

1.9 Warranty

- 1.9.1 Furnish manufacturer's 10-year on-site labour and material warranty from the date of Ready-for-Takeover.

2. PRODUCTS**2.1 Manufacturer**

- 2.1.1 Manufacturer:
 - .1 Corian by DuPont.
 - .2 Or Agency approved equal

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2.2 Solid Surface Material

- 2.2.1 Composition Solid-Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1 and ISFA-2.
- 2.2.2 Panel thickness: 12.7mm.
- 2.2.3 Panel weight: 21.5kg/m².
- 2.2.4 Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - .1 Flame-Spread Index: 25 or less.
 - .2 Smoke-Developed Index: 50 or less.
 - .3 Flammability: To NFPA 101, Class A.
- 2.2.5 Pattern and Finish, COR-1: Corian, colour to be selected by the Agency from full range of manufacturer's standards.
- 2.2.6 Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

2.3 Accessories

- 2.3.1 Adhesive for Bonding to other products: as recommended by solid surface material manufacturer.
- 2.3.2 Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 – Joint Sealing.
- 2.3.3 Heat Reflecting Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- 2.3.4 Insulating Fabric: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 Fabrication

- 2.4.1 Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI Architectural Woodwork Standards.
 - 2.4.2 Grade: Premium.
 - 2.4.3 Configuration:
 - .1 Front: Pencil round edge 3.0mm radius.
 - .2 Backsplash and side splash: Pencil round edge 3.0mm radius.
 - 2.4.4 Countertops: 12.7mm thick, solid surface material with front edge built up with same material.
 - 2.4.5 Backsplashes: 12.7mm thick, solid surface material.
 - 2.4.6 Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 2.4.7 Fabricate with loose backsplashes and end splashes for field assembly.
 - 2.4.8 Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated on reviewed shop drawings.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 06, Section 06 61 16, Solid Surfacing**

- .1 Joint Locations: Not within 76mm of a cutout or cooktop, 25mm from inside corner for conventional seams, and not where countertop sections less than 900mm long would result, unless unavoidable.
- 2.4.9 Cutouts and Holes:
 - .1 Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - .1 Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop.
 - .2 Provide vertical edges, rounded to 10mm radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom.
 - 2.4.10 Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 2.4.11 Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

3. EXECUTION**3.1 Examination**

- 3.1.1 Examine substrates to receive solid surfacing. Identify conditions detrimental to proper or timely installation. Do not commence installation until conditions have been corrected.
- 3.1.2 Verify that substrates supporting solid surfacing are plumb, level, and flat to within 3.0mm/3.0 meters.

3.2 Preparation

- 3.2.1 Precondition solid surfacing in accordance with manufacturer's printed instructions.

3.3 Installation

- 3.3.1 Install components plumb and level, in accordance with reviewed shop drawings, Project installation details, and manufacturer's printed instructions.
- 3.3.2 Joints between adjacent pieces of surfacing shall be flush, tight fitting, level, and neat. Securely join adjacent pieces with manufacturer's adhesive. Fill joints level to polished surface.
- 3.3.3 Install countertops level to a tolerance of 3mm in 2.4m, 6mm maximum. Do not exceed 0.4mm difference between planes of adjacent units.
- 3.3.4 Fasten countertops by adhering with 100-percent silicone material in dab format (not bead format) to base units into underside of countertop at 457 to 610mm o.c. Shim as needed to align subtops in a level plane.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 06, Section 06 61 16, Solid Surfacing**

- 3.3.5 Align adjacent surfaces and, using adhesive in colour to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- 3.3.6 Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- 3.3.7 Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- 3.3.8 Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- 3.3.9 Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- 3.3.10 Apply mildew resistant silicone sealant to perimeter of all countertops as specified in Section 07 92 00 – Joint Sealing.

3.4 Protection

- 3.4.1 Protect surfaces from damage until date of Substantial Performance. Replace damaged components that cannot be repaired to Consultant/Agency's satisfaction.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 13, Building Insulation**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Furnish all labour, materials, products, equipment and services necessary to supply and install building insulation as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|--------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 06 10 10 | Rough Carpentry |
| 1.3.3 | Section 07 21 19 | Foamed-in-Place Insulation |
| 1.3.4 | Section 07 26 00 | Vapour Retarders |
| 1.3.5 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.6 | Section 07 42 43 | Composite Wall Panels |
| 1.3.7 | Section 07 54 19 | Polyvinyl Chloride Roofing |
| 1.3.8 | Section 07 92 10 | Joint Sealing |
| 1.3.9 | Section 08 11 00 | Metal Doors and Frames |
| 1.3.10 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References

| | |
|-------|--|
| 1.4.1 | ASTM International (ASTM) |
| .1 | ASTM C423-23 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method |
| .2 | ASTM C518-21 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus |
| .3 | ASTM C578-22 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation |
| .4 | ASTM C612-14(2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation |
| .5 | ASTM C665-23 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing |
| .6 | ASTM C1620-16(2023) Standard Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants |
| .7 | ASTM D1621-16(2023) Standard Test Method for Compressive Properties of Rigid Cellular Plastics |
| .8 | ASTM D1623-17(2023) Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics |

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 13, Building Insulation**

- .9 ASTM E1677-19 Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls
 - .10 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials
 - 1.4.2 CSA Group (CSA)
 - .1 CSA B111-1974 (R2003) Wire Nails, Spikes and Staples
 - 1.4.3 Underwriters Laboratories Canada (ULC)
 - .1 ULC 701.1 Standard for Thermal Insulation, Polystyrene Boards
 - .2 ULC 702.1 Standard for Thermal Insulation Mineral Fibre for Buildings
 - .3 ULC 704 Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
 - 1.4.4 Canadian General Services Board (CGSB)
 - .1 CGSB 71-GP-24M Adhesive, Flexible, for Bonding to Cellular Polystyrene Insulation.
 - .2 CAN 2-51.32 Sheathing, Membrane, Breather Type.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit insulation manufacturer's product literature including specified physical properties for each type of insulation specified.
 - 1.5.3 Submit installation instructions.
 - 1.5.4 Submit certification that product complies with specification requirements and is suitable for the use indicated.
 - 1.6 **Environmental Requirements**
 - 1.6.1 Insulation shall not be produced with, or contain, any of the regulated CFC compounds listed in the Montreal Protocol of the United Nations Environmental Program.
 - 1.7 **Shipping, Handling and Storage**
 - 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.7.2 Deliver material to the site in the original unbroken packages bearing the name of manufacturer.
 - 1.7.3 Store materials in an approved manner at the site preceding application and protect from damage at all times.
 - 1.7.4 Remove damaged or deteriorated materials from site.
 - 1.8 **Warranty**
 - 1.8.1 Provide written warranty that the actual thermal resistance of the extruded polystyrene foam insulation will not vary by more than 10% from its published thermal resistance.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 13, Building Insulation**

- 1.8.2 Warranty period is 15 years on-site labour and material from the date of Ready-for-Takeover.

2. PRODUCTS**2.1 Board Insulation**

- 2.1.1 Rigid Insulation: Extruded polystyrene insulation to ULC 701.1 Type 3. Insulation shall have a minimum compressive strength of 170 KPa, RSI value of not less than 0.99/25mm and a moisture absorption rate of not more than 0.7% by volume. Insulation boards shall be 100mm thick or as detailed, 600 x 2400mm with butt edges.
- 2.1.2 Adhesives: As recommended by material manufacturer, compatible with insulation and substrate membrane, waterproof, conforming to CGSB 71-GP-24M.
- .1 Air-Bloc 21 by Monsey Bakor
 - .2 Shur Stik 99 by The GH Company
 - .3 PL Premium by LePage
 - .4 Or Agency approved equivalent.
- 2.1.3 Primer for concrete and masonry surfaces recommended by the adhesive manufacturer for the materials to be adhered.

2.2 Batt Insulation

- 2.2.1 Fibreglass friction fit batts or mineral fibre to CAN/ULC 702.1 Type 1 for wall application, width and thickness as shown on details:
- .1 Owens Corning ProPink Wall Insulation, unfaced.
 - .2 Owens Corning Thernmafiber Ultrabatt
 - .3 Roxul Batt Insulation.

2.3 Sprayed Insulation

- 2.3.1 Sprayed insulation for exterior wall assemblies is specified in Section 07 21 19 - Foamed-in-Place Insulation.

2.4 Acoustic Insulation

- 2.4.1 Acoustic insulation for gypsum board partitions is specified in Section 09 21 16 - Gypsum Board Assemblies

2.5 Spray Foam Insulation

- 2.5.1 Spray Foam Insulation: to ASTM C1620, one component expanding polyurethane or polyisocyanurate foam, ULC approved and compatible with rigid insulating materials, with Class 1 fire rating to ASTM E84 for window and door frame application:
- .1 Ultra Seal PF-100 Gun Foam by Nuco Inc.
 - .2 Handi-Foam by Fomo Products Inc.
 - .3 Pinkseal by Owens Corning.
 - .4 Hilti CF 812 Window and Door Pro.
 - .5 Or Agency approved equivalent.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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2.6 Accessories

- 2.6.1 Sealing Tape: minimum 65mm width, polypropylene sheathing tape with acrylic adhesive.
- 2.6.2 Rough Hardware: Nails and staples as required for installation of insulation and membrane materials, galvanized to CSA B111 and B34.
- 2.6.3 Mechanical Fastening: galvanized screw type fasteners with 25mm galvanized plate washers. Screws shall be 13mm longer than the combined thickness of the insulation and sheathing.
- 2.6.4 Vapour Retarder: As specified in Section 07 26 00 - Vapour Retarders.

3. EXECUTION**3.1 Installation – General**

- 3.1.1 Install insulation of types indicated, or, where not indicated, as appropriate, to provide a continuously un-interrupted building envelope in accordance with the requirements of the reference standards.
- 3.1.2 Install insulation after building substrate materials are dry.
- 3.1.3 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- 3.1.4 Fit insulation tightly around all structural angles, penetrations and other protrusions.
- 3.1.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly; offset vertical joints.
- 3.1.6 Insulation board materials shall be free from chipped or broken edges.
- 3.1.7 Sizes of materials shall be consistent with the module of the system.
- 3.1.8 Do not enclose or conceal insulation until it has been inspected by the Consultant..

3.2 Batt Insulation

- 3.2.1 Install insulation to maintain continuity of thermal protection to building elements and spaces. Ensure that insulation is kept dry and not compressed.
- 3.2.2 Install insulation in spaces as shown on Contract Drawings.
- 3.2.3 Insulation shall be placed in all metal stud and header assemblies that will be inaccessible after their installation into the wall. Refer to Section 05 41 00.
- 3.2.4 Install batt insulation in built up wood roof curbs where detailed.
- 3.2.5 Pack loose insulation in crevices between exterior masonry and door and window frames and about lintels, frames, beams around ducts at holes and other places where shown or required to eliminate air infiltration.
- 3.2.6 Pack loose insulation into voids around mechanical and electrical pipes and ducts where they pass through walls and slabs.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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Appendix 8.2, Division 07, Section 07 21 13, Building Insulation

3.3 **Spray Foam Insulation**

- 3.3.1 Completely fill all joints and penetrations in exterior walls, at door and window frames and where indicated, with expanding spray foam insulation, in accordance with manufacturer's instructions.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install sprayed insulation as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 07 21 13 | Building Insulation |
| 1.3.3 | Section 07 27 00 | Vapor Permeable Air Barriers |
| 1.3.4 | Section 07 42 43 | Composite Wall Panels |
| 1.3.5 | Section 07 46 13 | Preformed Metal Siding |
| 1.3.6 | Section 07 92 00 | Joint Sealing |
| 1.3.7 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM D1621-16 Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- .2 ASTM D1622-20 Standard Test Method for Apparent Density of Rigid Cellular Plastics
- .3 ASTM D1623-17 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
- .4 ASTM D2842-19 Standard Test Method for Water Absorption of Rigid Cellular Plastics
- .5 ASTM D6226-21 Standard Test Method for Open Cell Content of Rigid Cellular Plastics
- .6 ASTM E96/E96M-22ae1 Standard Test Methods for Water Vapor Transmission of Materials
- .7 ASTM E283-19 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- .8 ASTM E330/E330M-14(2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

1.4.2 Underwriters Laboratories of Canada (ULC)

- .1 ULC 102-18 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

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PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation**

- .2 ULC 705.1-15 Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Third Edition.
 - .3 ULC 705.2-05 Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application
 - .4 ULC 770-15 Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams
 - 1.4.3 Canadian Urethane Foam Contractors Association (CUFCA)
 - .1 Manual for Installers of Spray Polyurethane Foam Thermal Insulation.
 - .2 Quality Assurance Program.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Installer Qualifications: Submit proof confirming the installing contractor is licensed by the manufacturer’s quality and training program and certified to perform the installation of the product or system specified in accordance with ULC 705.2.
 - 1.5.3 Submit field quality control procedures to be utilized by the applicator to ensure proper preparation and installation of the materials specified
 - 1.5.4 Submit two 300 mm x 300 mm samples of finished product.
 - 1.5.5 Provide the CCMC Evaluation Report and the manufacturer’s documentation confirming material has been evaluated and conforms to the requirements of ULC 705.1.
 - 1.5.6 Manufacturer’s installation instructions: indicate preparation, installation requirements and techniques, product storage and handling criteria, and limitations of the material.
 - 1.5.7 When the spray polyurethane foam is the material in an air barrier assembly, submit documentation to confirm that the material meets the requirements of the CCMC’s Technical Guide for Air Barrier Materials.
 - 1.6 **Test Reports**
 - 1.6.1 Submit test reports, verifying qualities of insulation that meet or exceed requirements of this Specification.
 - 1.7 **Design Requirements**
 - 1.7.1 Provide materials which maintain continuity of thermal insulation and air barrier at building enclosure in conjunction with thermal and air barrier materials specified elsewhere.
 - 1.7.2 Finished RSI value or thickness of spray applied insulation shall be as indicated on the drawings.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation**

1.8 Qualifications

- 1.8.1 Contractor performing work under this section must be certified by the manufacturer and licensed under the SPF Quality Assurance Program (QAP) used by CUFCA (Canadian Urethane Foam Contractors Association or Caliber QAP).
- 1.8.2 Installers performing work under this Section must have at least 5 years of experience in the application of spray polyurethane foam insulations and must be licensed under the SPF Quality Assurance Program. Installers shall be trained by CUFCA/NECA (National Energy Conservation Association) and certified by PSDI in accordance with the training requirements outlined in ULC 705.2. Applicators shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.
- 1.8.3 Conduct on-site daily testing as required by the ULC 705.2 Installation Standard. The Licensed Installer shall complete the Daily Work Report as required by the ULC 705.2. Forward to the Agency copies of the Daily Work Record upon request. Submit copies of the Daily Work Records or a monthly summary sheet to the CUFCA office, on a monthly basis, as required by the SPF Quality Assurance Program used by CUFCA.

1.9 Quality Assurance

- 1.9.1 A pre-installation meeting shall be held prior to the commencement of spray operations to ensure isolation of the immediate spray area and non-interference with other trades.
- 1.9.2 Coordinate with other Sections in the preparation of mockups for each exterior wall system indicated.
 - .1 Locate mockups as directed by the Consultant.
 - .2 Mockups shall be minimum 1 m².
 - .3 Modify mockups as necessary for Consultant's approval. Mockups may remain in place as part of completed work after approval.
 - .4 Approved mockups shall represent standard for remainder of work.

1.10 Shipping, Handling and Storage

- 1.10.1 Deliver materials in original containers and packaged with labels. Containers shall be marked as required by ULC 705.1. The "use before" date shall be included on the drum label.
- 1.10.2 Material shall be stored in a safe manner as recommended by the manufacturer, as required by ULC 705.2. During cold weather, store raw materials in heated storage.

1.11 Environmental Requirements

- 1.11.1 Apply spray polyurethane foam when chemical, atmospheric and cavity/surface temperatures are within the limitations required by the ULC 705.2 and as recommended by the manufacturer.
-

SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA, PROJECT 22701

Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation

1.12 Protection

- 1.12.1 Ensure continuous ventilation of the work area, through a fresh air intake and the extraction of foul air, during the course of the application process and for a period of 24 hours following application.
- 1.12.2 Install temporary partitions in order to prevent any effect on the ambient air outside of the work area, from spray applied insulation material.
- 1.12.3 Ensure all structures are well protected, in accordance with the manufacturer's recommendations.
- 1.12.4 Protect all adjacent surfaces and equipment against any damage that may be caused by dispersion and overspray of insulation material beyond the prescribed limits.

1.13 Sequencing and Scheduling

- 1.13.1 Co-ordinate this work with the work of all Sections referencing this work.
- 1.13.2 All foam insulation closures and substrates shall be completed and secure before the work of this Section commences.

2. PRODUCTS

2.1 Closed Cell Spray Foam Insulation

- 2.1.1 Two-component, next generation HFO blown medium density spray-applied polyurethane foam meeting requirements of ULC S705.1. Product to be produced with a Global Warming CSFI 8/2020 9 Potential (GWP) of less than One and with an Ozone Depletion Potential (ODP) of Zero.

| PHYSICAL PROPERTIES | TEST PROCEDURE | UNITS | RESULT |
|---|----------------|--------------------|--------|
| R value/25mm | ASTM C518 | | 6.9 |
| Core Density (min.) | ASTM D1622 | Kg/m ³ | 32.03 |
| Compressive Strength (min.) | ASTM D1621 | KPa | 324 |
| Closed Cell Content | ASTM D2856 | % min | 90 |
| Water Vapour Transmission, Permeance @3.5" | ASTM E96 | | 0.23 |
| Air Impermeable (max) @ 1" | ASTM E2178 | L/s-m ² | 0.02 |
| Tensile Strength (min.) | ASTM D1623 | KPa | 413 |
| Dimensional Stability, 28 days, percent volume change (max) | ASTM D2126 | | 9 |
| Flame Spread | ASTM E84 | | <25 |
| Smoke Developed | ASTM E84 | | <450 |

2.1.2 Basis of Design Product:

- .1 Carlisle Sealtite Pro One Zero.

- 2.1.3 The sprayed polyurethane foam shall exceed the requirements of the CCMC Technical Guide for Air Barrier Systems, as outlined by the Institute
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation**

for Research in Construction - National Research Council of Canada (0.05 L/m². Indoor Humidity greater than 55%).

- 2.1.4 Primers: in accordance with manufacturer's recommendations if required for surface conditions.

2.2 **Equipment**

- 2.2.1 The equipment used to spray the polyurethane foam material shall be in accordance with ULC 705.2 and the equipment manufacturer's recommendations for specific type of application.
- 2.2.2 Equipment settings are to be recorded on the Daily Work Record as required by ULC 705.2.
- 2.2.3 Each proportioner unit to supply only one spray gun.

3. **EXECUTION**

3.1 **Inspection**

- 3.1.1 Verify that surfaces and conditions are suitable to accept work required in this Section.
- 3.1.2 Ensure that all work by other trades that may penetrates through the thermal insulation is in place and complete.
- 3.1.3 Report, in writing, defects in surfaces or conditions which may adversely affect the performance of products installed under this Section to the Consultant; prior to commencement of work.
- 3.1.4 Do not commence work until defects have been corrected.

3.2 **Protection**

- 3.2.1 Mask and cover adjacent areas to protect from over spray.
- 3.2.2 Apply primers for special conditions as required by foam manufacturer.
- 3.2.3 Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
- 3.2.4 Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
- 3.2.5 Clean work area prior to commencing spray operations.
- 3.2.6 Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spay area.
- 3.2.7 Mask and cover adjacent areas to protect from overspray.

3.3 **Surface Preparation**

- 3.3.1 Surfaces to receive sprayed polyurethane foam insulation shall be frost free and not coated with release agents or other deleterious substances. Commencement of work shall be deemed as acceptance of existing work and conditions.
- 3.3.2 Surfaces to receive sprayed polyurethane foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation**

- 3.3.3 Ensure that surface preparation and any primers required conform to the manufacturer's instructions.
 - 3.3.4 Apply air barrier membrane material to all transitions in accordance with Section 07 27 00 in the exterior walls and ensure all perimeter air seals at window and door openings are in place, prior to application of spray applied insulation.
- 3.4 **Application**
- 3.4.1 Spray-application of polyurethane foam shall be performed in accordance with ULC 705.2 and the manufacturer's instructions.
 - 3.4.2 Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and ULC 705.2.
 - 3.4.3 Use primer where recommended by the manufacturer.
 - 3.4.4 Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 15mm and not greater than 50mm.
 - 3.4.5 Do not install spray polyurethane foam within 75mm of heat emitting devices such as light fixtures.
 - 3.4.6 Remove masking materials and overspray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
 - 3.4.7 Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
 - 3.4.8 Install sealant at outside edges of transition membrane at vertical to horizontal membrane locations.
 - 3.4.9 Finished polyurethane foam shall be free of voids and embedded foreign materials and to minimum thicknesses shown or specified on Contract Drawings.
- 3.5 **Tolerance**
- 3.5.1 Maximum variation from required thickness: +6mm/-0 mm.
- 3.6 **Test and Inspections**
- 3.6.1 Conduct daily visual inspection, adhesion/cohesion testing and density measurements as outlined by ULC 705.2.
 - 3.6.2 Installed assembly will be tested and inspected for conformance with specifications by an independent inspection and testing company paid from the Cash Allowances.
- 3.7 **Protection**
- 3.7.1 The spray polyurethane foam shall be protected from ultraviolet as per manufacturer's requirements.
-

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PROJECT 22701**

Appendix 8.2, Division 07, Section 07 21 19, Foamed-in-Place Insulation

- 3.7.2 The spray polyurethane foam shall be covered with an appropriate thermal barrier meeting local building codes when installed on the interior of the building.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 26 00, Vapour Retarders**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 provide all labour, materials, products, equipment and services necessary to supply and install vapour retarders as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 06 10 10 | Rough Carpentry |
| 1.3.3 | Section 07 21 13 | Building Insulation |
| 1.3.4 | Section 07 21 19 | Foamed-in-Place Insulation |
| 1.3.5 | Section 07 92 00 | Joint Sealing |
| 1.3.6 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References

1.4.1 ASTM International (ASTM)

- .1 ASTM E96/E96M-22ae1 Standard Test Methods for Water Vapor Transmission of Materials
- .2 ASTM F1249-20 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.4.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.34 Vapour Barrier, Polyethylene Sheet, for Use in Building Construction

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Submit manufacturer's product data including certification that materials meet the requirements of the reference standards, and application instructions.

1.6 Project Conditions

1.6.1 Products specified are not intended for uses subject to abuse or permanent exposure to the elements.

1.7 Quality Assurance

1.7.1 Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapour

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retarder.

- 1.7.2 Obtain vapour retarder materials from a single manufacturer regularly engaged in manufacturing the product.
- 1.7.3 Provide products which comply with all federal, provincial and local regulations controlling use of volatile organic compounds (VOCs).

1.8 Shipping, Handling and Storage

- 1.8.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.8.2 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- 1.8.3 Store materials in a clean dry area in accordance with manufacturer's instructions. Stack membrane on smooth ground or wood platform to eliminate warping.
- 1.8.4 Protect materials during handling and application to prevent damage or contamination.
- 1.8.5 Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 220cm.

2. PRODUCTS**2.1 Sheet Vapour Barrier**

- 2.1.1 Polyethylene film: to CAN/CGSB-51.34, 0.15mm thick.
- 2.1.2 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50mm wide for all lap joints and perimeter seals.
- 2.1.3 Mastic: as recommended by membrane manufacturer and compatible with substrate.
- 2.1.4 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.
- 2.1.5 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

3. EXECUTION**3.1 Vapour Retarders in Walls**

- 3.1.1 Ensure services are installed and inspected prior to installation of vapour retarder.
 - 3.1.2 Use sheets of largest practical size to minimize joints. Install horizontally on wall surfaces.
 - 3.1.3 Adhere membrane to metal studs with continuous ribbons of mastic.
 - 3.1.4 Tape all joints.
 - 3.1.5 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
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- .2 Lap sheet over sealant and press into sealant bead.
- .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- 3.1.6 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate using sealant/adhesive.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150mm and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- 3.1.7 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour barrier.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.
- 3.1.8 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- 3.1.9 Refer to building elements schedule on the drawings and details for locations of vapour retarders.
- 3.2 **Inspection**
 - 3.2.1 Arrange for inspection of vapour retarders immediately prior to covering, by local building department and the Consultant.
 - 3.2.2 Make all required repairs identified during inspection.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install vapour permeable air barriers as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 06 10 10 | Rough Carpentry |
| 1.3.3 | Section 07 21 13 | Building Insulation |
| 1.3.4 | Section 07 42 43 | Composite Wall Panels |
| 1.3.5 | Section 07 46 13 | Preformed Metal Siding |
| 1.3.6 | Section 07 62 00 | Sheet Metal Flashing and Trim |
| 1.3.7 | Section 07 92 00 | Joint Sealing |
| 1.3.8 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM D882-18 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 - .2 ASTM D903-98(2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - .3 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials
 - .4 ASTM E96/E96M-22 Standard Test Methods for Water Vapor Transmission of Materials
 - .5 ASTM E283/E283M-19 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - .6 ASTM E330/E330M-14(2021) 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
 - .8 ASTM E1186-17 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
 - .9 ASTM E2178-21a Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building
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Materials

- .10 ASTM E2357-18 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
 - 1.4.2 National Air Barrier Association (NABA)
 - .1 National Air Barrier Association's (NABA) Quality Assurance Program (QAP)
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - 1.5.3 Submit manufacturer's complete set of standard details for air barriers.
 - 1.5.4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
 - 1.6 **Performance Requirements**
 - 1.6.1 Select and install wall components and assemblies to resist air leakage caused by static air pressure across exterior wall assemblies, including windows, glass, doors, and other interruptions to integrity of wall systems; to maximum air leakage rate of 0.01 L/s.m² when subjected to pressure differential of 75 Pa as measured in accordance with ASTM E330.
 - 1.6.2 Select and install wall components and assemblies to resist air leakage caused by dynamic air pressure across exterior wall assemblies, including windows, glass, doors and other interruptions to integrity of wall systems; to maximum air leakage rate of 0.013 L/s.m² when subjected to hourly wind design loads in accordance with NBC, using 1 in 10 year probability, as measured in accordance with ASTM E330.
 - 1.6.3 If ongoing testing is required throughout air barrier system installation, perform qualitative testing methods in accordance with ASTM E1186 and ASTM D4541.
 - 1.6.4 Provide continuity of air barrier materials and assemblies in conjunction with materials described in other Sections.
 - 1.7 **Quality Assurance**
 - 1.7.1 Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the National Air Barrier Association's (NABA) Quality Assurance Program.
 - 1.7.2 Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction and chemical/fire safety
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plans. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

- 1.7.3 Mock-Ups: Build mock-up representative of primary air barrier assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Consultant. Mock-up shall be dimensions no less than 2.5m long by 2.5m high and include the materials and accessories proposed for use in the exterior wall assembly.

1.8 **Sequencing**

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

1.9 **Shipping, Handling and Storage**

- 1.9.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

2. **PRODUCTS**

2.1 **Materials**

- 2.1.1 Materials: as required to achieve specified performance criteria; meeting specified reference standards and functionally compatible with adjacent materials and components.
- 2.1.2 Air barrier membrane components and accessories must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

2.2 **Membranes**

- 2.2.1 Primary Sheet-Applied, Vapour Permeable Water Resistive Air Barrier:
- .1 Self-adhered vapour permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface and patented permeable adhesive technology with split-back poly-release film; having the following typical minimum physical properties:
- .1 Thickness: 0.58mm (23 mils)
- .2 Water Vapour Permeance (ASTM E96): 1658 ng/Pa.m².s., (29 perms)
- .3 Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
- .4 Air Permeance (ASTM E2178): Pass
- .5 Nail Sealability (ASTM D1970): Pass
- .6 Dry Tensile Strength (ASTM D882):
- .1 41 lbf /182N MD
- .2 29 lbf /129N CD
- .1 Surface Burning Characteristics (ASTM E84):
- .1 Flame Spread: Class A
- .2 Smoke Development: Class A

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- 2.3 **Adhesive and Primers**
 - 2.3.1 As recommended by manufacturer.
 - 2.3.2 Low Application Temperature: -7 ° C.

 - 2.4 **Mastics & Termination Sealants**
 - 2.4.1 As recommended by manufacturer.

 - 3. **EXECUTION**
 - 3.1 **Manufacturer's Instructions**
 - 3.1.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

 - 3.2 **General**
 - 3.2.1 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

 - 3.3 **Examination**
 - 3.3.1 Examine all surfaces to ensure conformance to the manufacturer's recommended surface conditions.

 - 3.4 **Preparation**
 - 3.4.1 Prepare substrate surfaces in accordance with air barrier material manufacturer's instructions.
 - 3.4.2 All surfaces which are to receive flexible air barrier must be smooth, clean, dry, frost-free and in sound condition. All moisture, frost, grease, oils, loose mortar, dust, or other foreign materials which may impede the adhesion of the air barrier must be removed.
 - 3.4.3 Remove any and all sharp protrusions and repair any defects such as spalled or loose aggregate areas.
 - 3.4.4 Do not proceed with air barrier application until all substrate defects are repaired.

 - 3.5 **Installation**
 - 3.5.1 Install air barrier materials continuously over substrate in accordance with manufacturer's instructions. Partial application is not acceptable, and the insulation specified elsewhere is not intended to perform as the air barrier.
 - 3.5.2 Prime surfaces and apply membrane in strict accordance with manufacturer's printed directions.
 - 3.5.3 Primed surfaces not covered by air barrier membrane during the same working day must be reprimed.
 - 3.5.4 Apply membrane by heating the surface in contact with the substrate with
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- a trigger-activated propane torch, type as recommended by the manufacturer.
- 3.5.5 Cut sheet membrane into manageable sizes, position membrane for alignment prior to removing protective film.
- 3.5.6 Install membrane horizontally, in a shingle fashion starting at lowest point. Position membrane and remove protective film and press firmly into place. Ensure minimum 50mm overlap at all end and side laps. Promptly roll the membrane surface and all laps with a countertop roller to ensure proper surface bond and effect the seal.
- 3.5.7 Tie-in to window frames, door frames, roofing systems, cladding, and at the interface of dissimilar materials as indicated or as necessary to achieve a continuous air seal throughout the building envelope. Seal with air barrier tape. Refer to manufacturer's standard details.
- 3.5.8 All joints, interconnections, and penetrations of the air barrier components including lighting fixtures shall be indicated on manufacturer's standard details.
- 3.5.9 Ensure all projections are properly sealed with a trowel or caulk application of specified sealant.
- 3.6 **Inspection and Repair**
- 3.6.1 Inspect membrane thoroughly before covering and make any corrections to punctures, tears, voids and other obvious defects which would impede the membrane from performing as intended.
- 3.6.2 Notify Consultant when sections of work are complete so as to allow for review prior to installation of insulation. Remove, replace or repair materials not satisfactory to the Consultant and wait for re-inspection before covering work.
- 3.7 **Cleaning and Protection**
- 3.7.1 Protect air barrier materials from damage during installation and the remainder of the construction period, according to material manufacturer's written instructions.
- 3.7.2 Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the material manufacturer.
- 3.7.3 Clean adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install aluminum composite wall panels and accessories as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.3 | Section 07 21 19 | Foamed-in-Place Insulation |
| 1.3.4 | Section 07 26 00 | Vapour Retarders |
| 1.3.5 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.6 | Section 07 62 00 | Sheet Metal Flashing and Trim |
| 1.3.7 | Section 07 92 00 | Joint Sealing |
| 1.3.8 | Section 08 44 13 | Glazed Aluminum Curtain Walls |
| 1.3.9 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM A653/A653M-22 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .2 ASTM C481-99(2016) Standard Test Method for Laboratory Aging of Sandwich Constructions
- .3 ASTM D968-22 Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
- .4 ASTM D3363-22 Standard Test Method for Film Hardness by Pencil Test
- .5 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials

1.4.2 American Architectural Manufacturers Association (AAMA)

- .1 AAMA 508-14 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.

1.4.3 CSA Group (CSA)

- .1 CSA S136-12 North American Specification for the Design of Cold Formed Steel Structural Members
- .2 CSA S157-17 Strength Design in Aluminum

1.4.4 Canadian Sheet Steel Building Institute (CSSBI)

- .1 CSSBI Standard Practice for Sheet Steel Cladding.

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1.5 Submittals

- 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- 1.5.2 Submit shop drawings. Indicate dimensions, wall openings, head, jamb, sill and mullion details, materials and finish, attachment methods, compliance with design criteria and requirements of related work and accommodation of thermal movement. Show material profile, caulking, closures and expansion joint details. Include necessary plans, elevations and details. Details shall be drawn at not less than one half full size.
 - 1. All dimensions must be verified in the field prior to submission of shop drawings.
- 1.5.3 Shop drawings shall be stamped and signed by a registered Professional Engineer licensed to practice in the Province of Ontario.
- 1.5.4 Submit for approval duplicate 200 x 200mm samples in the selected materials, colours and profiles.
- 1.5.5 Submit cleaning and maintenance data for inclusion in Maintenance Manuals specified in Section 01 78 00 - Closeout Submittals.

1.6 Design Requirements

- 1.6.1 Design, fabricate and erect a pressure equalized composite metal wall panel system to meet the requirements of this Specification.
- 1.6.2 Structural and thermal movement: Accommodate movement of supporting structural framing and movement caused by thermal expansion and contraction of system component parts without causing bowing, buckling, delamination, oil canning, failure of joint seals, excessive stress on fasteners or any other detrimental effects.
- 1.6.3 Include expansion joints to accommodate movements in wall system and between wall system and building structure, caused by structural movements, without permanent distortion.
- 1.6.4 Design framing members to withstand dead load and wind load as calculated in accordance with the National Building Code of Canada, (OBC climatic data, 100 year probability) to maximum allowable deflection of L/175 of span or 19mm whichever is less for system supports.
- 1.6.5 Provide for positive drainage of condensation occurring within wall construction and water entering at joints to exterior face of wall in accordance with NRC rain screen principles.
- 1.6.6 Design wall system to accommodate erection tolerances of structure.
- 1.6.7 Panel Removal: Design system to allow removal of individual panels within wall system.

1.7 Quality Assurance

- 1.7.1 Panel fabricator and installer shall be experienced and acceptable to panel manufacturer.
 - 1.7.2 Maximum deviation from the vertical and horizontal alignment of erected
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panels shall be no more than 6mm in 6.0 metres.

- 1.7.3 Design engineer and panel supplier shall furnish calculations confirming structural adequacy if requested.
- 1.7.4 Painted surfaces of composite panels shall meet all criteria printed in the manufacturer's literature.
- 1.7.5 Field measurements shall be taken prior to completion of shop fabrication.
- 1.7.6 Provide mockups on building consisting of complete cladding system, including but not limited to metal furring, panels, securement devices, flashings, trims and mouldings. All material shall be of the colour and finish specified.
 - .1 Locate mockups as directed by the Consultant.
 - .2 Mockups shall be minimum 4 panels in a 2 over 2 configuration.
 - .3 Modify mockups as necessary for Consultant's approval. Mockups may remain in place as part of completed work after approval.
 - .4 Approved mockups shall represent standard for remainder of work.

1.8 Shipping, Handling and Storage

- 1.8.1 Refer to Section 01 61 00 – Common Product Requirements.
- 1.8.2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.8.3 Metal wall cladding shall be handled and stored on the job in such a manner that no damage shall be done to the material or the structures.
- 1.8.4 Materials showing evidence of improper handling and storage shall be rejected and removed from the site at no additional expense to the Agency.
- 1.8.5 Protect panel finish and edges per panel manufacturer's recommendations.

2. PRODUCTS.

2.1 Panels

2.1.1 Composite Wall Panels:

- .1 To be Alucobond panels by 3A Composites USA, Inc. 208 West 5th Street, Benton, KY 42025 (800-626-3365 or 270-527-4200), or approved equal.
 - .2 Thickness: 4mm.
 - .3 Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values: Peel Strength: 115N-mm/mm as manufactured, 115N-mm/mm after 21 days soaking in water at 21°C.
 - .4 Fire Performance:
 - .1 ASTM E84: Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.
 - .2 ASTM D1929: A self-ignition temperature of 343°C or greater.
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- .3 ASTM D635: Requires a CC1 classification.
- .5 Finishes:
 - .1 Coil coated KYNAR® 500 or HYLAR 5000 based Polyvinylidene Fluoride (PVDF) resin in conformance with the following general requirements of AAMA 2605.
 - .2 Colour: to match existing. Two colours will be used. Provide sample for Consultant approval prior to fabrication.
 - .3 Coating Thickness: 1.0 mil (± 0.2 mil).
 - .4 Hardness: ASTM D3363; HB minimum using Eagle Turquoise Pencil.
 - .5 Impact: Test method: ASTM D2794; Gardner Variable Impact Tester with 16mm mandrel. Coating shall withstand reverse impact of 0.0173kg/m substrate thickness.
 - .6 Adhesion: Test Method: ASTM D3359. Coating shall not pick off when subjected to a 280mm x 280mm x 2mm grid and taped with #600 Scotch Tape.
 - .7 Humidity Resistance: Test Method: ASTM D2247. No formation of blisters when subject to condensing water fog at 100% relative humidity and 38°C (100°F) for 4000 hours.
 - .8 Salt Spray Resistance: Test Method: ASTM B117; Expose coating system to 4000 hours, using 5 per cent NaCl solution.
 - .9 Corrosion creepage from scribe line: 2mm max.
 - .10 Minimum blister rating of 8 within the test specimen field.
 - .11 Weather Exposure Outdoor:
 - .1 Ten-year exposure at 45 degree angle facing south Florida exposure.
 - .2 Maximum color change of 5 Delta-E units as calculated in accordance with ASTM D2244.
 - .3 Maximum chalk rating of 8 in accordance with ASTM D4214.
 - .4 No checking, crazing, adhesion loss.
 - .5 Chemical Resistance.
 - .12 ASTM D1308 utilizing 10 per cent Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
 - .13 ASTM D1308 utilizing 20 per cent Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
 - .14 AAMA 2605 utilizing 70 per cent reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D2244.

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2.2 Panel Composition

- 2.2.1. Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.
- 2.2.2 Aluminum Face Sheets:
 - .1 Thickness: 0.50mm (nominal)
 - .2 Alloy: AA3000 Series (Painted material)
- 2.2.3 Panel Weight: 4mm: 0.047kg/m²
- 2.2.4 Tolerances:
 - .1 Panel Bow: Maximum 0.8 per cent of any 1828mm panel dimension.
 - .2 Panel Dimensions: Field fabrication shall be allowed where necessary but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
 - .3 Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
 - .4 Maximum deviation from panel flatness shall be 3mm in 1524mm on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

2.3 System Characteristics

- 2.3.1 Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable upon the sole discretion of the Agency, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
- 2.3.2 System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
- 2.3.3 System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
- 2.3.4 Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 21°C.
- 2.3.5 Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and watertight.
- 2.3.6 The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

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2.4 **System Type**

2.4.1 Pressure Equalized Rain Screen System.

2.5 **System Performance**

2.5.1 Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards and as required by the Ontario Building Code:

.1 Wind Load: If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

.1 Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (lb./ft²) and 30lb./ft² on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.

.2 Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 19mm, whichever is less.

.3 Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.

.4 Maximum anchor deflection shall not exceed 1.6mm.

.5 At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1.6mm.

.2 Air/Water System Test: If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

.1 Air Infiltration: When tested in accordance with ASTM E283, air infiltration at .08kPa must not exceed 0.1cmm/.09m² of wall area.

.2 Water Infiltration: Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. System shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur under a differential static pressure of 0.30kPa after 15 minutes of exposure in accordance with ASTM E331.

.3 Pressure Equalized Rain Screen Systems shall comply with AAMA 508 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.

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2.6 Accessories

- 2.6.1 Extrusions, formed members, sheet, and plate shall conform to ASTM B209 and the recommendations of the manufacturer.
- 2.6.2 Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
- 2.6.3 Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
- 2.6.4 Fabricate flashing materials from 1mm minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
- 2.6.5 Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

2.7 Sub-framing Accessories

- 2.7.1 Cladding Clip and Rail: clip and rail support system to improve thermal efficiency of wall system.
 - 1. Sub-framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
 - 1. Thermal Spacer thickness for top, base and web: 4.8 mm nominal.
 - 2. Thermal spacer depth: as indicated.
 - 3. Depth tolerance: ± 0.127 mm.
 - 4. Basis of Design: Cascadia Windows Inc., Cascadia Clip, www.cascadiaclick.com.
- 2.7.2 Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.
 - 1. Fastener for steel framing: 1/4 - 14 x length as required with hex head.
 - 2. Acceptable material: Leland Industries Inc., Master Driller No. 2 Mini Drill Point with DT2000 coating. Or Agency approved equivalent.

2.8 Fabrication

- 2.8.1 Field verify all dimensions prior to fabrication.
 - 2.8.2 Panels to be factory fabricated in accordance with specifications and reviewed shop drawings.
 - 2.8.3 Bond panels using continuous process without using applied adhesives.
 - 2.8.4 Maximum allowable fabrication tolerances to be:
 - 1. Panel bow: 0.8% of panel dimensions.
 - 2. Width or length:
 - 1. ± 0.8 mm up to 1220mm
 - 2. ± 1.6 mm from 1220 to 3600mm
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 42 43, Composite Wall Panels**

3. Squareness: maximum 5.0mm difference between diagonal measurements.
 - 2.8.5 Form all panels to specified dimensions with tolerances to accommodate thermal expansion and contraction between panels and structural members. Accurately form radii of curved panels in plant.
 - 2.8.6 Fabricate corner pieces as detailed, without joints. Bend panels to minimum radius permitted by panel thickness.
 - 2.8.7 Factory fabricate accessory and trim components, ready for installation.
 - 2.8.8 Ensure panel surfaces are free of fabrication scratches or marks, and that entire project is manufactured from single colour coil paint run to ensure colour uniformity.
 - 2.8.9 Ensure that exposed panel grain is maintained with no panel blank sizes rotated.
 3. **EXECUTION**
 - 3.1 **Examination**
 - 3.1.1 Inspect building structure, panel substructure and sheathing prior to commencement of installation.
 - 3.1.2 Substructure shall be structurally sound, level, plumb and free of defects detrimental to work and erected in accordance with established building tolerances.
 - 3.1.3 Do not proceed until all satisfactory conditions have been corrected.
 - 3.2 **Preparation**
 - 3.2.1 Sub-Framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing
 - 3.2.2 Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer's written recommendations.
 1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate at 660mm maximum on centre vertically and 400mm maximum on center horizontally or as indicated on engineered shop drawings.
 - 3.3 **Installation**
 - 3.3.1 Comply with manufacturer's instructions and reviewed shop drawings.
 - 3.3.2 Install galvanized steel sub girts horizontally over substrate in conjunction with insulation application and fasten through to substructure in accordance with the shop drawings. Maximum fastener spacing in either direction: 400mm.
 - 3.3.3 Erect panels level and plumb, in proper alignment and relation to substructure framing and established lines. Maintain tolerances specified and recommended by the manufacturer.
 - 3.3.4 Panel anchorage shall be structurally sound and in accordance with engineered shop drawings.
 - 3.3.5 Where panel materials come in contact with dissimilar materials, a
-

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bituminous paint or caulking tape shall be installed to insulate between the dissimilar materials.

3.4 Accessories

- 3.4.1 Brake form metal copings and flashings to profiles shown, in maximum lengths.
- 3.4.2 Where aluminum materials come in contact with dissimilar materials, install isolation shim or tape at fastening locations.
- 3.4.3 Install head and sill flashings, edge trim, cap pieces and other metal profiles as detailed and as required for a complete, weather tight installation.
- 3.4.4 Install expansion and control joints where indicated.
- 3.4.5 Maintain following installation tolerances:
 - .1 Maximum variation from plane or location shown on approved shop drawings: 13mm in 6.0 metres.
 - .2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.8mm.

3.5 Adjusting and Cleaning

- 3.5.1 Adjust all panels as erection commences to ensure proper alignment.
- 3.5.2 Replace all damaged panels.
- 3.5.3 Clean all foreign material from panel system.
- 3.5.4 Remove strippable film coating as soon as possible after surrounding material has been installed.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 46 13, Preformed Metal Siding**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install performed metal siding as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.3 | Section 06 10 00 | Rough Carpentry |
| 1.3.4 | Section 07 21 19 | Foamed-in-Place Insulation |
| 1.3.5 | Section 07 26 00 | Vapour Retarders |
| 1.3.6 | Section 07 27 00 | Vapour Permeable Air Barriers. |
| 1.3.7 | Section 07 54 19 | Polyvinyl Chloride Roofing |
| 1.3.8 | Section 07 62 00 | Sheet Metal Flashing and Trim |
| 1.3.9 | Section 07 92 00 | Joint Sealing |

1.4 References

1.4.1 The National Building Code of Canada.

1.4.2 ASTM International (ASTM)

- .1 ASTM A653/A653M-22 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .2 ASTM A792/A792M-22 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .3 ASTM D1005-95(2020) Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.

1.4.3 CSA Group (CSA)

- .1 CSA S136-07 Cold Formed Steel Structural Members

1.4.4 Canadian Sheet Steel Building Institute (CSSBI)

- .1 CSSBI 20M-2008 Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.
- .2 CSSBI B14-93 Steel Roofing and Siding Installation Guide.
- .3 CSSBI-B15-1993 Snow, Wind and Earthquake Load Design Criteria for Steel Building Systems
- .4 CSSBI B16-1994 Prefinished Sheet Steel for Building Construction.

1.4.5 Canadian Institute of Steel Construction (CISC)

- .1 CISC Standard Code of Practice (2009).

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- 1.5 **Submittals**
- 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit shop drawings including plans, elevations and details.
 - .1 All dimensions must be verified in the field prior to submittal of shop drawings.
 - .2 Show profile, size, lap dimensions and details, connections, attachments, anchorage, caulking, and closure details.
 - .3 Indicate details of complete wall assembly including liner panel, insulation, sub-framing, exterior panel, flashing, trim and accessories.
 - .4 Shop drawings shall be stamped and signed by a registered Professional Engineer registered in the Province of Ontario.
 - 1.5.3 Submit full range of manufacturer's colours.
 - 1.5.4 Submit duplicate samples of each type of fastener proposed to be used.
 - 1.5.5 Submit engineering design calculations for all materials and assemblies when requested by the Agency.
 - 1.5.6 Provide maintenance data for metal cladding for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00.
- 1.6 **Design**
- 1.6.1 Design metal cladding and assemblies to sustain all applied loads as required by the National Building Code of Canada.
 - 1.6.2 Design metal cladding and fasteners for a positive wind load of 0.96 kPa and a negative wind load of 0.56 kPa and a maximum deflection of 1/180 of the span at maximum load.
 - 1.6.3 Spacing of sub-framing system shall be not greater than 1200mm centres.
 - 1.6.4 Stress shall not exceed 144 MPA for Grade A steel.
 - 1.6.5 Design shall be performed by a professional Engineer licensed to practice in Ontario.
- 1.7 **Pre-Installation Conference**
- 1.7.1 Arrange a pre-installation conference to review with all affected trades, requirements for metal wall systems installation.
- 1.8 **Shipping, Handling and Storage**
- 1.8.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.9 **Warranty**
- 1.9.1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.
 - 1.9.2 Submit manufacturer's warrantee that prefinished materials will not lose
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chip, crack or lose film integrity for 15 years and will not chalk or fade for 10 years following date of Substantial Performance.

2 PRODUCTS**2.1 Materials**

- 2.1.1 Sheet Metal: To ASTM A635M-09b and CSA136-07, galvanized sheet steel, commercial quality with a minimum yield stress of 230 MPA, and a working stress of 144 MPA. Material shall have Z275 designation zinc coating unless noted otherwise.
- 2.1.2 Metal Cladding: Exterior Corrugated Wall Panel:
 - .1 2 2/3 x 7/8 Corrugated.
 - .2 C.N.T. 0.76mm.
 - .3 Zinc Coating Designation Z275.
- 2.1.3 Z Bars and Sub-framing Systems:
 - .1 Zinc coated steel minimum 1.22mm base steel thickness.
 - .2 Notched Z bar subgirts at liner panels.
 - .3 Depth as indicated or required by engineering design.
- 2.1.4 Flashings and Trim:
 - .1 Flat Sheet.
 - .2 Minimum C.N.T. 0.48mm
 - .3 Zinc coating designation of Z275.
 - .4 Colour to match cladding colour.

2.2 Finishes

- 2.2.1 Prefinished material shall be colour coated with manufacturer's standard finish system equivalent to Valspar WeatherXL coating system, utilizing silicone modified polyester resin, minimum dry film thickness of 1.0 ± 0.1 mils when tested to ASTM D1005.
- 2.2.2 Cladding colours shall be selected by the Consultant/Agency from full range of manufacturer's standard colours. Up to three colours may be selected.

2.3 Accessories

- 2.3.1 Fasteners: Panel fastened with exposed self-tapping "confas" or Tapcon screws, prefinished nylon hat to match colour of cladding. Interior sheets and sub-girts fastened with type "AB" hex head cadmium plated high carbon steel, self-tapping sheet metal screws.
- 2.3.2 Closures: Unifoam PVC closures to profile of cladding.
- 2.3.3 Sealants: Refer to Section 07 92 10 - Joint Sealing.

2.4 Fabrication

- 2.4.1 Fabricate all metal flashing, starter strips, closures, and trim as required for complete installation of wall cladding. Hem all exposed edges minimum 13 mm for appearance and stiffness. Mitre and seal corners with sealant.
 - 2.4.2 Fabricate flashings and trim to suit existing material profile and
-

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configuration.

3 EXECUTION**3.1 Examination**

- 3.1.1 Examine building frame and substrate, take field measurements and examine other work which may affect this work.
- 3.1.2 Check the accuracy and alignment of the building substrate. If not within tolerances set forth in the CISC Standard Code of Practice, the matter shall be brought to the attention of the Consultant before proceeding with erection of the metal cladding.
- 3.1.3 Ensure that all air barrier membranes and air seals are in place and have been accepted by the Consultant.
- 3.1.4 Notify Consultant of any conditions which would prevent proper installation.
- 3.1.5 Do not proceed with cladding installation until work which will be concealed has been inspected and approved.
- 3.1.6 Commencement of work implies acceptance of existing conditions.

3.2 Installation

- 3.2.1 Erection shall be carried out by the manufacturer's trained erection crews or their approved erector, in accordance with the manufacturer's specifications.
 - 3.2.2 Install all flashings and seal to provide a weather-tight structure.
 - 3.2.3 Fasteners or method of attachment shall withstand all loads of wind or of suction as may be imposed on the metal cladding. Exposed fasteners shall have pre-coated or nylon coated heads to match colour of the metal wall cladding.
 - 3.2.4 Installation shall be in accordance with the reviewed shop drawings, the manufacturer's printed instructions and the referenced standards.
 - 3.2.5 Install sub-framing, girts, trim, flashings, insulation and metal cladding as indicated.
 - 3.2.6 Allow for application of foamed in place insulation as specified in Section 07 21 19.
 - 3.2.7 Fasten sub-framing to backup with self-tapping screws or masonry anchors of sufficient length to penetrate a minimum of 19mm into the structure. Locate sub framing at maximum 1200mm centres but not more than required to support applied wind loads.
 - 3.2.8 Apply a continuous bead of caulking on faces of all supports and at top, bottom and ends of cladding to provide a complete seal.
 - 3.2.9 On lapped joints, caulk continuously between laps to provide a complete water seal.
 - 3.2.10 Bed all flashings, closures and corner pieces in sealant to provide a weather tight installation.
 - 3.2.11 Caulk all openings, joints and around perimeter to provide a weathertight installation.
 - 3.2.12 Complete all air seals between metal cladding and other systems or
-

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materials as detailed. Air barrier membranes are specified under Section 07 27 00 - Vapour Permeable Air Barriers.

- 3.2.13 Provide expansion joints required by shop drawings complete with metal closures, flashings, trim and caulking, to provide a weather tight installation.
- 3.2.14 Provide all matching trim, fasteners and accessories to make building weathertight.
- 3.2.15 There shall be no apparent difference between face sheets of same colour when viewed from a minimum distance of 15 metres. Remove and replace off-colour sheets as directed by the Consultant.

3.3 Touch-Up

- 3.3.1 Repair and touch up with colour matching high grade enamel minor surface damage, only where permitted by the Consultant and only where appearance after touch-up is acceptable to Consultant.
- 3.3.2 Replace damaged panels and components that, in opinion of the Consultant, cannot be satisfactorily repaired.

3.4 Cleaning

- 3.4.1 Clean all exposed panel surfaces in accordance with manufacturer's instructions.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 54 19, Polyvinyl Chloride Roofing**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install polyvinyl chloride (PVC) roofing as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------------|
| 1.3.1 | Section 05 31 00 | Steel Decking |
| 1.3.2 | Section 06 10 00 | Rough Carpentry |
| 1.3.3 | Section 07 21 13 | Building Insulation |
| 1.3.4 | Section 07 26 00 | Vapour Retarders |
| 1.3.5 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.5 | Section 07 62 00 | Sheet Metal Flashing and Trim |
| 1.3.6 | Section 07 92 00 | Joint Sealing |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM C726-17 Standard Specification for Mineral Wool Roof Insulation Board.
- .2 ASTM C1002-22 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.
- .3 ASTM C1177/C1177M-17 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .4 ASTM C1396/C1396M-17 Standard Specification for Gypsum Board.
- .5 ASTM D4434/D4434M-21 Standard for Poly(Vinyl Chloride) Sheet Roofing.

1.4.2 CSA Group (CSA)

- .1 CAN/CSA-A123.21:20 Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
- .2 CSA O121-17 (R2022) Douglas Fir Plywood.
- .3 CSA O151-17 (R2022) Canadian Softwood Plywood.

1.4.3 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-11 Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-09 Standard for Thermal Insulation Mineral Fibre for Buildings.
 - .3 CAN/ULC-S704-11 Standard for Thermal Insulation, Polyurethane
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- .4 and Polyisocyanurate, Boards, Faced.
 - .4 CAN/ULC-S706-09 Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
 - 1.4.3 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual
 - 1.4.4 Green Seal Environmental Standards (GSES)
 - .1 GS-36-00 Commercial Adhesives.
 - 1.4.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005 Adhesive and Sealant Applications.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Product Data:
 - .1 Provide two copies of most recent technical roofing components datasheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - 1.5.3 Submit two copies of WHMIS SDS and indicate VOC content for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Filter fabric.
 - 1.5.4 Shop Drawings:
 - .1 Indicate flashing, control joints, tapered insulation details.
 - .2 Provide layout for tapered insulation
 - 1.5.5 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
 - 1.5.6 Test and Evaluation Reports: submit laboratory test reports certifying compliance of roofing materials and membrane with specification requirements.
 - 1.5.7 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
 - 1.5.8 Manufacturer's field report: in accordance with Section 01 45 00.
 - 1.5.9 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.
 - 1.6 **Quality Assurance**
 - 1.6.1 Installer qualifications: company or person specializing in application of PVC roofing systems with 5 years documented experience approved by manufacturer.
 - 1.6.2 Mock-ups:
-

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- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up 10m² minimum size showing typical lap joint, one inside corner and one outside corner. Accepted mock-up may form part of complete work.
 - .3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with roofing work.
- 1.6.3 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and Agency to:
- .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- 1.7 **Shipping, Handling and Storage**
- 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.7.2 Storage and Handling Requirements:
- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
 - .2 Provide and maintain dry, off-ground weatherproof storage.
 - .3 Store rolls of PVC flat on cross supports.
 - .4 Remove only in quantities required for same day use.
 - .5 Store materials in accordance with manufacturer's written instructions.
 - .6 Store insulation protected from sunlight, weather and deleterious materials.
- 1.8 **Project Conditions**
- 1.8.1 Ambient Conditions:
- .1 Temperature, relative humidity, moisture content.
 - .2 Apply PVC membrane only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .3 Do not install PVC membrane when temperature remains below 5° C, or when wind chill gives equivalent cooling effect.
 - .4 Install PVC membrane on dry substrate, free of snow and ice. Use only dry materials and apply only during weather that will not introduce moisture into system.
- 1.8.2 Ventilation:
- .1 Ventilate area of work by use of approved portable supply and
-

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exhaust fans.

- .2 Provide continuous ventilation during and after roofing application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of roofing installation.

1.9 Warranty

- 1.9.1 Warrant the work of this Section against defects of workmanship and material, for a period of twenty years (20) from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

2 PRODUCTS**2.1 Compatibility**

- 2.1.1 Compatibility between components of system and adjacent materials is essential. Provide a written declaration to Agency stating that all materials and components, as assembled in system, meet this requirement.

2.2 Roof Systems Description

- 2.2.1 Refer to Contract Drawings for description and detailing of roof systems and components.

2.3 Underlayment Board

- 2.3.1 To ASTM C1177, moisture resistant. 1220 x 2440mm sheets, 15.9mm thickness, 1220 x 1220mm size. Minimum compressive strength of 310kPa.
 - .1 Georgia Pacific Dens Deck Prime Roof and Substrate Board
 - .2 CGC Securock Gypsum Fiber Roof Board
- 2.3.2 Adhesive as recommended by the manufacturer.
 - .1 Low VOC type to conform to SCAQMD Rule 1168-03.

2.4 Vapour Retarder

- 2.4.1 "Peel and stick" rubberized asphalt membrane with compatible film coating, 40-mil composite consisting of 35 mils of self-adhering rubberized asphalt laminated to a 5-mil polyolefin film.
- 2.4.2 Vapour retarder is to be free of nicks and cuts and shall demonstrate average moisture transmission rate of 0.04 perms when tested to ASTM E96, Procedure B
- 2.4.3 Adhesives and primers as recommended by manufacturer to suit substrate, low VOC type to conform to SCAQMD Rule 1168-03.

2.5 Membrane

- 2.5.1 Roof Membrane: To ASTM DD4434, Type III Poly Vinyl Chloride(PVC) sheet roofing membrane, 1.5mm (60 mils) thick reinforced membrane
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Appendix 8.2, Division 07, Section 07 54 19, Polyvinyl Chloride Roofing

manufactured to the following physical properties:

| PROPERTY | 3.1 TEST METHOD | TYPICAL TEST VALUES |
|---------------------------------|---------------------------|---------------------|
| Colour (Face) | | White |
| Weight: kg/m ² | ASTM D751 | 1.95 |
| Thickness, Nominal | ASTM D751 | 1.5mm |
| Thickness Over Scrim, mm (in) | ASTM D4434 Optical Method | .686mm Min. |
| Breaking Strength, min | ASTM D751 | 58mm x 55mm |
| Tearing Strength, Min. | ASTM D751 | 245N |
| Properties after heat aging | ASTM D751 | |
| a. Breaking Strength | ASTM D3045 | 90% |
| b. Tear Strength | | 90% |
| c. Elongation | | 90 % |
| Brittleness Point | ASTM D2137 | -40C |
| Ozone Resistance | ASTM D1149 | Pass |
| Water Absorption, Max. | ASTM D471 | +/- 2% |
| Linear Dimensional Change, Max. | ASTM D1204 | +/- 0.4% |
| Weather Resistance | ASTM G53 | Pass (No Cracks) |
| Solar Reflectance Index | ASTM C1549 | White: 108 |
| Water Vapour Transmission | ASTM E96 | 13 (perm mils) |
| Puncture Resistance | FTM 101C Method 2031 | 320 lbs Min. |

- 2.5.2 Elastic flashings - Field fabricated with PVC membrane, 1.6mm thick.
- 2.5.3 Adhesive as recommended by membrane manufacturer, low VOC type to conform to SCAQMD Rule 1168.
- 2.5.4 Base Layer Rigid Board Insulation: Polyisocyanurate Insulation, Type 3, Class 2 manufactured with HC blowing agent laminated to heavy black non-asphaltic fibre reinforced felt facers on top and bottom surfaces. Meeting the requirements of CAN/ULC S126 and CAN/ULC S107 and conforming to CAN/ULC S704 and CAN/ULC S770 for Long Term Thermal Resistance (LTTR) R- values. Evaluated and listed by current CCMC approvals guide and approved and listed by Factory Mutual Global for Class 1-60/75/90 windstorm classification and meeting FM 4450 approval requirements for Class 1A Fire as a component in roof deck construction. Provide layer of 102mm thickness on roof as detailed with a minimum LTTR value of RSI 4.16 (R23.6), square edges. Minimum compressive strength of 138 Kpa.
- .1 E'NRG'Y 3 by Johns Manville
- .2 Lexsuco Isolex Isocyanurate

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- .3 Firestone ISO+GL
 - .4 Atlas AC Foam II by Atlas Roofing Corporation.
 - .5 Energy Guard ISO by GAF Materials Corp.
 - .6 H-Shield Iso by Carlisle Syntec Canada.
 - .7 Trisotech Roof Insulation by Tremco Canada.
 - .8 Or Agency approved equivalent.
- 2.5.5 Top Layer Rigid Board Insulation: Stone Wool High Density Bitumen Coated Insulation Boards to ASTM C726. Rock Wool Toprock DD plus or approved equal. Non-Combustible in accordance with CAN/ULC S114. 102mm thick or as indicated on Contract Drawings.
- .1 Density 220Kg/m2 ASTM C303
 - .2 Linear Shrinkage 0.71% @ 600oC ASTM C356
 - .3 Thermal Resistance RSI 0.74 @ -4°C ASTM C518
RSI 0.72 @ 4°C
RSI 0.68 @ 24°C
RSI 0.64 @ 43°C
 - .4 Moisture Absorption 0.15% ASTM C1104
 - .5 Water Absorption <1.0% ASTM C209
 - .6 Water Vapour Transmission 41 perms ASTM E96
 - .7 Compression Strength 140KPa @10% ASTM C165
250KPa @25% ASTM C165
- 2.5.6 Tapered Insulation: compatible with roofing system, slope as shown on the Contract Drawings, factory tapered to provide slope to drains (slopes as per Contract Drawings) to CAN/ULC S706.
- 2.5.7 Insulation adhesive: as recommended by manufacturer, low VOC type.
- 2.6 **Sealants**
- 2.6.1 Sealants: Refer to Section 07 92 00 - Joint Sealing.
 - 2.6.2 Compatible with all roofing materials.
 - 2.6.3 Low VOC type.
- 2.7 **Fasteners and Plates**
- 2.7.1 Underlayment board to steel deck: No.12 flat head, self-tapping, Type A or AB, cadmium plated screws. Fasteners and plates must meet FMG 4470 for wind uplift and corrosion resistance. Fasteners must penetrate a minimum of 12mm into steel deck.
 - 2.7.2 Insulation fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and provided by roofing system manufacturer.
- 2.8 **Metal Edging and Membrane Termination**
- 2.8.1 As recommended by manufacturer.
-

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2.8.2 Fascia or coping system component designed per ANSI/SPRI ES-1 standard.

2.9 **Walkway Pads**

2.9.1 Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface- textured protective surfacing for roof traffic shall be membrane manufacturer's standard PVC walkway rolls.

2.10 **Adhesives, Tapes and Primers**

2.10.1 Adhesive, tapes and primers, in accordance with manufacturer's recommendations.

2.10.2 Low VOC type to conform to SCAQMD Rule 1168.

3. **EXECUTION**

3.1 **Workmanship**

3.1.1 Do roofing work in accordance with applicable standard in CRCA Roofing Specifications Manual and manufacturer's instructions except where specified otherwise.

3.2 **Substrate Examination**

3.2.1 Examine work of other trades and notify in writing to the Consultant that the work is acceptable or of any defects or discrepancies. Verify that work of other trades which penetrates roof deck or requires men and equipment to transverse roof deck has been completed or adequate protection is provided.

3.2.2 Examine surfaces for inadequate anchorage, foreign material, moisture and unevenness which would prevent the execution and quality of application of the roofing system as specified. Do not proceed with application of the roof system until defects are corrected. Installation of any part of the work without the written acceptance of such surfaces shall require immediately removal of such installed work.

3.2.3 Prior to beginning Work ensure: Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.

3.2.4 Ensure curbs have been built and installed.

3.2.5 Ensure drains have been installed at proper elevations relative to finished surfaces.

3.2.6 Ensure plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.3 **Protection**

3.3.1 Cover walls, walks and adjacent work where materials hoisted or used.

3.3.2 Use warning signs and barriers. Maintain in good order until completion of Work.

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- 3.3.3 Dispose of rainwater away from face of building until drains or hoppers are installed and connected.
 - 3.3.4 Protect from traffic and damage. Comply with precautions deemed necessary by Agency.
 - 3.3.5 Place plywood runways over work to enable movement of material and other traffic.
 - 3.3.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
 - 3.3.7 Seal and ballast exposed edges.
 - 3.3.8 If metal connectors are used, treat connectors and decking with rust proofing.
- 3.4 **Substrate Board**
- 3.4.1 Mechanically fasten glass mat gypsum board to steel deck with screws spaced 400mm on centre each way.
 - 3.4.2 Place with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs.
- 3.5 **Vapour Retarder**
- 3.5.1 Prime substrate and adhere roof vapour retarder over underlay board with approved adhesive at manufacturer's recommended rate.
 - 3.5.2 Overlap vapour retarder minimum 100mm for side laps and 150mm for end laps.
 - 3.5.3 Extend vapour retarder under cant strips and blocking. Extend to perimeter and deck protrusions.
 - 3.5.4 Seal roof vapour retarder to wall air/vapour barrier system with flexible flashing membranes to ensure continuity of building air/vapour barrier envelope.
- 3.6 **Insulation**
- 3.6.1 Loose lay insulation panels over vapour retarder ensuring panels are butt-edges together with a maximum separation of 2mm.
 - 3.6.2 Install appropriate size insulation fasteners according to the required spacing and density of Roofing System Supplier and Factory Mutual Systems.
 - 3.6.3 All cut insulation panels or cut parts shall have a minimum of two (2) fasteners.
 - 3.6.4 Adhere top layered insulation to base layer using adhesive. Place boards in parallel rows with ends staggered, and in firm contact with one another.
 - 3.6.5 Apply adhesive in continuous ribbons at 300mm on centre.
 - 3.6.6 Cut end pieces to suit. Insulation shall be installed in two layers with joints offset by minimum 1/3 of the board width.
 - 3.6.7 Tapered insulation application.
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- .1 Mop insulation to top layer of insulation with adhesive at the rate recommended by the manufacturer.
- 3.6.8 Install tapered insulation in accordance with shop drawings. Stagger joints between layers 150 mm minimum.
- 3.7 **Exposed Membrane Application**
 - 3.7.1 Membrane, adhered, exposed application.
 - .1 Position membrane over insulation starting at highest point.
 - .2 Allow membrane to relax for ½ hour.
 - .3 Apply adhesive to membrane and substrate in accordance with manufacturer's written instructions.
 - 3.7.2 Lap joints.
 - .1 Clean both mating surfaces, apply primer and splicing contact cement in accordance with manufacturer's written instructions.
 - .2 Apply double-sided adhesive tape in accordance with manufacturer's written instructions.
 - .3 Solvent clean edge and apply lap sealant.
 - 3.7.3 Perimeter securement with adhesive and mechanical fasteners in accordance with manufacturer's written instructions.
 - 3.7.4 Edge securement: Attach fastening strips to mechanically secure membrane. Ensure screws penetrate into deck or wood nailers.
 - 3.7.5 Flashings: Install 1.6mm thick PVC membrane flashings in accordance with manufacturer's written instructions.
 - 3.7.6 Penetrations: Install vent stack covers and other penetration flashings and seal to membrane in accordance with manufacturer's recommendations.
- 3.8 **Walkways**
 - 3.8.1 Install walkway pads in accordance with manufacturer's instructions.
 - 3.8.2 Install walkway pads at all traffic concentration points and all locations as identified on the Contract Drawings.
- 3.9 **Field Quality Control**
 - 3.9.1 Inspection and testing of membrane application will be carried out by independent testing agency retained by the Contractor and approved by the Consultant. Refer to Section 01 45 00 – Quality Control.
- 3.10 **Cleaning**
 - 3.10.1 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install sheet metal flashing and trim as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|----------------------------|
| 1.3.1 | Section 06 10 10 | Rough Carpentry |
| 1.3.2 | Section 07 42 43 | Composite Wall Panels |
| 1.3.3 | Section 07 46 13 | Preformed Metal Siding |
| 1.3.4 | Section 07 54 19 | Polyvinyl Chloride Roofing |
| 1.3.5 | Section 07 92 00 | Joint Sealing |

1.4 References

1.4.1 ASTM International (ASTM)

.1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM D523-14(2018) Standard Test Method for Specular Gloss

1.4.2 CSA Group (CSA)

.1 CSA B111 Wire Nails, Spikes and Staples

.2 CSA S136-16 North American Specification for the Design of Cold-Formed Steel Structural Members

1.4.3 Canadian General Services Board (CGSB)

.1 CAN/CGSB 1.108-M Bituminous Solvent Type Paint

.2 CAN/CGSB-37.5 Cutback Asphalt Plastic Cement

.3 CAN/CGSB-51.32 Sheathing, Membrane, Breather Type.

1.4.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI Standard Practice for Sheet Steel Cladding.

.2 CSSBI 20M-91 Sheet Steel Cladding for Architectural and Industrial Applications.

.3 CSSBI B16-94 Prefinished Sheet Steel for Building Construction.

1.4.5 Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Submit duplicate 300 x 300mm samples of each type of sheet metal

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material, colour and finish when requested by the Consultant.

1.6 Design and Performance Requirements

- 1.6.1 Appearance: neatly and evenly lay out and install components. Exposed fastening devices not permitted.
- 1.6.2 Effects of Wind: resist positive and negative wind pressures without detrimental effects.
- 1.6.3 Water Control: prevent passage of water.
- 1.6.4 Thermal Movement: accommodate expansion and contraction of component parts without buckling, failure of joints, undue stress on fasteners and other detrimental effects.
- 1.6.5 Compatibility: components shall be compatible with dissimilar metals and materials with which they are in contact or fastened to so as to prevent corrosion, staining and other detrimental effects. If required, treat or separate contact surfaces with inert and non-staining insulation material to achieve compatibility.

1.7 Quality Assurance

- 1.7.1 Work of this Section shall be performed by a qualified sheet metal contractor with a minimum of 5 years of experience in the type of work required and specified. Submit proof of experience where requested by the Consultant.

1.8 Shipping, Handling and Storage

- 1.8.1 Materials shall be handled and stored on the job in such a manner that no damage shall be done to the material or the structures.
- 1.8.2 Materials showing evidence of improper handling and storage shall be rejected and removed from the site at no additional expense to the Agency.

1.9 Warranty

- 1.9.1 Warrant the work of this Section against defects of workmanship and material, for a period of five years (5) from the date of Ready-for-Takeover. Contractor to agree to make good promptly any defects which occur or become apparent within the warranty period.
- 1.9.2 Submit manufacturer's warrantee that pre-finished materials will not lose film integrity for 15 years and will not chalk or fade for 10 years following date of Ready-for-Takeover.

2. PRODUCTS**2.1 General**

- 2.1.1 Ensure compatibility of all materials in contact with roof membrane.

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2.2 Materials

- 2.2.1 Sheet Metal: 0.48mm thick galvanized sheet steel, commercial quality to ASTM A653 Grade 'A' with a minimum yield stress of 230 MPA, and a working stress of 144 MPA, to CSA S136. Material shall have Z275 designation zinc coating.
- 2.2.2 Prefinished material shall be colour coated with manufacturer's standard finish system equivalent to Valspar WeatherXL coating system, utilizing silicone modified polyester resin, minimum dry film thickness of 1.0 ± 0.1 mils when tested to ASTM D1005. This Section shall supply all metal flashing for all roof and wall applications whether shown or not, and as necessary for the complete installation.
 - .1 Colour for all sheet metal flashing and trim shall be as selected by the Consultant/Agency from full range of manufacturer's standard colours.
- 2.2.3 Continuous hook on strips and metal bellows: 0.65mm galvanized sheet steel, zinc coating designation ZF275.
- 2.2.4 Isolation Coating: Alkali resistant exterior bituminous paint to CAN/CGSB 1.108-M.
- 2.2.5 Plastic Cement: To CAN/CGSB 37.5.
- 2.2.6 Nails, Bolts, Screws and Other Fastenings: same metal finish as sheet metal being used to CSA B111. The size of fastenings shall suit the applicable conditions.
- 2.2.7 Underlay: No. 15 perforated asphalt felt to CSA A123.3-M or dry sheathing, breather type, to CAN/CGSB-51.32
- 2.2.8 Cleats: Of same material, and temper as sheet metal, minimum 50mm wide. Thickness same as sheet metal being secured.

3. EXECUTION**3.1 General**

- 3.1.1 Install sheet metal work in accordance with CRCA specifications and as detailed.
- 3.1.2 Use concealed fastenings except where approved before installation.

3.2 Fabrication

- 3.2.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA specifications and as indicated.
- 3.2.2 Form pieces in 2440mm maximum lengths.
- 3.2.3 Hem exposed edges on underside 13mm. Mitre and seal corners with sealant.
- 3.2.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- 3.2.5 Apply isolation coating (two coats) to metal surfaces to be in contact with concrete or mortar or dissimilar metals.

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- 3.2.6 Install underlay under sheet metal in accordance with CRCA "FL" series details. Lap joints 100mm.
 - 3.2.7 All seams shall be of the "slip lock type" that permit adequate movement without resulting in deformation or loosening of metal flashings. Lapped joints or exposed raw edges will not be accepted. Exposed edges shall be "double back" at least 13mm. At eaves and parapets, metal shall be hooked over continuous starter strips minimum 1 gauge thicker than the metal used for flashing. Secure starter strips at 300mm on centre or closer as required.
 - 3.2.8 Where metal terminates under fascia boards, secure metal at 610mm centres using specified fasteners. At curbs to openings or at sleepers, provide locked or standing seams at corners. Solder mitred corners, pop rivet or form standing seams.
 - 3.2.9 Secure metal flashings in reglets at 610mm centres and further secure metal to vertical surfaces at locks as required.
 - 3.2.10 All flashings shall be installed in straight lines. Irregular or badly fitted work will not be accepted. Exposed fastenings will only be permitted where concealed fastening is not possible. Provide neoprene washers for exposed fasteners.
 - 3.2.11 Imperfections in metal flashing work such as holes, dents, creases, or oil-canning will not be accepted.
 - 3.2.12 Fabricate and install scuppers as detailed and in accordance with CRCA specifications and standards.
- 3.3 **Caulking of Flashings**
- 3.3.1 Sealants shall be as specified in Section 07 92 10 - Joint Sealing.
 - 3.3.2 Caulk all joints in flashing.
 - 3.3.3 Dissimilar metals in contact, or metals in contact with adjacent surfaces shall be separated from one another to prevent corrosion, staining, or electrolysis by use of approved methods and materials.
 - 3.3.4 Caulking compound shall be applied in strict accordance with the manufacturer's application instructions. Use proper surface primers where necessary.
 - 3.3.5 Colour of caulking compound shall be the integral colour of the abutting material.

END OF SECTION

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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install sprayed insulation as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 05 21 00 | Steel Joist Framing |
| 1.3.3 | Section 05 31 00 | Steel Decking |
| 1.3.4 | Section 07 81 23 | Intumescent Fireproofing |
| 1.3.5 | Section 07 84 00 | Firestopping |

1.4 References

1.4.1 ASTM International (ASTM)

1.4.2 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials

1.4.3 ASTM E119-22 Standard Test Methods for Fire Tests of Building Construction and Materials

1.4.4 ASTM E605/E605M-19 Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members

1.4.5 ASTM E736/E736M-19(2023) Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

1.4.6 ASTM E759/E759M-92(2023) Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

1.4.7 ASTM E760/E760M-92(2020) Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members

1.4.8 ASTM E761/E761M-92(2020) Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members

1.4.9 ASTM E859/E859M-23 Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members

1.4.10 ASTM E937/E937M-93(2020) Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members

1.4.11 ASTM G21-15(2021)e1 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

1.4.12 Underwriters Laboratories Inc. (ULC)

.1 Fire Resistance Directory (Latest Edition)

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- .2 ULC 101 2014 Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .3 ULC 102 2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - 1.4.13 Uniform Building Code (UBC)
 - .1 UBC Standard No. 7-6 – Thickness and Density Determination for Spray Applied Fireproofing
 - .2 UBC Standard No. 7-7 – Methods for Calculating Fire Resistance of Steel, Concrete and Wood Construction
 - 1.4.14 Association of the Wall and Ceiling Industry (AWCI)
 - .1 AWCI Technical Manual 12-A: Standard Practice for the Testing and Inspection of Spray Applied Fire-Resistive Materials.
 - .2 AWCI Technical Manual 12: Design Selection Utilizing Spray Applied Fire-Resistive Materials.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit manufacturer's instructions for proper application of aggregate slurry fireproofing.
 - 1.5.3 Fire Testing: Submit evidence that the aggregate slurry fireproofing has been subjected to full-scale UL 263/ASTM E119 fire testing at Underwriters Laboratories Inc., or another accredited laboratory, by the manufacturer.
 - 1.5.4 Submit test results in accordance with ULC 101 for fire endurance and ULC 102 for surface burning characteristics.
 - 1.5.5 Test Data: Independent laboratory test results for fireproofing shall be submitted for the following performance criteria:
 - .1 Compressive Strength per ASTM E761
 - .2 Bond Strength per ASTM E736
 - .3 Deflection per ASTM E759
 - .4 Bond Impact per ASTM E760
 - .5 Air Erosion per ASTM E859
 - .6 Corrosion Resistance per ASTM E937
 - .7 Abrasion Resistance
 - .8 Impact Penetration
 - .9 High Speed Air Erosion per ASTM E859
 - .10 Surface Burning Characteristics per ASTM E84
 - .11 Combustibility per ASTM E1354 Cone Calorimeter
 - .12 Mould Resistance per ASTM G21
 - 1.5.6 Thickness Schedule: Provide schedule indicating material to be used, structural elements to be protected with spray applied fireproofing, hourly rating and material thickness provided and appropriate references.
 - 1.5.7 For assemblies not tested and rated, submit engineered proposals based on related designs using accepted fireproofing design criteria. Criteria must
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include statement that building structures and structural elements have been reviewed and are included in the design of the proposed fire proofing. Proposals shall be prepared by an Engineer registered in the province of Ontario.

1.6 Quality Control

- 1.6.1 Cooperate with inspection and testing agency and repair or restore all areas of fireproofing removed by the agency for laboratory analysis.
- 1.6.2 Testing will be in accordance with AWCI Publication: Inspection Procedure for Field Applied Sprayed Fire Protection Materials and ASTM E605

1.7 Qualifications of Applicator

- 1.7.1 Licensed by manufacturer of fireproofing materials.

1.8 Quality Assurance

- 1.8.1 Fireproofing work shall be performed by a firm acceptable to the aggregate slurry fireproofing material manufacturer.
- 1.8.2 Products, execution, and fireproofing thicknesses shall conform to the applicable code requirements for the required fire-resistance ratings.
- 1.8.3 Contractor, fireproofing subcontractor and independent testing laboratory shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, inspection procedures and other issues.
- 1.8.4 Submit evidence that the aggregate slurry fireproofing has been tested per ASTM E119 by Underwriters Laboratories Inc or another accredited testing laboratory. Include evidence that the fire testing was sponsored by the manufacturer and that the material tested was produced at the manufacturer's facility under the supervision of laboratory personnel.
- 1.8.5 Mock-up
 - .1 Apply fireproofing to approximately 5 square metres of surface to be treated, including deck and steel structure.
 - .2 Allow 24 hours for inspection of mock-up by Testing Agency and Consultant before proceeding with fireproofing work.

1.9 Shipping, Handling and Storage

- 1.9.1 Refer to Section 01 61 00 – Common Product Requirements.
- 1.9.2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.9.3 Deliver materials in original unopened packages, fully identified as to manufacturer, brand or other identifying data and bearing the proper independent testing laboratory labels for Surface Burning Characteristic and Fire Resistance Classification.
- 1.9.4 Store material off the ground, under cover, and in a dry location until ready for use. All bags that have been exposed to water before use shall be found

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unsuitable and discarded. Stock of material is to be rotated and used prior to its expiration date.

1.10 Protection

- 1.10.1 Ensure the work area is adequately ventilated, in compliance with manufacturer's requirements.
- 1.10.2 Ensure continuous and proper ventilation of the work area, through a fresh air intake and the extraction of foul air, during the course of the application process and for 24 hours thereafter.
- 1.10.3 Install temporary partitions in order to prevent any overspray outside of the work area from the sprayed-on insulation material.
- 1.10.4 Protect all adjacent surfaces and equipment against any damage that may be caused by dispersion and overspray of insulation material beyond prescribed limits.
- 1.10.5 Ensure all structures are well protected, in accordance with the manufacturer's recommendations.
- 1.10.6 Clean equipment in areas designated for this purpose.

1.11 Project Conditions

- 1.11.1 Ensure all concrete materials are cured.
- 1.11.2 A minimum air and substrate temperature of 4 °C shall be present before application of spray applied fireproofing. Maintain a minimum air and substrate temperature of 4 °C during and for 24 hours after application of the fireproofing. Provide enclosures with heat to maintain temperature.
- 1.11.3 Provide ventilation to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

2 PRODUCTS**2.1 Systems**

- 2.1.1 Cementitious fireproofing shall be aggregate slurry mixture Monokote MK-6/HY or MK-10HB as manufactured by GCP Applied Technologies Inc.
- 2.1.2 ULC labelled and listed cementitious fireproofing, asbestos free, qualified for use in specified standards as manufactured by one of the following is acceptable subject to submission and review of proposed materials, technical data and application procedures:
 - .1 Cafco Industries Inc./Isolatek
 - .2 A/D Fire Protection Systems

2.2 Materials

- 2.2.1 Fireproofing material shall meet the following physical performance standards:
 - .1 Dry Density: The field density shall be measured in accordance with ASTM Standard E605. Minimum average density shall be that required by the manufacturer, or as listed in the UL Fire Resistance

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- Directory for each rating indicated, or as required by the authority having jurisdiction, or a minimum average 240kg/m³ whichever is greater.
- .2 Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.
 - .3 Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.
 - .4 Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 9.6kN/m² and a minimum individual bond strength of 7.2kN/m².
 - .5 Air Erosion: Maximum allowable total weight loss of the fireproofing material shall be 0.00 g/m² when tested in accordance with ASTM E859. Sample surface shall be "as applied" (not pre-purged) and the total reported weight loss shall be the total weight loss over a 24 hour period from the beginning of the test.
 - .6 High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 12.7m/s when tested per ASTM E859.
 - .7 Compressive Strength: The fireproofing shall not deform more than 10% when subjected to compressive forces of 71 kPa when tested in accordance with ASTM E761.
 - .8 Abrasion Resistance: No more than 15 cm³ shall be abraded or removed from the fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
 - .9 Impact Penetration: The fireproofing material shall not show a loss of more than 6 cm³ when subjected to impact penetration tests in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
 - .10 Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
 - .1 Flame Spread 0
 - .2 Smoke Development 0
 - .11 Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
 - .12 Resistance to Mould: The fireproofing material shall be formulated with a mould inhibitor. Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mould growth for a period of 28 days for general use.

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- .13 Combustibility: Material shall have a maximum total heat release of 20 MJ/m² and a maximum 125 kw/m² peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E1354 at a radiant heat flux of 75 kw/m² with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.
 - .14 Fire Resistance Classification: The spray applied fireproofing material shall have been tested and reported by Underwriters Laboratories of Canada, or another accredited laboratory, in accordance with the procedures of ANSI/ASTM E119 and shall be listed in the Underwriters Laboratories Fire Resistance Directory.
 - 2.2.2 Mixing water shall be clean, fresh, potable and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.
 - 2.3 **Accessories**
 - 2.3.1 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; application aids such as metal lath, scrim, or netting; and accelerator.
 - 3 **EXECUTION**
 - 3.1 **Inspection**
 - 3.1.1 All surfaces to receive spray applied fireproofing shall be provided free of oil, grease, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate. Where necessary, cleaning or other corrections of surfaces to receive fireproofing shall be the responsibility of the supplier of the incompatible surface.
 - 3.1.2 Application of the fireproofing shall not begin until the contractor, applicator and fireproofing testing laboratory (inspector) have examined surfaces to receive fireproofing and determined that the surfaces are acceptable to receive the fireproofing material.
 - 3.2 **Preparation**
 - 3.2.1 Prior to application of the fireproofing material, a bonding agent, approved by the fireproofing material manufacturer, shall be applied to all substrates to receive fireproofing.
 - 3.2.2 Other trades shall install clips, hangers, support sleeves and other attachments required to penetrate the fireproofing, prior to application of the fireproofing materials.
 - 3.2.3 Other trades shall not install ducts, piping, equipment or other suspended items until the fireproofing is complete.
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3.3 Application

- 3.3.1 Clean all structural steel, joists, and metal deck to remove all loose scale or oily coatings, in accordance with manufacturer's recommendations. Remove existing coatings, paint, etc. if necessary to satisfy design criteria for fireproof assemblies.
- 3.3.2 Apply bonding adhesive or primer to substrate if recommended by manufacturer.
- 3.3.3 Apply fireproofing over substrates, building up to required thickness with as many passes or stages necessary to provide monolithic blanket of uniform density and texture. Total thickness shall be in accordance with submitted and approved designs.
- 3.3.4 At ducts, pipes and similar items, passing through fire rated assemblies and structural members, extend fireproofing 150mm on either side along the penetrating item.

3.4 Tests and Inspections

- 3.4.1 Installed assembly will be tested and inspected for conformance with specifications by an independent inspection and testing company retained and paid for by the Agency.

3.5 Patching

- 3.5.1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before Substantial Performance.

3.6 Cleaning

- 3.6.1 Proceed in accordance with Section 01 74 19 – Cleaning, Waste Management and Disposal.

END OF SECTION

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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install sprayed insulation as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 07 84 00 | Firestopping |
| 1.3.3 | Section 07 81 16 | Cementitious Fireproofing |
| 1.3.4 | Section 09 91 23 | Interior Painting |

1.4 References

1.4.1 ASTM International (ASTM)

1.4.2 ASTM D2240-15(2021) Standard Test Method for Rubber Property—Durometer Hardness

1.4.3 ASTM D2794-93(2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

1.4.4 ASTM D3960-05(2018) Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings

1.4.5 ASTM D4060-19 Standard Test Method for Abrasion Resistance of Organic

1.4.6 Coatings by the Taber Abraser

1.4.7 ASTM E84-23b Standard Test Method for Surface Burning Characteristics of Building Materials

1.4.8 ASTM E119-20 Standard Test Methods for Fire Tests of Building Construction and Materials

1.4.9 ASTM E595-15(2021) Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment

1.4.10 ASTM E736/E736M-19 Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

1.4.11 ASTM E759/E759M-92(2020) Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

1.4.12 ASTM E761/E761M - 92(2020) Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members

1.4.13 ASTM E2924-14(2020) Standard Practice for Intumescent Coatings

1.4.14 Association of the Wall and Ceiling Industries - International (AWCI)

.1 Technical Manual 12-B, Standard Practice for the Testing and

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Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

- 1.4.15 Underwriters' Laboratories of Canada (ULC)
 - .1 List of Equipment and Materials, Fire Resistance, current edition.
 - 1.4.16 Underwriters Laboratories Inc. (ULI)
 - .1 Fire Resistance Directory, Volume 1, current edition.
 - .2 ULC 101 Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - 1.4.17 Intertek Testing Services / Warnock Hersey International, Inc. (ITS/WH):
 - .1 Directory of Listed Products, current edition.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Product Data: Submit product data for specified products. Include product data indicating product characteristics, performance and limitation criteria.
 - 1.5.3 Quality Assurance/Control Submittals:
 - .1 Design Data: ULC and FM published test designs for fire resistive coating application to substrate materials required and test reports showing compliance with specified physical performance characteristics and physical properties.
 - .2 Manufacturer's installation instructions.
 - 1.6 **Quality Assurance**
 - 1.6.1 Manufacturer Qualifications:
 - .1 Company specializing in manufacturing products of this section for a minimum of 10 years.
 - .2 Company's quality management system shall have been assessed and registered by an independent registrar as conforming to the requirements of the standard ISO 9001:1994.
 - 1.6.2 Applicator Qualifications:
 - .1 Approved, certified and supervised by manufacturer of fire resistive coating materials.
 - .2 Company shall have minimum five years documented experience.
 - 1.6.3 Product Qualifications: Manufactured under ULI, ULC, ITS/WH and/or FM Follow-up Programs. Each container or package shall bear ULI, ULC, ITS/WH and/or FM label.
 - 1.6.4 Regulatory Requirements: Conform to applicable codes for fire resistance ratings. Submit certification of acceptability of fire resistive coating materials to Consultant and authority having jurisdiction.
 - 1.7 **Project Conditions**
 - 1.7.1 Environmental Requirements
 - .1 Protect work area from windblown dust and rain. Protect adjacent
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- areas from overspray.
 - .2 Provide ventilation in areas to receive work of this Section, during application and for 24 hours (minimum) after application.
 - 1.7.2 Provide metal pans or adequate tarpaulin to protect surfaces in areas assigned for the storage and mixing of paints.
 - 1.7.3 Temperature and Humidity Requirements:
 - .1 Do not apply thin-film intumescent fire-resistive coating when temperature of substrate and/or surrounding air is below 10 °C. Use electric or natural gas heat, if supplemental heat is required.
 - .2 Relative humidity of 40 percent to 60 percent is recommended in work area. Relative humidity in work area must not exceed 75 percent throughout the total period of application and drying for the intumescent coating and must not exceed 65 percent throughout the application and drying for the protective decorative finish coat.
 - .3 Manufacturer's recommended temperature and humidity conditions must be maintained throughout the entire application and drying period until intumescent coating and basecoat are fully dried and top coated, including any interim period prior to application of the topcoat.
 - 1.8 **Sequencing and Scheduling**
 - 1.8.1 Sequence work in conjunction with ceiling hanger tabs, sprinkler pipes, HVAC systems and other mechanical systems, structural steel installation.
 - 1.8.2 Do not apply thin-film intumescent fire-resistive coating until concrete toppings and/or roofing applications have been installed.
 - 1.8.3 Steel surfaces with less than 1 meter clear working access may necessitate the application of materials to inaccessible surfaces prior to erection of the finished steel members, either at the point of fabrication or on-site.
 - 1.9 **System Descriptions**
 - 1.9.1 Design Requirements: Thin-film intumescent fire-resistive coating system shall provide a fire resistance rating as indicated on the Contract Drawings.
 - 1.10 **Shipping, Handling and Storage**
 - 1.10.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.10.2 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification label intact.
 - 1.10.3 Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 - 1.10.4 Store materials at a temperature not less than 10 °C in a dry, protected area, off ground in original, undamaged, sealed containers with manufacturer's labels and seals intact.
 - 1.10.5 Protect from freezing.
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1.10.6 Do not store in direct sunlight.

1.10.7 Discard any materials that have come into contact with contaminants prior to actual use.

2 PRODUCTS**2.1 Manufacturers**

2.1.1 A/D Fire Protection Systems, 420 Tapscott Rd., Scarborough, Ontario M1B 1Y4.

2.1.2 Equivalent products as manufactured by the following are acceptable subject to compliance with performance requirements specified herein.

.1 3M

.2 Cafco Industries Inc,

.3 Carboline

.4 Or Agency approved equivalent.

2.2 Products

2.2.1 Proprietary Systems: A/D FIREFILM III Intumescent Coating.

2.2.2 Primer: Select primer from manufacturer's list of approved primers, or other only as approved by manufacturer.

2.2.3 Basecoat: A/D BASECOAT by A/D Fire Protection Systems.

2.2.4 Topcoat: A/D COLORCOAT by A/D Fire Protection Systems.

2.2.5 Products/Systems Testing: Listed by ULC and bearing the ULC label.

2.2.6 Or Agency approved equivalent.

2.3 Materials

2.3.1 Fire Resistive Coating Material: Thin-film, intumescent coating: A/D FIREFILM III as manufactured by A/D Fire Protection Systems listed by ULC and bearing ULC label on each container or package.

.1 Water based.

.2 Hardness (Shore "D"): Durometer D81.8, creep 1 at 15 s, 230° C.

.3 Surface Burning Characteristics (ASTM E84): Flame Spread: 0-20, Smoke Development: 0-50, Class "A".

.4 Density 1,366 g/l.

.5 Dry Weight: 2.2kg/m² at 1.6 mm dry.

.6 Cohesion/Adhesion (Bond or Tensile) (ASTM E736): 3.24kgm² at 3mm dry.

.7 Compressive strength (ASTM E761): 7.6MPa at 10 percent deformation.

.8 Deflection Resistance (ASTM E759): Pass without spalling, .9 cracking or delaminating.

.9 Impact Resistance (ASTM D2794): 3.3 kg-m (direct) at 3 mm, 1.4 kg-m (direct) at 1.6 mm.

.10 Abrasion Resistance (ASTM D4060): 508 cycles per mil at 1.6mm dry.

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- .11 Off gassing (ASTM E595): TML 0.82, CVCM 0.00, WVR 0.49), NASA SP-R-0022A and ESA PSS-01-702.

2.4 Mixing

- 2.4.1 Paints shall be ready mixed.
- 2.4.2 Mix gently in order to minimize introduction of air to the product. Do not add water or solvent.
- 2.4.3 Mix topcoat by boxing and stirring. Do not add water or solvent.

3 EXECUTION**3.1 Inspection**

- 3.1.1 Examine surfaces to receive work of this Section and report any defects that may affect the work of this section. Identification marking of steel components must be by wax crayon to facilitate ease of removal prior to application of this intumescent fireproofing.
- 3.1.2 Verify that substrate surfaces have been prepared in accordance with manufacturer's recommendations.
- 3.1.3 Verify that all clips hangers, sleeves and similar devices have been attached. Confirm compatibility of surfaces to receive fireproofing materials. Steel surfaces must be primed with a compatible primer.
- 3.1.4 Beginning of installation means acceptance of substrate.
- 3.1.5 Verify substrate and workspace temperature and humidity conditions are in accordance with manufacturer's recommendations.

3.2 Preparation

- 3.2.1 Protection: Protect adjacent surfaces, work areas, finished surfaces and equipment from over-spray/damage during product application.
- 3.2.2 Surface Preparation: Clean substrate free of dust, dirt, grease or other foreign matter that would impair bond of fire resistance material.
- 3.2.3 Weld flashes shall be ground smooth prior to commencement of application.

3.3 Installation

- 3.3.1 Apply primer and basecoat by spray application in accordance with manufacturer's product data, including technical bulletins, product catalogue, application instructions and product markings for installation in sufficient thickness to achieve required fire resistance rating.
- 3.3.2 Priming: Apply only to primed surfaces. Use only primer as approved by manufacturer. Follow primer manufacturer's instructions.
- 3.3.3 Apply topcoat decorative finish according to manufacturer's recommendations.
- 3.3.4 Application Rates and Thickness Measurements:
 - .1 Comply with fire test designs or manufacturer's thickness selection tables for determination of dry film thickness of intumescent

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- coatings required for size of steel element to be protected and for required fire resistance ratings.
- .2 Apply basecoat at a maximum rate off 60-mil wet per coat.
 - .3 Apply intumescent coatings at a maximum rate of 1.14mm wet or approximately 0.58mm dry per coat.
- 3.3.5 Final dry film thickness must be measured with a dry-film thickness gauge. For method of thickness determination refer to AWCI Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.
- 3.4 **Application**
- 3.4.1 Spray Equipment: Use equipment recommended by manufacturer.
 - 3.4.2 Drying and Recoat Time: Drying time will vary with temperature and humidity conditions. Apply next coat only after previous coat is dry.
 - 3.4.3 Topcoat Application:
 - .1 Allow a minimum of 24 hours between application of the final coat of basecoat and application of topcoat. Recommended site conditions must be maintained for any interim period after final coat of basecoat and until topcoat has been applied and dried. Basecoat must be dry before application of topcoat.
 - .2 Do not apply topcoat until it has been determined that the required dry film thickness of basecoat materials has been provided.
 - .3 Thickness: Apply topcoat to a minimum dry film thickness of 0.05 - 0.10mm.
 - 3.4.4 Patching: Patch and repair any fire resistive coating that has been damaged in accordance with patching recommendations of material manufacturer. If coating becomes damaged, rebuild thickness by spray or brush. Fill small areas with trowel. When dry, smooth and finish with topcoat to match.
- 3.5 **Field Quality Control**
- 3.5.1 Field Samples: An independent testing laboratory/company shall be selected by the Agency to test random samples as applied, to verify thickness of thin-film intumescent fire-resistive coating in accordance with AWCI Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire Resistive Materials; an Annotated Guide. Inspection shall be carried out immediately following final thickness of thin film intumescent coatings and just before application of topcoat.
 - 3.5.2 All test results must be made available to all parties at the completion of each designated area and approved prior to the application of top-coat.
 - 3.5.3 In-place fire protection material not in compliance with the specification requirements must be corrected prior to the application of the decorative top-coat.
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- 3.5.4 Prior to application, random pre-determined liquid samples of the water borne intumescent material must be submitted for material characterization (fingerprinting) in accordance with the procedures detailed in the ISO 20340 Standard. Sample frequency will be pre-determined by the Consultant and testing performed by an independent testing laboratory or the intumescent material manufacturer.
- 3.6 **Cleaning**
- 3.6.1 Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions. Remove and legally dispose of construction debris.
- 3.7 **Protection**
- 3.7.1 Protect intumescent coatings from damage until date of Ready-for-Takeover.
- 3.7.2 Touch up any areas damaged in accordance with manufacturer's recommendations and to the entire satisfaction of the Consultant.

END OF SECTION

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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install firestopping as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

1.3.1 Section 07 92 00 Joint Sealing

1.3.2 Section 09 21 16 Gypsum Board Assemblies

1.4 References**1.4.1 ASTM International (ASTM)**

.1 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials

.2 ASTM E119-20 Standard Test Methods for Fire Tests of Building Construction and Materials

.3 ASTM E136-19a Standard Test Method for Behavior of Material in a Vertical Tube Furnace at 750° C

.4 ASTM E814-13a (2017) Standard Test Method for Fire Tests of Penetration Firestop Systems

.5 ASTM E1966-15(2019) Standard Test Method for Fire-Resistive Joint Systems

.6 ASTM E2307-20 Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus

1.4.2 Underwriter's Laboratories of Canada (ULC)

.1 ULC 101-2014 Standard Methods of Fire Endurance Tests of Building Construction and Materials

.2 ULC 102.2-2018 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

.3 ULC 115-2018 Standard Method of Fire Tests of Firestop Systems

1.4.3 National Fire Protection Association (NFPA)

.1 NFPA 252 Standard Methods of Fire Test and Door Assemblies

1.4.4 South Coast Air Quality Management District (SCAQMD) California State

.1 SCAQMD Rule 1168-03: Adhesives and Sealants.

1.4.5 Ontario Building Code**1.5 Submittals**

1.5.1 Product Data: Submit manufacturer's printed product literature,

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- specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.5.2 Shop Drawings: Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.
- 1.5.3 Samples: Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- 1.5.4 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Test reports: in accordance with ULC 101 for fire endurance and ULC 102 for surface burning characteristics.
- .2 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- 1.6 **Definitions**
- 1.6.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- 1.6.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- 1.6.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- 1.7 **Quality Assurance**
- 1.7.1 One installer shall install all firestopping on the project. Each trade shall not firestop their own service penetrations. Installer shall be certified by fire stopping manufacturer.
- 1.7.2 Qualifications:
- .1 Qualified Installer: specializing in fire stopping installations with 5 years documented experience approved and trained by manufacturer.
- 1.7.3 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and
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Consultant to:

- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Co-ordination with other building subtrades.
- .4 Review manufacturer's installation instructions and warranty requirements.

1.7.4 **Site Meetings:**

- .1 As part of Manufacturer's Services described in 3.5- Field Quality Control, schedule site visits, to review Work, at stages listed.
- .2 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
- .3 Twice during progress of Work at 25% and 60% complete.
- .4 Upon completion of Work, after cleaning is carried out.
- .5 Single Source Responsibility: Obtain through-penetration fire-stop systems for each kind of penetration and construction condition indicated from a single manufacturer.

1.7.5 **Field-Constructed Mockup:** Prior to installing fire-stopping, erect mockups for each different through-penetration fire-stop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

- .1 Locate mockups on site in locations indicated or, if not indicated, as directed by Consultant.
- .2 Notify Consultant one week in advance of the dates and times when mockups will be erected.
- .3 Obtain Consultant's acceptance of mockups before start of final unit of Work.
- .4 Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work.
- .5 Accepted mockups in an undisturbed condition at time of Substantial Performance may become part of completed unit of Work.

1.8 **Sustainable Requirements**

- 1.8.1 Materials shall be Low VOC type conforming to SCAQMD Rule 1168-03. Maximum VOC level of firestopping materials shall be 250 g/l.

1.9 **Project Conditions**

- 1.9.1 **Environmental Conditions:** Do not install fire-stopping when ambient or substrate temperatures are outside limits permitted by fire-stopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- 1.9.2 **Ventilation:** Ventilate fire-stopping per fire-stopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.
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1.10 Shipping, Handling and Storage

- 1.10.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.10.2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- 1.10.3 Storage and Protection:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

2. PRODUCTS**2.1 Materials**

- 2.1.1 All fire stopping shall consist of ULC listed firestop system.
 - 2.1.2 Applications: Provide fire-stopping systems composed of materials specified in this Section that comply with system performance and other requirements.
 - 2.1.3 General: Provide fire-stopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
 - 2.1.4 All firestopping material shall be:
 - .1 From one manufacturer;
 - .2 Intumescent where an appropriate system exists.
 - 2.1.5 Fire stopping and smoke seal systems: ULC listed in accordance with ULC 115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of ULC 115 and not to exceed opening sizes for which they are intended.
 - 2.1.6 Service penetration assemblies: ULC listed systems tested to ULC 115.
 - 2.1.7 Service penetration fire stop components: ULC listed and certified by test laboratory to ULC 115.
 - 2.1.8 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
 - 2.1.9 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
 - 2.1.10 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
 - 2.1.11 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
 - 2.1.12 Water: potable, clean and free from injurious amounts of deleterious substances.
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- 2.1.13 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
 - 2.1.14 F-Rated Through-Penetration Fire-stop Systems: Provide through-penetration fire-stop systems with F ratings indicated, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
 - 2.1.15 T-Rated Through-Penetration Fire-stop Systems: Provide through-penetration fire-stop systems with T ratings, in addition to F ratings, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupy-able floor areas. T-rated assemblies are required where the following conditions exist:
 - .1 Where fire-stop systems protect penetrations located outside of wall cavities.
 - .2 Where fire-stop systems protect penetrations located outside fire-resistive shaft enclosures.
 - .3 Where fire-stop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 - .4 Where fire-stop systems protect penetrating items larger than a 100mm diameter nominal pipe or 10,000mm² in overall cross-sectional area.
 - 2.1.16 Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs. Sealants for vertical joints: non-sagging.
 - 2.1.17 For fire-stopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - .1 For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration fire-stop systems.
 - .2 For floor penetrations with annular spaces exceeding 100mm or more in width and exposed to possible loading and traffic, provide fire-stop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
 - .3 For penetrations involving insulated piping, provide through-penetration fire-stop systems not requiring removal of insulation.
 - 2.1.18 For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450.
 - 2.1.19 Compatibility: Provide fire-stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by fire-stopping manufacturer based on testing and field experience.
 - 2.1.20 Accessories: Provide components for each fire-stopping system that are
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needed to install fill materials and to comply with "System Performance Requirements". Use only components specified by the fire-stopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance-rated systems. Accessories include but are not limited to the following items:

- .1 Permanent forming/damming/backing materials including the following:
 - .1 Semi-refractory fibre (mineral wool) insulation.
 - .2 Ceramic fibre.
 - .3 Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - .4 Fire-rated formboard.
 - .5 Joint fillers for joint sealants.
 - .1 Temporary forming materials.
 - .2 Substrate primers.
 - .3 Collars.
 - .4 Steel sleeves.

3. EXECUTION**3.1 Manufacturer's Instructions**

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications.

3.2 Preparation

- 3.2.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
- 3.2.2 Ensure that substrates and surfaces are clean, dry and frost free. Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- 3.2.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour retarder.
- 3.2.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 Installation

- 3.3.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing and as necessary to maintain fire resistance ratings of floor and wall assemblies.
 - 3.3.2 Provide fire stopping for all disciplines.
 - 3.3.3 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
 - 3.3.4 Fill spaces between openings, ducts, pipes and unused sleeves passing through fire separations with firestop material and install firestopping systems in accordance with the appropriate ULC system number for the
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products and type of penetration.

- 3.3.5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- 3.3.6 Tool or trowel exposed surfaces to neat finish.
- 3.3.7 Remove excess compound promptly as work progresses and upon completion.

3.4 Sequences of Operation

- 3.4.1 Proceed only when submittals have been reviewed by Consultant.
- 3.4.2 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 Field Quality Control

- 3.5.1 Inspections: notify Consultant when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- 3.5.2 Employ a ULC accredited Designated Responsible Individual (DRI) to inspect and label all fire stop applications on site.
- 3.5.3 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Article 1.4 - Submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in Article 1.6 - Quality Assurance.

3.6 Commissioning

- 3.6.1 Employ a ULC accredited Designated Responsible Individual (DRI) to inspect and label all fire stop applications on site. Submit DRI's written reports within 3 days of review, verifying compliance of Work.
- 3.6.2 Perform a thorough examination of the fire stopping system to determine if the assembly is installed as per its ULC listing.
- 3.6.3 Allow for destructive testing of installed firestopping. Repair all tested assemblies.
- 3.6.4 The examination shall take place prior to close-up to confirm assembly components and installation configuration.
- 3.6.5 Any and all deviations from the ULC listed system shall be considered grounds for rejection and replacement.

3.7 Schedule

- 3.7.1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated partitions and walls.
-

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- .2 Perimeter of fire-resistance rated partitions.
 - .3 Intersection of fire-resistance rated partitions.
 - .4 Control and sway joints in fire-resistance rated partitions and walls.
 - .5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .6 Around mechanical and electrical assemblies penetrating fire separations.
 - .7 Rigid ducts: greater than 129cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
 - .8 All electrical boxes installed in fire rated gypsum board assemblies.
 - .9 All locations required by the Ontario Building Code.
 - .10 Any other locations indicated.
- 3.8 **Cleaning**
- 3.8.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
 - 3.8.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 07, Section 07 92 00, Joint Sealing**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install joint sealants as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|--------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 06 10 00 | Rough Carpentry |
| 1.3.3 | Section 06 20 00 | Finish Carpentry |
| 1.3.4 | Section 06 40 00 | Architectural Woodwork |
| 1.3.5 | Section 07 21 13 | Building Insulation |
| 1.3.6 | Section 07 21 19 | Foamed-in-Place Insulation |
| 1.3.7 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.8 | Section 07 42 43 | Composite Wall Panels |
| 1.3.9 | Section 07 46 13 | Preformed Metal Siding |
| 1.3.10 | Section 07 54 19 | Polyvinyl Chloride Roofing |
| 1.3.11 | Section 07 62 00 | Sheet Metal Flashing and Trim |
| 1.3.12 | Section 07 84 00 | Firestopping |
| 1.3.13 | Section 08 11 00 | Metal Doors and Frames |
| 1.3.14 | Section 08 44 13 | Glazed Aluminum Curtain Walls |
| 1.3.15 | Section 08 80 50 | Glazing |

1.4 References

| | |
|-------|---|
| 1.4.1 | ASTM International (ASTM) |
| .1 | ASTM C510-16(2022) Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants |
| .2 | ASTM C661-15(2022) Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer |
| .3 | ASTM C679-15(2022) Standard Test Method for Tack-Free Time of Elastomeric Sealants |
| .4 | ASTM C719-22 Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle) |
| .5 | ASTM C793-05(2017) Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants |
| .6 | ASTM C794-18(2022) Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants |
| .7 | ASTM C834-17 Standard Specification for Latex Sealants |

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- .8 ASTM C919-22 Standard Practice for Use of Sealants in Acoustical Applications
 - .9 ASTM C920-18 Standard Specification for Elastomeric Joint Sealants
 - .10 ASTM C1087-23 Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
 - .11 ASTM C1183/C1183M-13(2018) Standard Test Method for Extrusion Rate of Elastomeric Sealants
 - .12 ASTM C1193-16 Standard Guide for Use of Joint Sealants
 - .13 ASTM C1246-17(2022) Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants After Cure
 - .14 ASTM C1247-20 Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids
 - .15 ASTM C1248-22 Standard Test Method for Staining of Porous Substrate by Joint Sealants
 - .16 ASTM C1311-22 Standard Specification for Solvent Release Sealants
 - .17 ASTM C1330-18 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
 - .18 ASTM D412-16(2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - .19 ASTM D2203-01(2023) Standard Test Method for Staining from Sealants
 - .20 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials
 - .21 ASTM E90-09(2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - 1.4.2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
 - 1.4.3 U. S. Environmental Protection Agency (EPA)
 - .1 EPA 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 1.4.4 South Coast Air Quality Management District (SCAQMD) California State
 - .1 SCAQMD Rule 1168-03: Adhesives and Sealants.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Submit product data for all sealant materials and accessories including:
 - .1 Preparation instructions and recommendations.
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- .2 Standard drawings illustrating manufacturer's recommended sealant joint profiles and dimensions applicable to Project.
 - 1.5.3 Joint Sealant Schedule: Indicate joint sealant location, joint sealant type, manufacturer and product name, and colour, for each application. Utilize joint sealant designations included in this Section.
 - 1.5.4 Samples:
 - .1 Samples for Colour Selection: For each joint sealant type.
 - .2 Samples for Verification: For each joint sealant product, for each colour selected.
 - 1.5.5 Greenguard Certificates: For each sealant and accessory product specified to meet volatile organic emissions standards of the Greenguard Children and Schools Certification.
- 1.6 **Quality Assurance**
- 1.6.1 Installer Qualifications: Company with minimum of three years of experience specializing in work of this section, employing applicators trained for application of joint sealants required for this project, with record of successful completion of projects of similar scope, and approved by manufacturer.
 - 1.6.2 Single Source Responsibility: Provide joint sealants by a single manufacturer responsible for testing of Project substrates to verify compatibility and adhesion of joint sealants.
 - 1.6.3 Caulking work shall be carried out in strict accordance with manufacturer's printed directions.
 - 1.6.4 Preconstruction Manufacturer Laboratory Compatibility, Staining, and Adhesion Testing: Submit samples of each substrate or adjacent material that will be in contact with or affect joint sealants. Current manufacturer test data of products on matching substrates will be acceptable.
 - 1.6.5 Adhesion: Use ASTM C719 and ASTM C794 to determine requirements for joint preparation, including cleaning and priming.
 - 1.6.6 Compatibility: Use ASTM C1087 to determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant colour.
 - 1.6.7 Stain Testing: Use ASTM C510, ASTM C1248, or ASTM D2203 to verify non-staining characteristics of proposed sealants on specified substrates.
- 1.7 **Shipping, Handling and Storage**
- 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
-

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1.8 Project Conditions

- 1.8.1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- 1.8.2 Ventilate area of work by use of approved portable supply and exhaust fans.

1.9 Scheduling

- 1.9.1 Ensure sealants are cured before covering with other materials.

2. PRODUCTS**2.1 Manufacturer**

- 2.1.1 Basis-of-Design Products: Provide joint sealant products manufactured by Tremco, Inc., Commercial Sealants and Waterproofing, 220 Wicksteed Avenue, Toronto, www.tremcosealants.com, or comparable products of other manufacturer approved by Consultant.

2.2 Materials, General

- 2.2.1 VOC Content for Interior Applications: Provide sealants and sealant primers complying with the following VOC content limits per 40 CFR 59, Subpart D (EPA Method 24):
 - .1 Architectural Sealants: 250 g/L.
 - .2 Sealant Primers for Nonporous Substrates: 250 g/L.
 - .3 Sealant Primers for Porous Substrates: 775 g/L.
- 2.2.2 Low-Emitting Sealants for Interior Applications: Provide sealants and sealant primers complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2.2.3 Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with adjacent materials, as demonstrated by sealant manufacturer using ASTM C1087 testing and related experience.
- 2.2.4 Joint Sealant Standard: Comply with ASTM C920 and other specified requirements for each joint sealant.
- 2.2.5 Stain Test Characteristics: Where sealants are required to be non-staining, provide sealants tested per ASTM C1248 as non-staining on porous joint substrates specified.

2.3 Silicone Joint Sealants

- 2.3.1 SJS#1: Single-Component, Nonsag, Non-Staining, Moisture-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.

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- .1 Basis of Design Product: Tremco Spectrem 1.
 - .2 Volatile Organic Compound (VOC) Content: 1 g/L maximum.
 - .3 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
 - .4 Staining, ASTM C1248: None on concrete, marble, granite, limestone, and brick.
 - .5 Colour: As selected by Consultant from manufacturer's standard line.
- 2.3.2 SJS#2: Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT.
- .1 Basis of Design Product: Tremco Tremsil 200 Sanitary.
 - .2 Volatile Organic Compound (VOC) Content: 1 g/L maximum.
 - .3 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
 - .4 Colour: White and Clear.
- 2.4 **Urethane Joint Sealants**
- 2.4.1 UJS#1: Single-Component, Nonsag, Moisture-Cure, Polyurethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, Use NT; Greenguard certified.
- .1 Basis of Design Product: Tremco Dymonic 100.
 - .2 Volatile Organic Compound (VOC) Content: 40 g/L maximum.
 - .3 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
 - .4 Tensile Strength ASTM D412: 350 to 450 psi
 - .5 Percent Elongation ASTM D412: 800 to 900%
 - .6 Modulus at 100% ASTM D412: 75 to 85 psi
 - .7 Tear Strength ASTM D412: 65 to 75 psi
 - .8 Smoke Development ASTM E84: 5
 - .9 Colour: As selected by Agency from manufacturer's standard line.
- 2.4.2 UJS#2: Immersible, Single-Component, Pourable, Traffic Grade Polyurethane Joint Sealant: ASTM C920, Type S, Grade P, Class 50, Use T and I.
- .1 Basis of Design Product: Tremco Vulkem 45 SSL.
 - .2 Volatile Organic Compound (VOC) Content: 110 g/L maximum.
 - .3 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
 - .4 Colour: As selected by Agency from manufacturer's standard line.
- 2.5 **Latex Joint Sealants**
- 2.5.1 LJS#1: Latex Joint Sealant: Siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
- .1 Basis of Design Product: Tremco Tremflex 834.
 - .2 Volatile Organic Compound (VOC) Content: 35 g/L maximum.
-

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- .3 Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
- .4 Colour: White, paintable.

2.6 Acoustical Sealants

- 2.6.1 AJS#1: Acoustical/Curtainwall Sealant: Single-component, non-hardening, non-sag, paintable synthetic rubber-tested to reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing of similar assemblies according to ASTM E90.
 - .1 Basis of Design Product: Tremco Acoustical/Curtainwall Sealant.
 - .2 Volatile Organic Compound (VOC) Content: 160 g/L maximum.
 - .3 Colour: White, paintable.

2.7 Joint Sealant Accessories

- 2.7.1 Cylindrical Sealant Backing: ASTM C1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.
- 2.7.2 Bond Breaker Tape: Polymer tape compatible with joint sealant and adjacent materials and recommended by sealant manufacturer.
- 2.7.3 Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.
- 2.7.4 Cleaners: Chemical cleaners acceptable to joint sealant manufacturer.
- 2.7.5 Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

3. EXECUTION**3.1 Examination**

- 3.1.1 Examine joint profiles and surfaces to determine if work is ready to receive joint sealants. Verify joint dimensions are adequate for development of sealant movement capability. Verify joint surfaces are clean, dry, and adequately cured. Proceed with joint sealant work once conditions meet sealant manufacturer's written recommendations.

3.2 Preparation

- 3.2.1 Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer. Comply with ASTM C1193.
 - .1 Remove curing compounds, laitance, form-release agents, dust, and other contaminants.
 - .2 Clean nonporous and porous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.

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- .3 Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 Application

- 3.3.1 Sealant and Primer Installation Standard: Comply with ASTM C1193 and manufacturer's written instructions.
 - 3.3.2 Joint Backing: Select joint backing materials recommended by sealant manufacturer as compatible with sealant and adjacent materials. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement.
 - 3.3.3 Install joint backing to maintain the following joint ratios:
 - .1 Joints up to 13mm wide: 1:1 width to depth ratio.
 - .2 Joints greater than 13mm wide: 2:1 width to depth ratio; maximum 13mm joint depth.
 - .3 Install bond breaker tape over substrates when sealant backings are not used.
 - 3.3.4 Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.
 - 3.3.5 Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.
 - 3.3.6 Liquid Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths recommended for application. Apply in continuous operation from bottom to top of joint vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.
 - .1 Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
 - .2 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
 - .3 Tool exposed joint surface concave using tooling agents approved by sealant manufacturer for application.
 - 3.3.7 Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.
 - .1 Remove masking tape immediately after tooling joint without disturbing seal.
 - .2 Remove excess sealant from surfaces while still uncured.
 - 3.3.8 Installation of Acoustical Sealant: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control
-

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joints, and at openings and penetrations on both sides of assemblies with a continuous bead of acoustical sealant. Comply with ASTM C919 and with manufacturer's written recommendations.

3.4 Field Quality Control

- 3.4.1 Field-Adhesion Testing: Perform adhesion tests in accordance with manufacturer's instructions and with ASTM C1193, Method A.
 - .1 Perform 5 tests for the first 300m of joint length for each kind of sealant and joint substrate, and one test for each 300m of joint length thereafter or 1 test per each floor per building elevation, minimum.
 - .2 For sealant applied between dissimilar materials, test both sides of joint.
- 3.4.2 Remove sealants failing adhesion test, clean substrates, reapply sealants, and re-test. Test adjacent sealants to failed sealants.
- 3.4.3 Submit report of field adhesion testing to Agency indicating tests, locations, dates, results, and remedial actions taken.

3.5 Exterior Joint Sealant Schedule

- 3.5.1 Exterior concealed transition joints in air barrier.
 - .1 SJS#1: Single-component neutral-curing low-modulus silicone sealant.
 - .2 Compatibility: Compatible with air barrier components specified in Section 07 27 00.
 - 3.5.2 Exterior construction joints in cast-in-place concrete.
 - .1 UJS#1: Single-component non-sag urethane sealant.
 - 3.5.3 Exterior exposed joints in metal panel cladding systems.
 - .1 SJS#1: Single-component neutral-curing non-staining silicone sealant.
 - 3.5.4 Exterior concealed watertight joints in cladding systems.
 - .1 SJS#1: Single-component neutral-curing silicone sealant.
 - 3.5.5 Exterior joints between different materials listed above.
 - .1 SJS#1: Single-component neutral-curing non-staining silicone sealant.
 - 3.5.6 Exterior perimeter joints at frames of doors, windows, storefront frames, curtain wall frames, and louvers.
 - .1 SJS#1: Single-component neutral-curing non-staining silicone sealant.
 - 3.5.7 Exterior joints within aluminum storefront framing, curtain walls, and window systems:
 - .1 SJS#1: Single-component neutral-curing non-staining silicone sealant.
-

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- 3.5.8 Exterior joints within structural glazing and curtain walls: Refer to Section 08 44 13.
- 3.5.9 All other exterior non-traffic joints.
 - .1 SJS#1: Single-component neutral-curing non-staining silicone sealant.
- 3.6 **Interior Joint Sealant Schedule**
 - 3.6.1 Interior sanitary joints between plumbing fixtures, food preparation fixtures, and casework and adjacent walls, floors, and counters.
 - .1 SJS#2: Mildew-Resistant, Single-Component, nonsag, acid-curing silicone joint sealant.
 - 3.6.2 Interior traffic joints in floor and between floor and wall construction.
 - .1 UJS#2: Single-component pourable urethane sealant.
 - 3.6.3 Interior non-moving joints between interior painted surfaces and adjacent materials.
 - .1 LJS#1: Siliconized acrylic latex
 - .2 Joint-Sealant Colour: Paintable.
 - 3.6.4 Interior exposed and non-exposed acoustical applications.
 - .1 AJS#1: Acoustical joint sealant.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 08, Section 08 11 00, Metal Doors and Frames**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install metal doors and frames as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|-------|------------------|------------------------------|
| 1.3.1 | Section 06 10 10 | Rough Carpentry |
| 1.3.2 | Section 07 92 00 | Joint Sealing |
| 1.3.3 | Section 08 71 10 | Door Hardware |
| 1.3.4 | Section 09 21 16 | Gypsum Board Assemblies |
| 1.3.5 | Section 09 22 16 | Non-Structural Metal Framing |
| 1.3.6 | Section 09 91 23 | Interior Painting |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .2 ASTM C177-19e1 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- .3 ASTM C518-21 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- .4 ASTM C553-13(2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- .5 ASTM D6386-22 Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- .6 ASTM D7396-14(2020) Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting
- .7 ASTM E90-09(2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.4.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.181-99 Ready-Mixed Organic Zinc-Rich Coating.

1.4.3 CSA Group (CSA)

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- .1 CSA-G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-18 Welded Steel Construction (Metal Arc Welding).
 - 1.4.4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000
 - .2 CSDMA Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .3 CSDMA Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.
 - 1.4.5 Underwriters Laboratories Canada (ULC)
 - .1 ULC 702.1- 2014 Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - 1.4.6 American National Standards Institute (ANSI)
 - .1 ANSI 250.4-2018 Test Procedure and Acceptance Criteria for — Physical Endurance for Steel Doors, Frames and Frame Anchors
 - .2 ANSI 250.10-2011 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Provide shop drawings
 - .1 Indicate each type of door, frame, steel, construction and core.
 - .2 Indicate material thicknesses, mortises, reinforcements, anchorages, location of exposed fasteners, openings, arrangement of hardware, and finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on Contract Drawings and door schedule.
 - 1.6 **Defining Opening Sizes**
 - 1.6.1 Width - Widths of openings shall be measured from inside to inside of frame jamb rabbets. (Referred to as "frame rabbet width" or "nominal door width")
 - 1.6.2 Height - Heights of openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame. (Referred to as "frame rabbet height" or "nominal door height")
 - 1.6.3 Door Sizes - Doors shall be sized so as to fit the above openings and allow a 3mm nominal clearance at jambs and head of frame. A clearance of 13mm maximum shall be allowed between the bottom of the door and the finished floor (exclusive of floor coverings).
 - 1.6.4 Tolerances - Doors and frame product shall be manufactured and installed in accordance with the CSDMA's, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".
-

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PROJECT 22701****Appendix 8.2, Division 08, Section 08 11 00, Metal Doors and Frames**

1.7 Shipping, Handling and Storage

1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.8 Testing and Performance

1.8.1 Product quality shall meet the standards established by the Canadian Steel Door Manufacturer's Association.

1.8.2 Door construction shall meet acceptance criteria of ANSI A250.10 and shall be certified as meeting Level A (1,000,000 cycles) and Twist Test Acceptance Criteria deflection not to exceed 6.4mm/13.6 kg force, total deflection at 136.1 kg force not to exceed 64 mm and permanent deflection not to exceed 3.0mm when tested in strict conformance with ANSI A250.4. Test shall be conducted by an independent nationally recognized accredited laboratory.

2. PRODUCTS**2.1 Materials****2.1.1 Acceptable Materials**

.1 Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

2.1.2 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 unless noted otherwise.

2.1.3 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653, ZF75.

2.1.4 Door Core Materials

.1 Interior Doors: Structural small cell, 24.5mm maximum kraft paper 'honeycomb'. Weight 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness. ULC approved.

2.1.5 Primers:

.1 Touch-up prime CAN/CGSB-1.181, organic zinc rich, rust inhibitive.

.1 Maximum VOC limit 50 g/L to GC-03.

2.2 Adhesives

2.2.1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.

2.2.2 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

2.2.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, low VOC sealant/adhesive or U.L.C. approved equivalent.

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2.3 Accessories

- 2.3.1 Door silencers: single stud rubber/neoprene type.
- 2.3.2 Fiberglass: to ULC 702, loose batt type, minimum density of 24 kg/m³.
- 2.3.3 Metallic paste filler: to manufacturer's standard.
- 2.3.4 Sealant: As specified in Section 07 92 00 – Joint Sealing.

2.4 Fabrication - Frame Products**2.4.1 General**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Interior frame product shall be 1.60mm. Interior frames, transoms, sidelights and window assemblies shall be welded type construction.
- .4 Blank, reinforce, drill and tap frames for templated hardware and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Prepare frames to receive electrical conduit for door operators where indicated and required.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 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 1520mm provide two (2) anchors, and an additional anchor for each additional 760mm 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 150mm from the top and bottom of each jamb, and intermediate anchors at 660mm on centre maximum. Fasteners for such anchors shall be provided by others.
- .8 Minimum reinforcing, anchor and other component thickness shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".
- .9 Each interior door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two for double door openings, except on gasketed frame product.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.4.2 Welded Type

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

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- .3 Cope accurately and securely weld butt joints of mullions, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 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 holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150mm of the base of the jamb, shall be substituted.
- .6 Weld in two temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.
- .7 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.
- .8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .9 Manufacturer's nameplates on frames and screens are not permitted

2.5 Fabrication - Doors**2.5.1 General**

- .1 Interior doors: insulated steel construction with honeycomb core laminated to minimum 1.19mm nominal thickness steel face sheets under pressure.
- .2 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.
- .3 Doors: swing type, flush.
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.

2.5.2 Longitudinal edges shall be mechanically inter-locked, adhesive assisted. Seams: visible grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

2.5.3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware and electronic hardware, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

2.5.4 Holes 12.7mm 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 12.7mm 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.

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- 2.5.5 Doors shall be reinforced where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- 2.5.6 Provide top and bottom of doors with inverted, recessed, welded steel channels.
- 2.5.7 Minimum reinforcing and component thickness shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".
- 2.5.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- 2.5.9 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.
- 2.5.10 Manufacturer's nameplates on doors are not permitted.

2.6 Finishes

- 2.6.1 Doors and frames shall wipe coat zinc, ready for painting on site by Contractor. Paint colour to be selected by the Agency.

3. EXECUTION**3.1 Manufacturer's Instructions**

- 3.1.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 Installation

- 3.2.1 Install doors and frames to CSDMA Installation Guide, NAAMM-HMMA 840, Installation Guide for Commercial Steel Doors and Frames.
- 3.2.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows:
 - .1 Hinge side: 1.0mm.
 - .2 Latch side and head: 1.5mm.
 - .3 Finished floor and thresholds: 13mm.
- 3.2.3 Caulk perimeter of frames. Refer to Section 07 92 10 – Joint Sealants.

3.3 Finish Repairs

- 3.3.1 Touch up with primer finishes damaged during installation.
- 3.3.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install glazed aluminum curtain wall systems as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|-------|------------------|--------------------------------|
| 1.3.1 | Section 05 12 23 | Structural Steel for Buildings |
| 1.3.2 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.3 | Section 06 10 00 | Rough Carpentry |
| 1.3.4 | Section 07 21 13 | Building Insulation |
| 1.3.5 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.6 | Section 07 92 00 | Joint Sealing |
| 1.3.7 | Section 08 80 50 | Glazing |
| 1.3.8 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References

| | | |
|-------|---------------------------|--|
| 1.4.1 | ASTM International (ASTM) | |
| .1 | ASTM A36/A36M-19 | Standard Specification for Carbon Structural Steel |
| .2 | ASTM A276/A276M-17 | Standard Specification for Stainless Steel Bars and Shapes |
| .3 | ASTM A1008/A1008M-21a | 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 |
| .4 | ASTM A1011/A1011M-18a | 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 |
| .5 | ASTM B221-21 | Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes |
| .6 | ASTM C612-14(2019) | Standard Specification for Mineral Fiber Block and Board Thermal Insulation |
| .7 | ASTM C864-05(2019) | Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers |
| .8 | ASTM C920-18 | Standard Specification for Elastomeric Joint Sealants |

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- .9 ASTM E283/E283M-19 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - .10 ASTM E330/E330M-14(2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
 - .11 ASTM E331-00(2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - .12 ASTM E413-22 Classification for Rating Sound Insulation.
 - .13 ASTM E547-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential.
 - .14 ASTM E783-02(2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
 - .15 ASTM E1105-15(2023) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
 - .16 ASTM E1300-16 Standard Practice for Determining Load Resistance of Glass in Buildings
 - 1.4.2 The Aluminum Association, Inc (AA)
 - .1 DAF-45 Designation System for Aluminum Finishes.
 - 1.4.3 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA 501 Methods of Test for Exterior Walls
 - .2 AAMA 609 & 610.2 Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
 - .3 AAMA 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
 - .4 AAMA 2603 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
 - .5 AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
 - .6 AAMA CW-11 Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing
 - .7 AAMA CW-DG-1 Aluminum Curtain Wall Design Guide Manual
 - .8 AAMA MCWM-1 Metal Curtain Wall Manual
 - .9 AAMA T1R-A1 Sound Control for Fenestration Products.
 - 1.4.4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.20-M89 Structural Design of Glass for Buildings.
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- 1.4.5 CSA Group (CSA)
 - .1 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA S157-05/S157.1-05 (R2010) Strength Design in Aluminum.
 - .3 CSA W59.2-M1991 (R2008) Welded Aluminum Construction.
 - 1.4.6 Ontario Ministry of Municipal Affairs and Housing (MMAH)
 - .1 Ontario Building Code
 - .2 MMAH Supplementary Standard SB-10, Energy Efficiency Requirements.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Samples: Submit duplicate 300mm long sample sections of all component parts of aluminum extrusions, finished in specified colours.
 - 1.5.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate materials and profiles and provide full-size, scaled details for components.
 - .3 Indicate interior trim and exterior junctions with adjacent construction.
 - .4 Indicate junctions between combination units. Indicate elevations of units. Indicate core thicknesses of components.
 - .5 Indicate: Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, accessories and caulking materials. Indicate location of caulking.
 - .6 Indicate arrangement of hardware and required clearances to surrounding structure.
 - .7 Indicate assembly details and dimensions of fabrication.
 - .8 Indicate installation details and sequencing, method of glass installation, and location and method of sealing air and vapour barrier to curtain wall frame components.
 - .9 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anticipated deflection under load, affected related work, weep drainage network, expansion and contraction joint location and details, and field welding required.
 - .10 Indicate methods of accommodating thermal expansion and contraction, provisions for structural deflections, contractions, expansion and other normal movements.
 - .11 Indicate design loads and maximum support reactions.
 - 1.5.4 Submit test reports from approved independent testing laboratories, certifying compliance with specified performance characteristics and physical properties, for:
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- .1 Energy efficiency (MMAH SB-10 compliance for complete assembly including glass units).
 - .2 Structural design.
 - .3 Wind load resistance.
 - .4 Thermal resistance.
 - .5 Air infiltration.
 - .6 Water tightness
 - .7 Condensation resistance.
 - .8 Anodized finish, weathering characteristics.
 - .9 Design and components not complying with above requirements will not be accepted.
- 1.5.5 Certificates: submit product certificates signed by manufacturer certifying materials and assemblies comply with specified performance characteristics and criteria and physical requirements.
- 1.5.6 Design Calculations:
- .1 Submit design calculations of curtain wall system. Be responsible for the design of all components and accessories thereof and connections in accordance with the requirements of the Ontario Building Code.
 - .2 Make thorough examination of all Contract Drawings and details, check interfacing with work of other Contracts and other factors influencing the engineering design and performance of the work and be fully cognizant of requirements.
 - .3 The engineering design calculations and drawings for the curtain wall shall be prepared by a registered Professional Engineer registered to practice in Ontario. The said Engineer shall affix his seal and signature to the design calculations and drawings.
 - .4 Design to withstand without failure the positive and negative forces imposed by wind, earthquake, temperature and shrinkage stress, deflections of the supporting or adjacent structures, all with deflection limitations governed by the design of the supporting structure. The external pressure of suction due to wind on part or all of the surface of the units shall be calculated in accordance with the requirements of the Ontario Building Code.
- 1.5.7 Operations and Maintenance Data: At completion of the project submit three copies of manufacturer's maintenance, cleaning and maintenance instructions for curtain walls for inclusion into Operation and Maintenance Manuals specified in Section 01 78 00 – Closeout Submittals.
- 1.6 **Quality Assurance**
- 1.6.1 The installers executing the work of this Section shall have had at least ten years continuous Canadian experience in the successful manufacture and
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installation of work of the type and quality shown and specified and shall be approved by the systems manufacturer.

- 1.6.2 Design Engineer for curtain wall systems shall have a minimum five years of experience in the design of similar systems. Submit proof of experience on request.
- 1.6.3 Pre-installation Conference: Conduct a pre-installation conference to review and verify project requirements, substrate conditions, manufacturer's installation instructions and warranty requirements. Meeting shall be attended by manufacturer's representative, sealant manufacturer's representative, installer, Contractor and Consultant.
- 1.6.4 Perform work in accordance with AAMA CW-DG-1.
- 1.6.5 Perform welding work in accordance with CSA W59.2.

1.7 Performance Requirements

- 1.7.1 Structural members including intermediate mullions and horizontals, shall be designed to withstand loading in accordance with the Ontario Building Code.
 - 1.7.2 Design system to accommodate, without damage to components or deterioration of seals:
 - .1 Movement within system.
 - .2 Movement between system and perimeter framing components.
 - .3 Dynamic loading and release of building structural loads.
 - .4 Deflection, shortening or creep of structural support framing.
 - 1.7.3 Design system to accommodate expansion and contraction within system components caused by cycling temperature range of 10° C, over a 12 hour period, without causing detrimental effect to system components.
 - 1.7.4 Structural performance shall be based on ASTM E330 and CSA S157-05/S157.1 "Strength Design in Aluminum" and a maximum deflection of 1/175 of the span of unsupported span with full recovery of glazing materials.
 - 1.7.5 Design system as thermally broken, pressure-equalized vented and drained assembly.
 - 1.7.6 Insulating glass units in combination with curtain wall framing shall be designed by the supplier to comply with ASTM E1300.
 - 1.7.7 Air infiltration shall not exceed 0.0003 m³/s.m² when tested in accordance with ASTM E283 at a pressure differential of 298.77 Pa.
 - 1.7.8 Water penetration: To ASTM E331: None, with static pressure of 718.2 Pa.
 - 1.7.9 Drain water entering joints, condensation occurring in glazing channels or migrating moisture occurring within system, to exterior by weep drainage network.
 - 1.7.10 Provide continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing
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compound. Position thermal insulation on exterior surface of air and vapour barrier.

- 1.7.11 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.

1.8 **Protection**

- 1.8.1 Protect the work of this trade from damage. Protect work of other trades resulting from the work of this Section.
- 1.8.2 Provide at the factory, strippable coatings on all exposed surfaces of aluminum. This coating and protective wrappings shall remain on the surfaces through the period that other trades' works proceed on the building and shall be removed on completion of the building.
- 1.8.3 Make good all damaged work caused by failure to provide adequate protection. Remove unsatisfactory work and replace at no expense to the Agency.

1.9 **Sequencing**

- 1.9.1 Co-ordinate work of this Section with air barrier placement, flashing placement, and other related components or materials.

1.10 **Project Conditions**

- 1.10.1 Do not install sealants when ambient and surface temperature is less than 5 °C. Maintain this minimum temperature during and after installation of sealants.

1.11 **Shipping, Handling and Storage**

- 1.11.1 Deliver, store and handle materials in accordance with manufacturer's written instructions. Handle work of this section in accordance with AAMA CW-10.
- 1.11.2 Store materials indoors in dry location. Ensure materials do not come in contact with ground or other damp substrates.
- 1.11.3 Cover exposed pre-finished surfaces with pressure-sensitive, heavy protection paper or apply strippable plastic coating before shipping to job site. Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.12 **Warranty**

- 1.12.1 Warrant the work of this Section against defects of workmanship and material, for a period of five years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

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1.12.2 Provide a warranty stating that the anodized finish will be non-fading, nonconvertible, and permanently a part of the metal surface for a period of five years after acceptance of the building. The warranty shall state that any item showing failure during the warranty period will be replaced or refinished to the original condition, at no cost to the Agency.

2. PRODUCTS**2.1 Manufacturers**

2.1.1 Manufacture: Aluminum sections and products manufactured by Kawneer Company Canada Ltd. form the basis of the Contract Drawings and Specifications. The following manufacturers are considered as acceptable alternates subject to approval by the Consultant, of supporting technical literature, samples, drawings, engineering data and performance data:

- .1 Alumicor
- .2 Commdoor
- .3 CRL United States Aluminum
- .4 Oldcastle
- .5 Windspec
- .6 Or Agency approved equivalent.

2.2 Materials

2.2.1 System Description: Vertical, glazed, pre-finished aluminum curtain wall system including thermally broken tubular steel reinforced aluminum sections. Double-glazed, hermetically sealed vision. Related flashings, anchorage and attachment devices.

2.2.2 Assembled system to permit re-glazing of individual glass and infill panel units without requiring removal of structural mullion sections.

2.2.3 Extruded aluminum: To ASTM B221, AA 6063-T54 or 6063-T6 alloy and temper.

2.2.4 Member Wall Thickness: Each framing member shall provide structural strength to meet or exceed specified performance requirements.

2.2.5 Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.2.6 Curtain wall framing shall be designed to suit glass thickness indicated.

2.2.7 Extruded aluminum sills to size and shape to suit wall conditions, complete with end drip deflectors, cover plates and necessary anchors.

2.2.8 Flashings: Pre-finished aluminum where exposed to view. Finish: To match curtain wall sections. Secured with concealed fasteners.

2.2.9 Fasteners: Where exposed shall be stainless steel, to ASTM A276, 300 series or 400 series stainless steel cadmium plated of sufficient size and quantity to suit their intended purpose.

2.2.10 Steel Reinforcement, Weld Plates, Structural Sections and Anchors: Complying with ASTM A36 for structural shapes, plates and bars; ASTM

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A1008 for cold-rolled sheet and strip or ASTM A1011 for hot-rolled sheet strip.

- 2.2.11 Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- 2.2.12 Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
- 2.2.13 Pressure plates: Mechanically fastened fibreglass pressure plate of sufficient size and strength to provide adequate bite on glass and infill panels.
- 2.2.14 Exterior pressure plate cover: Extruded aluminum, standard sizes and profiles as detailed and to suit job conditions. Snap-on. Finish to match curtain wall framing.
- 2.2.15 Glass and Glazing: Glass and Glazing shall be as specified in Section 08 80 05.
- 2.2.16 Weathering and glazing gaskets: to ASTM C864, extruded silicone compatible EPDM rubber that provides for silicone adhesion.
- 2.2.17 Weathering and glazing gaskets: Exterior glazing system.
- 2.2.18 Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, containing no asbestos, formulated for 0.762mm thickness per coat.
- 2.2.19 Sealant: Single-Component, Nonsag, Moisture-Cure, Polyurethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, Use NT as specified in Section 07 92 00 – Joint Sealing.
- 2.2.20 Adhesives: as recommended by manufacturer of materials to be bonded.

2.3 Curtain Wall System

- 2.3.1 Exterior Curtain Wall Framing to be Kawneer 1600UT System 1 thermally broken prefinished aluminum curtain wall framing or approved equivalent.
- 2.3.2 Curtain wall framing profile: 63.5mm wide thermally broken with interior tubular section insulated from exterior pressure plate. Mullion depths: 190.5mm or as required by engineered design. Exterior caps: 19mm. Stick system with shear block connections. Pressure-equalized rain screen design with drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system.
- 2.3.3 Glazing: all locations: 25mm thick insulating glass.

2.4 Fabrication

- 2.4.1 Fabricate in accordance with manufacturer's written instructions.
- 2.4.2 Take field measurements prior to fabrication.

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- 2.4.3 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly without adversely affecting installation and dynamic movement of perimeter seal.
- 2.4.4 Design and fabricate coupling mullions to eliminate seam joints on exterior, to provide functional split, to permit modular construction and to allow for thermal expansion.
- 2.4.5 Framing joints to be accurately machined, fit, assembled, secured and sealed to provide tight, hairline, flush, neat weathertight joints and corners.
- 2.4.6 Prepare components to receive anchor devices. Install anchors.
- 2.4.7 Arrange fasteners and attachments to ensure concealment from view.
- 2.4.8 Reinforce framing members for external imposed loads.
- 2.4.9 Fabricate glazed pockets and insulation cavities with vents and drains, and pressure equalize to form rain screen assembly. Fabricate frames square to profiles shown and prepare for glazing. Fill frames with manufacturer's insulation.
- 2.4.10 Design and fabricate necessary brackets and anchorage devices so that, when installed, they will compensate for unevenness and dimensional difference in the structure to which they are secured, will allow full expansion and contraction of framing members as a result of such expansion and contraction of framing members and will adequately sustain themselves, the curtain wall framing, superimposed wind and rain loads and all other stresses.
- 2.4.11 Welding of component members will be permitted providing it does not in any way mar the surface appearance and with joints made tight, in true plane, ground and sanded smooth, flush with base metal. Do all welding on concealed surface.
- 2.4.12 Provide thermal break to maintain the interior surface of frames and glass free from condensation and frosting under conditions of minimum -12° C outside temperature with 24° C inside temperature at 35% relative humidity. All frame members to have extruded silicone compatible elastomeric thermal break integrated with the inner and outer aluminum extrusions by a roll-crimping process to form a rigidly interconnected assembly without the use of fasteners or other thermal bridging elements.
- 2.4.13 Equip sill base with splice plate back up sections at joint in long runs. Seal ends and jambs to provide neat, weather tight joints.
- 2.4.14 Provide adequate, shielded drainage and pressure equalization where required.
- 2.4.15 Aluminum Sills: Extruded to size and shape as detailed, complete with end drip deflectors, expansion cover plates and necessary anchors.
- 2.4.16 Form continuous flashings with intermediate clips, anchorages and reinforcing and as much as possible, be shop assembled. Provide all filler and closure pieces as required.

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2.5 Air Barriers and Vapour Retarders

2.5.1 Equip curtain wall framing with factory-installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:

- .1 Material: Identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
- .2 Material width: Adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

2.6 Aluminum Finishes

2.6.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.

2.6.2 Clear anodic finish: designation AA- AA M10C22A41, not less than 18 micrometre thick, Architectural Class I designation.

2.7 Isolation Coating

2.7.1 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials to provide isolation coating. Isolate aluminum from following:

- .1 Dissimilar metals, except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar, masonry and other alkaline materials.

2.7.2 Coating material shall be low VOC type conforming to SCAQMD Rule 1113-96.

3. EXECUTION**3.1 Examination**

3.1.1 Verify dimensions, tolerances and method of attachment with other work on site.

3.1.2 Verify that wall openings and adjoining air barrier materials are prepared and ready to receive work of this Section and match reviewed shop drawings.

3.1.3 Commence installation only when variations or discrepancies on the Site which will prevent satisfactory installation of this Section's work are corrected.

3.2 Installation

3.2.1 Install curtain wall system in accordance with manufacturer's written instructions and reviewed shop drawings and AAMA MCWM-1 Metal Curtain Wall Manual. Install in accordance with manufacturer's written instructions to achieve vented and drained, pressure-equalized rain screen assembly.

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- 3.2.2 Provide all fastenings or anchors to be built in under other Sections. Coordinate location and connection details for intermediate support framing with Section 05 12 23.
 - 3.2.3 Attach to exterior wall panels to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
 - 3.2.4 Provide alignment attachments and shims to permanently fasten system. Clean weld surfaces. Apply protective primer to field welds and adjacent surfaces.
 - 3.2.5 Align assembly and install plumb and level, square, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.
 - 3.2.6 Provide thermal isolation where components penetrate or disrupt building insulation.
 - 3.2.7 Install sill flashings.
 - 3.2.8 Co-ordinate attachment and seal of perimeter air barrier and vapour barrier materials.
- 3.3 **Site Tolerances**
- 3.3.1 Maximum variation from plumb: 1.6mm per .91 m non-cumulative or 12.7mm per 30.48 metres, whichever is less.
 - 3.3.2 Maximum misalignment of two adjoining members abutting in plane: 0.8mm.
 - 3.3.3 Maximum sealant space between curtain wall and adjacent construction: 12.7mm.
- 3.4 **Semi Rigid Curtain Wall Insulation**
- 3.4.1 Install board insulation in curtain wall construction as indicated, in accordance with curtain wall manufacturer's written instructions.
 - 3.4.2 Place insulation within panel, adhered to exterior face of interior sheet, over entire area with impale fasteners spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching glass.
 - 3.4.3 Arrange fasteners and attachments to ensure concealment from view.
 - 3.4.4 Maintain cavity width of dimension indicated between insulation and glass.
 - 3.4.5 Seal voids and gaps.
- 3.5 **Glazing**
- 3.5.1 Install glass in accordance with Section 08 80 50 - Glazing, to glazing method required to achieve performance criteria and to recommendations of manufacturer.
- 3.6 **Caulking**
- 3.6.1 Refer to Section 07 92 00 – Joint Sealing. Install perimeter sealant to method required to achieve performance criteria.
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3.7 Field Quality Control

- 3.7.1 Manufacturer's field services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- 3.7.2 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of work at 25% and 60% complete.
 - .3 Upon completion of work after cleaning is carried out.
- 3.7.3 Field Tests: Agency shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
 - .1 Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
 - .1 Air Leakage Tests: Conduct tests in accordance with ASTM E783. Allowable air leakage shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - .2 Water Infiltration Tests: Conduct tests in accordance with ASTM E1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 383 Pa.
 - .2 Evaluate installed system by thermo-photographic scan.
- 3.7.4 Obtain reports within three days of review and submit immediately to Consultant.

3.8 Cleaning

- 3.8.1 Remove protective material from pre-finished aluminum surfaces.
- 3.8.2 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- 3.8.3 Perform cleaning of aluminum components in accordance with AAMA 609 & 610.2.
- 3.8.4 Remove excess sealant by moderate use of solvent acceptable to sealant manufacturer.
- 3.8.5 Visible manufacturer's identification labels are not permitted.

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3.9 **Protection**

3.9.1 Protect finished work from damage.

END OF SECTION

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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install finishing door hardware as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 06 20 00 Finish Carpentry

1.3.2 Section 08 11 14 Metal Doors and Frames

1.4 References

1.4.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)

.1 ANSI/DHI A115.1G-1994 Installation Guide for Doors and Hardware

.2 ANSI/ICC A117.1-2017 Accessible and Usable Buildings and Facilities

.3 ANSI/BHMA A156.1-2013 American National Standard for Butts and Hinges.

.4 ANSI/BHMA A156.2-2011 Bored and Preassembled Locks and Latches.

.5 ANSI/BHMA A156.3-2014 Exit Devices.

.6 ANSI/BHMA A156.4-2013 Door Controls - Closers.

.7 ANSI/BHMA A156.5-2014 Auxiliary Locks and Associated Products.

.8 ANSI/BHMA A156.6-2010 Architectural Door Trim.

.9 ANSI/BHMA A156.8-2010 Door Controls - Overhead Stops and Holders.

.10 ANSI/BHMA A156.10-2011 Power Operated Pedestrian Doors.

.11 ANSI/BHMA A156.12-2013 Interconnected Locks and Latches.

.12 ANSI/BHMA A156.13-2012 Mortise Locks and Latches Series 1000.

.13 ANSI/BHMA A156.15-2011 Release Devices - Closer Holder, Electromagnetic and Electromechanical.

.14 ANSI/BHMA A156.16-2013 Auxiliary Hardware.

.15 ANSI/BHMA A156.18-2012 Materials and Finishes.

.16 ANSI/BHMA A156.19-2013 Power Assist and Low Energy Power - Operated Doors.

1.4.2 Canadian Steel Door Manufacturers' Association (CSDMA)

.1 CSDMA Canadian Metric Guide for Steel Doors and Frames

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(Modular Construction): Standard Hardware Location Dimensions.

- 1.4.3 Door Hardware Institute (DHI)
- 1.4.4 Accessibility for Ontarians with Disabilities Act (AODA)

1.5 Submittals

- 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- 1.5.2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- 1.5.3 Samples:
 - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .2 After approval samples will be returned for incorporation in the Work.
- 1.5.4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- 1.5.5 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- 1.5.6 Provide operation and maintenance data for door closers, locksets, door holders, electrified hardware and fire exit hardware for incorporation into Operations and Maintenance Manuals specified in Section 01 78 00 - Closeout Submittals.

1.6 Quality Assurance

- 1.6.1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
 - .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- 1.6.2 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.7 Shipping, Handling and Storage

- 1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.7.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
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- 1.7.3 Receive the delivery of the Finishing Hardware and identify all items against the Finishing Hardware Schedule. Ensure each hardware item is accompanied by the correct template, installation instructions, special tools, fastening devices and other loose items. Advise the finish hardware supplier and Agency in writing of errors or omissions.
- 1.7.4 Storage and Protection: Store finishing hardware in locked, clean and dry area.
- 1.7.5 Remove all hardware from doors and frames prior to painting. After painting is complete and dry, reinstall all hardware to manufacturer's recommendations.

2. PRODUCTS**2.1 Materials**

- 2.1.1 All hardware shall be supplied as specified in the Finishing Hardware Schedule.
- 2.1.2 All finishes shall be as indicated in the Finishing Hardware Schedule by international codes.
- 2.1.3 All door handles shall be lever type meeting requirements of the referenced accessibility standards and the Ontario Building Code.
- 2.1.4 Power Door Operators and controls shall be CSA approved and shall meet the requirements of the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act (AODA).

2.2 Fastenings

- 2.2.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- 2.2.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- 2.2.3 Exposed fastening devices to match finish of hardware.
- 2.2.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- 2.2.5 Use fasteners compatible with material through which they pass.

2.3 Electrified Devices

- 2.3.1 Electrified exit devices shall conform to all traditional exit device standards as specified above. All power requirements for exit devices used must utilize a continuous circuit electric hinge for clean design and no visible means of interrupting power to device.
- 2.3.2 All exit devices with electric latch retraction shall provide for a remote means of unlocking for momentary or maintained periods of time.
- 2.3.3 Exit devices with electrified trim shall be fail-secure unless otherwise specified.

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2.4 Keying

- 2.4.1 Keying: All permanent cylinders to be grandmaster-keyed as directed by the Agency. The factory shall key all locks and cylinders and maintain keying records. The factory shall establish a System Information Document (SID) to designate primary system administrators and require a separate letter of authorization for all future shipments of keyed products.
- 2.4.2 Remove all construction cores and install all permanent cores. Unless otherwise directed by the Consultant.
- 2.4.3 Construction master/change keys are to be delivered by the Contractor directly to the Agency.
- 2.4.4 Ship all permanent cylinders and keys separately. Identify door number and keyset symbol on each envelope for direct factory delivery to the Agency.

3. EXECUTION**3.1 Manufacturer's Instructions**

- 3.1.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- 3.1.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- 3.1.3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 Examination

- 3.2.1 Before installing any hardware, carefully check all Contract Drawings of the work requiring hardware, verify door swings, door and frame materials and operating conditions, and assure that all hardware will fit the work to which it is to be attached.
- 3.2.2 Check all shop drawings and frame and door lists affecting hardware type and installation, and certify to the correctness thereof, or advise the hardware supplier and Agency in writing of required revisions.

3.3 Templates

- 3.3.1 Check the hardware schedule, Contract Drawings and specifications, and furnish promptly to the applicable trades any patterns, templates, template information and manufacturer's literature required for the proper preparation for and application of hardware, in ample time to facilitate the progress of the work.

3.4 Installation

- 3.4.1 Installation of hardware shall be in accordance with ANSI A115.1G, manufacturer's templates and instructions.
 - 3.4.2 Install each item of mechanical and electro-mechanical hardware and access control equipment to comply with the manufacturer's written
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instructions and according to specifications. All items to be installed with fasteners identified by manufacturer's installation instructions unless otherwise noted.

- 3.4.3 Mounting Heights: Install door hardware at heights indicated in the following applicable publications unless; specifically indicated or required by local governing regulations, requirements to match for special templates, necessary coordination with door elevations, and or to ensure consistency with pairs of doors.
 - .1 DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames"
 - .2 ANSI/ICC A117.1 Accessibility Guidelines for Buildings and Facilities
 - .3 NWWDA
 - .4 AODA
- 3.4.4 Power door operator products and accessories are required to be installed by an AAADM certified technician as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system.
- 3.4.5 Coordinate installation of electric door strikes, keypad locks, card readers, washroom duress systems, and other electronic door control and security devices with Electrical contractor including supply and installation of wiring and all terminations.
- 3.4.6 All hardware shall be installed by carpenters, skilled in the application of architectural hardware and satisfactory to the hardware supplier. Refer to Section 06 20 00 - Finish Carpentry. Instruction sheets, details and templates shall be read and understood before installation.
- 3.4.7 Install all materials as listed in the Finishing Hardware Schedule on the doors and frames listed. Interchanging of hardware will not be allowed.
- 3.4.8 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- 3.4.9 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- 3.4.10 Remove construction cores when directed by Agency.
- 3.4.11 After installation, templates, installation instructions and details shall be put in a file and turned over to the Agency, when building is Substantially Performed.

3.5 Field Quality Control

- 3.5.1 Conduct periodic inspections to ensure that door frames are installed plumb, level and square with verification by installer prior to installation of doors and door hardware.
- 3.5.2 Hardware supplier to attend site meetings as required to ensure proper execution of the guidelines set forth herein.

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- 3.5.3 Hardware supplier will perform final field inspection of installed door hardware after final adjustment of all products and will document and report any deficiencies or omissions for correction and written acceptance by the Contractor.

- 3.6 **Adjusting**
 - 3.6.1 Adjust door hardware, operators, closers and controls for optimum, smooth operating condition, safety and for weather tight closure.
 - 3.6.2 Lubricate hardware, operating equipment and other moving parts.
 - 3.6.3 Adjust door hardware to provide tight fit at contact points with frames.

- 3.7 **Demonstration**
 - 3.7.1 Instruct Agency's maintenance personnel in the proper adjustment, operation and maintenance of mechanical and electromechanical door hardware, electronic devices and maintenance of finishes.

- 3.8 **Cleaning**
 - 3.8.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - 3.8.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - 3.8.3 Remove protective material from hardware items where present.

END OF SECTION

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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install glazing as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

1.3.1 Section 07 92 10 Joint Sealing
1.3.2 Section 08 11 14 Metal Doors and Frames
1.3.3 Section 08 44 13 Glazed Aluminum Curtain Walls

1.4 References

1.4.1 ASTM International (ASTM)
.1 ASTM C162-05 (2015) Standard Terminology of Glass and Glass Products.
.2 ASTM C542-05(2017) Standard Specification for Lock-Strip Gaskets
.3 ASTM C1048-18 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
.4 ASTM C1376-15 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
.5 ASTM D790-17 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
.6 ASTM D2240-15e1 Standard Test Method for Rubber Property—Durometer Hardness
.7 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials
.8 ASTM E330/E330M-14 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
.9 ASTM E1300-16 Standard Practice for Determining Load Resistance of Glass in Buildings
1.4.2 American National Standards Institute (ANSI).
.1 ANSI Z97.1 American National Standard for Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
1.4.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-12.1-17 Safety Glazing
.2 CAN/CGSB-12.2-91 (R2017) Flat, Clear Sheet Glass.

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- .3 CAN/CGSB-12.3-91 (R2017) Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-91 (R2017) Heat Absorbing Glass
 - .5 CAN/CGSB-12.8-17 Insulating Glass Units
 - 1.4.4 American Architectural Manufacturer's Association (AAMA)
 - .1 AAMA SSGPG-1 Structural Silicone Glazing (SSG) Design Guidelines.
 - 1.4.5 CSA Group (CSA)
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - 1.4.6 Consumer Product Safety Commission
 - .1 CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
 - 1.4.7 Environmental Choice Program (ECP).
 - .1 CCD-045-95 Sealants and Caulking.
 - 1.4.8 Flat Glass Manufacturers Association (FGMA).
 - .1 FGMA Glazing Manual - 1997.
 - 1.4.9 Glass Association of North America (GANA)
 - .1 GANA Glazing Manual 50th Anniversary Edition-2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.
 - .3 GANA Sealant Manual-2008.
 - .4 GANA Guide to Architectural Glass (2010).
 - .5 GANA/PGC International Protective Glazing Manual (2010).
 - 1.4.10 South Coast Air Quality Management District, California State (SCAQMD)
 - .1 SCAQMD Rule 1168-03, Adhesives and Sealants Applications.
 - 1.4.11 Ontario Ministry of Municipal Affairs and Housing (MMAH)
 - .1 Ontario Building Code
 - .2 MMAH Supplementary Standard SB-10, Energy Efficiency Requirements.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Structural Silicone Glazing (SSG): Submit glazing details for all glazing requiring structural silicone joints to silicone manufacturer for approval and recommendations. Include glazing methods and procedures.
 - 1.5.3 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
 - 1.5.4 Certificates: submit product certificates signed by manufacturer certifying materials and assemblies comply with specified performance characteristics and criteria and physical requirements.
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- 1.5.5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - 1.5.6 Submit a letter from structural silicone sealant manufacturer certifying that he has reviewed all sealant details, tested all contact surfaces and finds them suitable for their intended purpose and proposed sealant is compatible with surfaces it contacts, will adhere satisfactorily to bonding surfaces and will not stain surfaces it will contact. Also provide surface preparation and primer requirements, if any, based on actual project substrates.
 - 1.5.7 Samples: Submit duplicate 300 x 300mm size samples of glass and sealant material.
 - 1.5.8 Manufacturer's Instructions: Submit manufacturer's installation instructions.
 - 1.5.9 Provide maintenance data for glazing for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.
- 1.6 **Quality Assurance**
- 1.6.1 Perform work in accordance with FGMA Glazing Manual and Laminators Safety Glass Association Standards Manual for glazing installation methods.
 - 1.6.2 Installer: Company specializing in the installation of structural glazing with five years proven experience and approved by the manufacturer for installation of their products.
 - 1.6.3 Safety glass products shall comply with the testing requirements of CAN/CGSB-12.1, Type-1 for laminated glass and Type 2 for Tempered Glass.
 - 1.6.4 Provide safety glass permanently marked with the company name or logo and CAN/CGSB-12.1 if the product meets categories 1 and 2, or mark as CAN/CGSB 12.1M-1 if the product meets the requirements of Category 1 only.
 - 1.6.5 Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or referenced standards.
 - .1 GANA Publications
 - .2 AAMA Publications
 - .3 IGMA/IGMAC Publications
 - 1.6.6 Insulating Glass products are to be permanently marked either on spacers or at least one insulating unit component with appropriate certification label of the Insulating Glass Manufacturers Alliance (IGMA) or Insulating Glass Manufacturers Association of Canada (IGMAC)
 - 1.6.7 Single-source fabrication responsibility: All glass fabricated for each type shall be processed and supplied by a single fabricator.
 - 1.6.8 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
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- 1.6.9 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- 1.7 **System Description**
- 1.7.1 Performance Requirements: Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follows:
- .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- 1.7.2 Insulating glass units in combination with aluminum window, storefront or curtain wall framing specified elsewhere shall be designed by the supplier to comply with energy efficient requirements specified in MMAH Supplementary Standard SB-10. Submit engineered shop drawings, calculations and certificates certifying compliance with that standard.
- 1.8 **Design Requirements**
- 1.8.1 Design glass, glazing channels, connections, attachments and glazing accessories to withstand loads designated by the Ontario Building Code and to accommodate all building deflections.
- 1.8.2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure of 1.2 kPa as measured in accordance with ANSI/ASTM E330.
- 1.8.3 Limit glass deflection to 1/200 with full recovery of glazing materials. Glass thicknesses indicated are minimum and are for detailing only.
- 1.8.4 Confirm glass thickness by analyzing project conditions, including in-service conditions and loads. Provide glass lites for various size openings in nominal thicknesses indicated but not less than required to meet performance requirements of referenced standards including energy efficiency requirements of MMAH-SB-10. Coordinate glass thicknesses with manufacturers of framing systems.
- 1.8.5 Design of structural glass (SSG) lites shall be prepared, certified, signed and sealed by a Structural engineer registered in the Province of Ontario.
- 1.9 **Project Conditions**
- 1.9.1 Install glazing when ambient temperature is 10 ° C minimum. Maintain ventilated environment for 24 hours after application.
- 1.9.2 Maintain minimum ambient temperature before, during and for 24 hours after installation of glazing compounds.
- 1.10 **Shipping, Handling and Storage**
- 1.10.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.10.2 Provide glass units with interleaving protection between lites. Keep glass and interleaving dry and store cases in clean, cool, dry areas with temperatures above the dew point. Circulation of cool, dry air in storage
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areas is essential. Open cases and inspect units periodically for moisture accumulation.

- 1.10.3 Do not store glass in direct sunlight without an opaque protective covering over same.

1.11 **Warranty**

- 1.11.1 Warrant the work of this Section against defects of workmanship and material, for a period of ten years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.
- 1.11.2 Warrant insulating glass units for ten years from date of Ready-for-Takeover against seal failure, interpane dusting, or interpane misting.
- 1.11.3 Warrant low-emissivity coatings when applied to the second or third surfaces of an insulating glass unit, for ten years against peeling or coating deterioration due to product failure.
- 1.11.4 Warrant Laminated glass for ten years against delamination and discolouration.

2. **PRODUCT**

2.1 **Materials-Flat Glass**

- 2.1.1 Float glass: to CAN/CGSB-12.3, glazing quality, 6mm thick minimum.
- 2.1.2 Sheet glass: to CAN/CGSB-12.2, selected, 6mm thick minimum.
- 2.1.3 Laminated Glass to CAN/CGSB 12.1 with 0.060mm Polyvinyl Butyral (PVB) inner layer between two 4.0mm layers of heat strengthened glass.
- 2.1.4 Tempered Safety Glass: To CAN/CGSB-12.1, transparent, thickness as indicated. Type 2-tempered.
- .1 Class B-float.
- .2 Category 1
- .3 Edge treatment: ground, bevel edge.

2.2 **Insulating Glass Units**

- 2.2.1 Performance requirements for insulating glass units specified herein are the minimum permitted requirements. Provide engineered shop drawings and calculations showing that glazed assemblies including framing and glazing products in combination, meet or exceed the minimum requirements of MMAH Supplementary Standard SB-10.
- 2.2.2 Insulating Glass Units: To CAN/CGSB-12.8-M, double glazed sealed units, 25mm overall thickness.
- .1 All vision glass in all exterior windows, curtain walls, doors and screens, unless noted otherwise, to be tempered exterior lite and safety laminated interior lite sealed units from Pilkington Glass with the following specifications:
- .1 Outboard: Eclipse Advantage Arctic Blue Solar Control Low-E (#2) 6mm, Tempered Glass.
- .2 Fill: Air 13mm with low conductivity spacers.
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.3 Inboard: Energy Advantage Clear Low-E (#4) 6mm, Laminated Safety Glass.

.4 To meet the following specifications:

| | | | | |
|--------------------|----------------------|-----|-----------------------------------|------|
| Visible Light | Transmittance | 33% | UV Transmittance | 5% |
| | Exterior Reflectance | 14% | U-Factor Summer (Btu/hr.sq.ft.°F) | 0.25 |
| | Interior Reflectance | 29% | U-Factor Winter (Btu/hr.sq.ft.°F) | 0.27 |
| Total Solar Energy | Transmittance | 17% | Solar Heat Gain Coefficient | 0.26 |
| | Reflectance | 9% | Shading Coefficient | 0.30 |

2.3 Spandrel Glass

2.3.1 Spandrel Glass: to match insulating glass units specified in 2.2.2 except inboard lite to have Opacifying coating on the No. 2 (inboard) surface. Colour to be selected by the Agency from full range of manufacturer's standards.

2.4 Glazing Products

2.4.1 Select appropriate glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials that they contact. These include glass products, insulating glass unit seals and glazing channel substrates under installation and service conditions, as demonstrated by testing and field experience.

2.4.2 Setting blocks: Neoprene 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.

2.4.3 Spacer shims: Neoprene 50-60 Shore A durometer hardness to ASTM D2240, 75mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.

.1 Glass spacers and edge seals conforming to ASTM C1249 and compatible with SSG glazing compounds where applicable.

2.4.4 Glazing tape:

.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D 2240; coiled on release paper; black colour.

.2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.

2.4.5 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, colour as selected.

2.4.6 Lock-strip gaskets: to ASTM C542.

2.4.7 Glazing Gaskets: To ASTM C864.

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- .1 For SSG glazing systems, structural silicone glazing gaskets shall be compatible with the structural silicone sealant.
 - 2.4.8 Sealant: as specified in Section 07 92 00 – Joint Sealants. Low VOC.
 - .1 Structural Silicone Sealant: To ASTM C920 and ASTM C1184, for glass to glass or glass to metal contact: One component, silicone based sealant, CGE Ultraglaze SSG-4000, Dow 795 or 999-A, or General Electric Gesil N 2600", SCS 100 or SCS 1200, or Guardian Silicone Structural Glazing Sealants or equal, as per manufacturer's recommendations for the particular condition of use. Colour to be "crystal clear".
 - 2.4.9 Vision Strips: Vision Strips: 3M glass film. Colour and pattern as selected by the Consultant.
3. **EXECUTION**
- 3.1 **Manufacturer's Instructions**
 - 3.1.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
 - 3.2 **Examination**
 - 3.2.1 Verify that openings for glazing are correctly sized and within tolerance.
 - 3.2.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
 - 3.3. **Preparation**
 - 3.3.1 Clean contact surfaces with solvent and wipe dry.
 - 3.3.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
 - 3.3.3 Prime surfaces scheduled to receive sealant.
 - 3.4 **Installation – General**
 - 3.4.1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.
 - 3.5 **Installation: Exterior Wet/Dry Method (Preformed Tape and Sealant)**
 - 3.5.1 Cut glazing tape to length and set against permanent stops, 6mm below sight line. Seal corners by butting tape and dabbing with sealant.
 - 3.5.2 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
 - 3.5.3 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
 - 3.5.4 Rest glazing on setting blocks and push against tape and heel head of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
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- 3.5.5 Install removable stops with spacer strips inserted between glazing and applied stops 6mm below sight line.
 - 3.5.6 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9mm below sight line.
 - 3.5.7 Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- 3.6 **Installation: Exterior SSG Glazing**
- 3.6.1 Exterior SSG Glazing shall be completed in accordance with manufacturer's instructions, shop drawings, GANA Glazing Manual and AAMA SSGPG-1.
 - 3.6.2 Joint surfaces must be clean, dry, dust free, and frost free. Surfaces must be cleaned with a solvent before the sealant is applied.
 - 3.6.3 Prime clean surfaces.
 - 3.6.4 Set glass or panel in place according to standard practice. Install spacers and backers as recommended by manufacturer and in accordance with shop drawings.
 - 3.6.5 Apply structural silicone sealant by pushing the bead into the joint cavity. Masking tape may be utilized to keep excess sealant from contacting adjacent areas. Apply the sealant in a continuous operation using a caulking gun or pump. A positive pressure, adequate to fill the entire joint width, must be used. This can be accomplished by pushing the sealant bead ahead of the application nozzle. Care must be taken to ensure complete fill of the sealant cavity. Every effort must be made to completely fill the entire cavity: special gunning nozzles or dual applications may be required.
 - 3.6.6 Strike a flush joint and make certain the sealant has the proper configuration and fully wets the joint walls. Tool the sealant with light pressure before a skin begins to form (typically 10 to 20 minutes). Do not use liquid tooling aids such as water, soap, or solvents, e.g. isopropyl alcohol (IPA).
 - 3.6.7 Remove the masking tape before the sealant skins over (within about 15 minutes of tooling).
 - 3.6.8 Perform adhesion testing after the sealant cures.
- 3.7 **Installation: Interior - Dry Method**
- 3.7.1 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9mm below sight line.
 - 3.7.2 Apply cap bead of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
 - 3.7.3 Cut glazing tape to length and set against permanent stops, projecting 1.6mm above sight line.
 - 3.7.4 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
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- 3.7.5 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
 - 3.7.6 Place glazing tape on free perimeter of glazing.
 - 3.7.7 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
 - 3.7.8 Knife trim protruding tape.
 - 3.7.9 Glaze hollow metal doors and pressed steel screens. Glass type as indicated.
- 3.8 **Vision Strips**
- 3.8.1 Where indicated or where required by Code in a barrier free path of travel, provide opaque vision strips conforming to Article 3.3.1.18 of the Ontario Building Code in doors and sidelights, minimum 50mm wide and mounted across the width of the door at a height of 1350 to 1500mm above the finished floor.
- 3.9 **Cleaning**
- 3.9.1 Perform cleaning to remove construction and accumulated environmental dirt. Remove traces of primer, caulking.
 - 3.9.2 Remove glazing materials from finish surfaces.
 - 3.9.3 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
 - 3.9.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers. Remove labels after work is complete.
- 3.10 **Protection of Finished Work**
- 3.10.1 After installation, mark light with an "X" by using removable plastic tape.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 21 16, Gypsum Board Assemblies**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Furnish all labour, materials and equipment necessary to supply and install gypsum board assemblies as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------------|
| 1.3.1 | Section 05 41 00 | Structural Metal Stud Framing |
| 1.3.2 | Section 06 10 00 | Rough Carpentry |
| 1.3.3 | Section 07 21 13 | Building Insulation |
| 1.3.4 | Section 07 26 00 | Vapour Retarders |
| 1.3.5 | Section 07 27 00 | Vapour Permeable Air Barriers |
| 1.3.6 | Section 07 84 00 | Firestopping |
| 1.3.7 | Section 07 92 00 | Joint Sealing |
| 1.3.8 | Section 09 22 16 | Non-Structural Metal Framing |
| 1.3.9 | Section 09 91 23 | Interior Painting |

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM C514-04(2020) Standard Specification for Nails for the Application of Gypsum Board
 - .2 ASTM C840-20 Standard Specification for Application and Finishing of Gypsum Board
 - .3 ASTM C954-22 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
 - .4 ASTM C1002-22 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - .5 ASTM C1047-19 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
 - .6 ASTM C1177/C1177M-17 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - .7 ASTM C1178/C1178M-18 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
 - .8 ASTM C1278/C1278M-17 Standard Specification for Fiber-Reinforced Gypsum Panel
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- .9 ASTM C1280 – 18 Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
 - .10 ASTM C1288-17 Standard Specification for Fiber-Cement Interior Substrate Sheets
 - .11 ASTM C1325-22 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units
 - .12 ASTM C1396/C1396M – 17 Standard Specification for Gypsum Board
 - .13 ASTM C1629/C1629M-19 Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
 - .14 ASTM E90-09(2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .15 ASTM E814-13a(2017) Standard Test Method for Fire Tests of Penetration Firestop Systems
 - .16 ASTM E1966-15(2019) Standard Test Method for Fire-Resistive Joint Systems
 - 1.4.2 American National Standards Institute (ANSI)
 - .1 ANSI A118.9-1992 Test Methods and Specifications for Cementitious Backer Units.
 - 1.4.3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34 Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB 19-GP-21M Sealing and Bedding Compound for Acoustical Purposes
 - 2.2.6 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 ULC 114-2018 Standard Method of Test for Determination of Non-Combustibility in Building Materials
 - .3 ULC 129- 2015 Standard Method of Test for Smoulder Resistance of Insulation (Basket Method)
 - .4 ULC List of Equipment and Material, Volume III, Fire Resistance Ratings.
 - 2.2.6 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-253-12 Application of Gypsum Sheathing
 - 1.4.6 Wall and Ceiling Bureau
 - .1 Technical Bulletin Control Joint Placement in Gypsum Board Assemblies
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1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Product Data:

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

1.6 Quality Assurance

1.6.1 Dry wall installers: minimum 5 years proven experience.

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

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

1.6.4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.7 Design Requirements

1.7.1 Where indicated provide minimum sound transmission rating of installed partitions of STC 50 tested to ASTM E90.

1.7.2 Provide fire resistance rating of installed partitions as indicated and according to referenced IULC design.

1.8 Shipping, Handling and Storage

1.8.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.8.2 Protect gypsum board materials before, during and after installation and to protect the installed work and materials of other trades affected by this work. Store materials in a dry area inside the building. Do not remove wrapping until ready for use. Prevent damage to all edges and surfaces.

1.9 Project Conditions

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

1.9.2 Apply board and joint treatment to dry, frost free surfaces.

1.9.3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

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2. PRODUCTS**2.1. Gypsum Board**

- 2.1.1 To ASTM C1396/C1396M. Standard for non-rated applications, Type X for rated applications, 1220mm wide x maximum practical length, ends square cut, edges tapered with round edge, 12.7mm thick or to thickness indicated on Contract Drawings. All fire rated board shall be minimum 16mm thickness.
- 2.1.2 Glass Mat Exterior Gypsum Sheathing: to ASTM C1177, 12.7mm thick, 1219mm wide x 2440mm long, square edge.
 - .1 Weight: 9.27 kg/m²
 - .2 Surfacing: Fiberglass mat on face, back, and long edges.
 - .3 Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
 - .4 Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
 - .5 Humidified Deflection (ASTM C1177): Not more than 6.0mm.
 - .6 Permeance (ASTM E96): Not less than 23 perms.
 - .7 R-Value (ASTM C518): 0.56.
 - .8 Mold Resistance (ASTM D3273): 10, in a test as manufactured.
 - .9 Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
 - .1 CGC Secureck
 - .2 Approved equivalent.

2.2 Fastening and Adhesives

- 2.2.1 Drywall Screws: To ASTM C954 or ASTM C1002 self-drilling, self-tapping, case hardened, length to suit board thickness and provide minimum 12mm penetration into support.
- 2.2.2 Sheathing Screws: To ASTM C1002, corrosion resistant, heat treated self-tapping sheet metal screws minimum 32mm long.
- 2.2.3 Joint Tape: To ASTM C475, 50mm perforated with preformed seam, mould and mildew resistant.
 - .1 Joint tape for abuse resistant gypsum board: CGC Mould Resistant Fiberglass Drywall Tape.
- 2.2.4 Joint Filler and Topping: To ASTM C475 vinyl or latex base, slow setting.
- 2.2.5 Joint Treatment for Gypsum Sheathing: 50mm wide, 10 x 10 woven threads per 25mm, self-adhering fiberglass joint tape and Borden HPPG Elmer's Siliconized Acrylic Latex Caulk.
- 2.2.6 Laminating Compound: as recommended by manufacturer, asbestos-free.

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2.3 Acoustic Insulation

- 2.3.1 Acoustic Attenuation: Min 50 STC in accordance with ASTM E90.
- 2.3.2 Acoustic Insulation: Mineral or Glass Fibre Acoustic Insulation:
 - .1 Mineral Fibre Acoustic Insulation: To ASTM C665, Mineral fibre blanket insulation, minimum density of 40 kg/m³:
 - .1 AFB Acoustical Fire Batts manufactured by Roxul Inc.
 - .2 Creased SAFB manufactured by Owens Corning Canada.
 - .2 Glass Fibre Acoustic Blanket Insulation: To CAN/ULC-S702, type 1, pre-formed unfaced glass fibre batt acoustic insulation.
 - .1 QUIETZONE Acoustic Blanket insulation manufactured by Owens Corning Canada.
- 2.3.3 Surface burning characteristics to ULC 102:
 - .1 Flame spread: 15
 - .2 Smoke developed: 5
 - .3 Smoulder resistance: to ULC 129.
 - .4 Non-combustible: to ULC 114
- 2.3.4 Thickness to suit depth of wall framing and as indicated.
- 2.3.5 Acoustic sealant: as specified in Section 07 92 10 – Joint Sealing.

2.4 Accessories

- 2.4.1 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by hot-dip process 0.5mm base thickness, perforated flanges, one piece length per location.
- 2.4.2 Insulating Strip: Rubberized, moisture resistant, 3.0mm thick, 12mm wide closed cell neoprene strip, with self-sticking permanent adhesive on one face; lengths as required.
- 2.4.3 Sealants: as specified in Section 07 92 10 - Joint Sealing.

3. EXECUTION**3.1 General**

- 3.1.1 Prior to installation of gypsum wallboard, ensure that all required vapour barriers, air seals, gaskets and the like installed under another Section have been inspected and accepted by Municipal authorities and the Agency. Failure to do so will result in removal of all gypsum board installed prior to approval and replacement, at no additional cost to the Agency.
- 3.1.2 Unless otherwise indicated on the Contract Drawings, all gypsum board partitions shall extend from floor level to the underside of floor or roof structures above.

3.2 Acoustic Insulation

- 3.2.1 Install acoustic blankets full width and length, with tight joints, between wall framing and around penetrating electrical service boxes, piping, air ducts and frames.

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- 3.2.2 Place acoustic blankets where indicated on the Contract Drawings and to thickness required to obtain acoustic performance indicated for the assembly.
 - 3.2.3 Place acoustic blankets between studs ensuring friction fit, free of sags, folds or open joints that may let sound pass through.
 - 3.2.4 Install blankets from the bottom up, tightly adjusted and trim accurately with a utility knife.
- 3.3 **Gypsum Board Application**
- 3.3.1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
 - 3.3.2 Do not apply gypsum board until bucks, anchors, blocking, electrical, and mechanical work are approved.
 - 3.3.3 Apply gypsum board at right angles to framing members or furring using screw fasteners. Maximum spacing of screws 300mm o.c.
 - 3.3.4 Install fibre gypsum abuse resistant panels at all ceilings and bulkheads except as noted below. Treat joints with fibreglass reinforced joint tape in accordance with manufacturer's instructions.
 - 3.3.5 Apply water or moisture resistant gypsum wallboard where indicated. Apply water resistant sealant to edges, ends and cut outs which expose gypsum core.
 - 3.3.6 Carry gypsum board from floor to underside of floor or roof structure above. Furr out and carry gypsum board around any structural members as may be required. Neatly cope gypsum board to fill deck flutes where gypsum board abuts floor or roof deck.
- 3.4 **Gypsum Sheathing**
- 3.4.1 Install in accordance with GA-253, ASTM C1280 and manufacturer's recommendations.
 - 3.4.2 Install exterior gypsum sheathing horizontally on all exterior walls where indicated. Stagger joints between adjacent sheets.
 - 3.4.3 Screw-attach gypsum sheathing to each stud with 32mm self-drilling corrosion resistant sheathing screws spaced 10mm from ends and edges 200mm o.c. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink. Apply sealant around sheathing perimeter at interface with other materials and install flashing as indicated on the Contract Drawings.
 - 3.4.4 Apply fibreglass joint treatment to all joints, overlapping at intersections by the width of the tape. Apply 10mm bead of sealant along the joint and embed the sealant into the entire surface of the tape with a trowel. Apply enough sealant to each exposed fastener to cover completely when trowelled smooth.
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3.5 Accessories

- 3.5.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.
- 3.5.2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- 3.5.3 Install insulating strips continuously at edges of gypsum board or casing beads abutting exterior door or window frames, to provide thermal break.
- 3.5.4 Install continuous bead of acoustic sealant at all penetrations through sound control partitions.
- 3.5.5 Provide control joints in gypsum board facing. Construct control joints in accordance with ASTM C840 and as described in Wall and Ceiling Bureau Technical Bulletin "Control Joint Placement in Gypsum Board Assemblies". Place control joints consistent with lines of building spaces as indicated. Where not indicated install as directed at maximum 6.0m spacing. Control joints shall be supported with metal studs or furring channels on both sides of the joint Construct joints using back-to-back casing beads filled with a low modulus sealant capable of flexible joint movement.
- 3.5.6 Maintain fire-resistance rating of wall assemblies. Control joints shall be provided:
 - .1 At abutting structural elements, steel columns.
 - .2 At expansion or control joints in the substrate;
 - .3 At each door jamb.

3.6 Access Doors

- 3.6.1 Install access doors to electrical and mechanical fixtures specified in respective Sections.
- 3.6.2 Rigidly secure frames to furring or framing systems, to satisfy fire rating requirements.

3.7 Taping and Filling

- 3.7.1 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- 3.7.2 Finish corner beads, control joints and trims as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- 3.7.3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.
- 3.7.4 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

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- 3.7.5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and equipment necessary to supply and install non-structural metal framing and furring painting as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 05 41 00 Structural Metal Stud Framing

1.3.2 Section 09 21 16 Gypsum Board Assemblies

1.4 References

1.4.1 ASTM International (ASTM).

.1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM C645-18 Standard Specification for Nonstructural Steel Framing Members

.3 ASTM C754-20 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.4 ASTM C841-03(2018) Standard Specification for Installation of Interior Lathing and Furring.

.5 ASTM C1002-22 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

.6 ASTM E90-09(2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.7 ASTM E814-13a(2017) Standard Test Method for Fire Tests of Penetration Firestop Systems

.8 ASTM E1966-15(2019) Standard Test Method for Fire-Resistive Joint Systems

1.4.2 Canadian General Services Board (CGSB).

.1 CAN/CGSB-1.40-97 Primer, Structural Steel, Oil Alkyd Type.

1.4.3 Underwriters Laboratories of Canada (ULC)

.1 ULC List of Equipment and Material, Volume III, Fire Resistance Ratings.

1.4.4 CSSBI Lightweight Steel Framing Manual

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1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Product Data:

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

1.6 Quality Assurance

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

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

1.6.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.7 Shipping, Handling and Storage

1.7.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

2. PRODUCTS**2.1 Metal Stud Framing Systems**

2.1.1 Non-load bearing channel stud framing: to ASTM C645, stud size as indicated, roll formed from 0.53mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460mm centres.

.1 Thickness of materials to conform to referenced standards unless noted otherwise.

.2 Thickness of materials shall be selected from manufacturer's standard span tables to suit total height requirements.

2.1.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32mm flange height.

2.1.3 Metal channel stiffener: 1.4mm thick cold rolled steel, coated with rust inhibitive coating.

2.1.4 Tie Wire: 0.90mm, galvanized, soft annealed, steel wire or clip as recommended by the manufacturer of furring channels.

2.1.5 Wind bearing light weight steel stud framing for exterior wall applications is specified in Section 05 41 00 - Structural Metal Stud Framing.

2.2 Metal Furring and Suspension Systems

2.2.1 Channel framing: to ASTM C645, stud size as indicated, roll formed from

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0.53mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board.

.1 Thickness of materials to conform to referenced standards unless noted otherwise.

2.2.2 Metal Furring Runners, Hangers, Tie Wires, Inserts, Anchors: to ASTM C645 , electro-zinc coated steel.

2.2.3 Runner Channels: 38 x 19 x 0.59mm and 38 x 9.5 x 0.45mm, hot dip or electro-galvanized sheet steel. Use of various sizes governed by applied loads and applicable spans.

2.2.4 Drywall Furring Channel: Channel shaped furring member for screw attachment of drywall with knurled face. For interior use. Furring masonry or concrete surfaces. Cross furring under steel joist or suspended metal channels in suspended ceiling systems: 70 x 22 x 0.9mm with knurled face, hot dip or electro-galvanized sheet steel. Bailey D-1001.

2.2.5 Deflection Track: Bailey Multi-Slot Track MST 250, size to suit studs, and top deflection clips TDC 350 and TDC 587.

2.2.6 Horizontal Flange attachment: Bailey Horizontal Flange Attachment Clip (HFA Clip)

2.2.7 Hangers: minimum 4.1mm diameter (or as required by ULC fire rating design requirements) mild steel rods.

2.3 **Fasteners**

2.3.1 Powder activated fasteners: to suit structural conditions and fastening requirements and in accordance with manufacturer's recommendations: Ramset; Hilti; or approved equivalent.

2.3.2 Sheet Metal Screws: To ASTM C1002, self-drilling, self-tapping, case hardened, length to suit board thickness and provide minimum 12mm penetration into support.

2.4 **Accessories**

2.4.1 Acoustic sealant: As specified in Section 07 92 10.

2.4.2 Insulating strip: rubberized, moisture resistant 3mm thick foam strip, 12mm wide, with self-sticking adhesive on one face, lengths as required.

2.4.3 Zinc Rich Paint: to CGSB 1-GP-181M. Low VOC type.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Agency.

.2 Inform Agency of unacceptable conditions immediately upon discovery.

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- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant.

3.2 Erection

- 3.2.1 Comply with ASTM C754.
- 3.2.2 All gypsum board shall be supported with steel framing whether indicated or not.
- 3.2.3 Unless otherwise indicated on the Contract Drawings, all gypsum board partitions shall extend from floor level to the underside of floor or roof structures above.
- 3.2.4 Align partition tracks at floor and ceiling and secure at 600mm on centre maximum. Provide top deflection tracks where indicated or as required to permit structural deflection. Install top deflection clips as necessary to increase load capacity.
- 3.2.5 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- 3.2.6 Place studs vertically at 400mm on centre unless noted otherwise and not more than 50mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- 3.2.7 Erect metal studding to tolerance of 1:1000.
- 3.2.8 Attach studs to bottom and ceiling track using screws.
- 3.2.9 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- 3.2.10 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- 3.2.11 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- 3.2.12 Install heavy thickness single jamb studs at openings.
- 3.2.13 Erect track at head of door/window openings and sills of window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- 3.2.14 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- 3.2.15 Provide 40mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- 3.2.16 Install steel studs or furring channel between studs for attaching electrical and other boxes.
-

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- 3.2.17 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50mm leg ceiling tracks.
- 3.2.18 Install continuous insulating strips to isolate studs from un-insulated surfaces.
- 3.2.19 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 Wall Furring

- 3.3.1 Install wall furring for gypsum board wall finishes in accordance ASTM C754 and ASTM C841 except where specified otherwise and indicated on Contract Drawings.
- 3.3.2 Frame openings and around built-in equipment, cabinets, access panels, etc., on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- 3.3.3 Furr duct shafts, beams, columns, pipes and exposed services.

3.4 Suspended and Furred Ceilings and Bulkheads

- 3.4.1 Erect hanger and runner channels for suspended gypsum board ceilings and bulkheads in accordance with ASTM C754 and ASTM C841 except where specified otherwise and indicated on Contract Drawings.
 - 3.4.2 Securely anchor hanger to structural supports 1220mm o.c. maximum along runner channels and not more than 150mm from ends. Under no circumstances shall hanger wires be secured to or supported from mechanical or electrical materials or equipment or penetrate mechanical ductwork.
 - 3.4.3 Space runner or furring channels as shown on Contract Drawings and not more than 610mm o.c. maximum nor 150mm from walls. Run channels in long direction of board. Bend hanger sharply under bottom flange of runner and securely wire in place with a saddle tie. Provide channels below mechanical or electrical equipment and mechanical ductwork to maintain maximum spacing.
 - 3.4.4 Install furring channels transversely across runner channels in short direction of wallboard at 610mm o.c. maximum or 150mm from walls and interruptions in ceiling continuity. Secure channels to support with furring clips or wire. Where splicing is necessary lap minimum 200mm and wire tie each end with double loops of 0.90mm galvanized tie wire, 25mm from each end of overlap.
 - 3.4.5 Support light fixtures by providing additional ceiling suspension hangers within 150mm of each corner and at maximum 610mm around perimeter of fixture. Coordinate with Electrical.
 - 3.4.6 Install work level to tolerance of 1:1200.
 - 3.4.7 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, etc.
 - 3.4.8 Install furring channels parallel to, and at exact locations of steel stud
-

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partition header track.

3.4.9 Furr for gypsum board faced vertical bulkheads within or at termination of ceilings.

3.5 **Gypsum Board**

3.5.1 Installation of gypsum board is specified in Section 09 21 16 - Gypsum Board Assemblies.

3.6 **Cleaning**

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

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install ceramic wall tile and ceramic backsplashes as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

1.3.1 Section 07 92 00 Joint Sealing

1.3.2 Section 09 21 16 Gypsum Board assemblies

1.4 References

1.4.1 ASTM International (ASTM)

.1 ACTM C144-18 Standard Specification for Aggregate for Masonry Mortar

.2 ASTM C150/C150M-22 Standard Specification for Portland Cement

.3 ASTM C207-18 Standard Specification for Hydrated Lime for Masonry Purposes

1.4.2 American National Standards Institute (ANSI)

.1 ANSI A108/A118/A136.1:2017 American National Specifications for the

.2 Installation of Ceramic Tile.

1.4.3 ANSI A137.1: 2017 American National Standard Specifications for Ceramic Tile

1.4.4 Canadian General Standards Board (CGSB)

.1 CGSB 71-GP 22M 1978 Adhesive, Organic, for Installation of Ceramic Wall Tile

1.4.5 International Standards Organization (ISO)

.1 ISO 10545 Series Ceramic Tiles, Standards for Testing

.2 ISO 13006-2012 Ceramic Tiles, Definitions, Classifications, Characteristics and Marking.

.3 ISO 13007-2010 Ceramic Tiles, Grouts and Adhesives.

1.4.6 Terrazzo, Tile and Marble Association of Canada (TTMAC)

.1 TTMAC 2019-2021 Specifications Guide 09 30 00, Tile Installation Manual.

.2 TTMAC Hard Surface Maintenance Guide.

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1.5 Submittals

- 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- 1.5.2 Provide product data. Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Mortar and grout.
 - .3 Divider strip.
 - .4 Levelling compound.
 - .5 Waterproofing isolation membrane.
- 1.5.3 Submit duplicate samples of tile. Samples to be submitted on 300 x 600 mm sample board for each colour, texture, size and pattern of tile. Grout sample joints for representative sample of final installation.
- 1.5.4 Trim and Accessories: submit duplicate samples of each trim.
- 1.5.5 Maintenance Data: Provide maintenance data for tile work, for incorporation into Maintenance Manuals specified under Section 01 78 00.

1.6 Quality Assurance

- 1.6.1 Do tile work in accordance with Installation Manual 200, Ceramic Tile, by Terrazzo, Tile and Marble Association of Canada (TTMAC), except where this specification is more stringent.
- 1.6.2 For the installation of ceramic tile, use only skilled tradesmen who are familiar with the referenced standards and with the requirements for this Work.
- 1.6.3 The setting material manufacturer's representative shall review the details with the Contractor prior to the start of work. Instruct the Contractor on the proper installation procedures to ensure compliance with the guaranteed requirements.

1.7 Shipping, Handling and Storage

- 1.7.1 Deliver packaged materials in original unopened containers.
- 1.7.2 Keep delivered material dry and free from stains. Store cementitious material off damp surfaces.
- 1.7.3 Use all means necessary to protect materials, before, during and after installation and to protect the installed work and materials of all other trades.
- 1.7.4 In the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant/Agency and at no additional cost to the Agency.
- 1.7.5 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

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- 1.8 **Project Conditions**
 - 1.8.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 °C for 48 hours before, during and after installation.
 - 1.8.2 Do not install tiles at temperatures less than 12 °C or above 38 °C.
 - 1.8.3 Do not apply epoxy mortar and grouts at temperatures below 15 °C or above 25 °C.
 - 1.8.4 Provide and maintain temporary lighting. Lighting levels shall be sufficient to complete work including inspections. Provide minimum lighting levels of 400 lux at work areas.

 - 1.9 **Qualifications**
 - 1.9.1 Installer of ceramic tiles shall have a minimum of 10 years of experience including at least five projects of similar scope and scale. Submit documented proof of experience prior to commencing work of this Section.

 - 1.10 **Maintenance**
 - 1.10.1 Upon completion of the installation and as a condition of acceptance, deliver to the Agency 2% of tile and accessory tiles in each colour and pattern of ceramic tiles installed under this section for the Agency's maintenance program. Identify each carton for location and installation date. Submission must be made all at one time and prior to Substantial Performance.

 - 1.11 **Warranty**
 - 1.11.1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

 - 2 **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Materials shall be graded, and containers grade sealed, delivered to the job site in their original packages or containers with the manufacturer's labels and seals intact.
 - 2.1.2 Tile and grout colours shall be selected by the Consultant/Agency from the manufacturer's standard range of colours. Provide sufficient samples for selection.
 - 2.1.3 Tile shall conform to ANSI A137.1.
 - 2.1.4 Provide coves, corners, reveals, surf caps, inners and outers as required to complete the work.
 - 2.1.5 Metal Lath: ASTM C847 corrosion resistant. 1.4 kg/m².
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2.2 Ceramic Tile**2.2.1 Porcelain Wall Tile:**

- .1 PCT-1: Olympia Tile, Regal Series, Taupe Polished, 305 x 610mm.
- .2 PCT-3: Olympia Tile, QT.CD.ARW.0416.BR, Arctic White Bright, 10 x 40cm.

2.2.2 Porcelain Floor Tile:

- .1 PCT-2: Olympia Tile, Regal Series, Blue Matte, 305 x 305mm.

2.3 Mortar, Adhesives and Grout Material

2.3.1 Primer: Low VOC, low viscosity primer as recommended by manufacturer to suit substrate and site conditions; provide proof of bonding ability of setting systems where manufacturer recommends that a primer is not necessary to installation.

2.3.2 Surface Preparation Materials:

2.3.3 Portland Cement Mortar: Scratch and bond coat, levelling bed containing the following:

- .1 Portland Cement: Meeting or exceeding requirements of CSA A3000, Type GU.
- .2 Hydrated Lime: Meeting or exceeding requirements of ASTM C207, Type N.
- .3 Sand: Meeting or exceeding requirements of ASTM C144, passing 16 mesh.
- .4 Water: Potable.

2.3.4 Self Levelling and Smoothing Underlayment: Cementitious and self levelling smoothing underlayment meeting or exceeding requirements of ANSI A108.1, Type 2.

2.3.5 Wall Tile Systems:

- .1 Thin Set Interior Installation: Dry set mortar meeting or exceeding requirements of ANSI A118.1 formulated for thin set applications, factory sanded mortar consisting of Portland cement, sand and additives requiring only addition of potable water for installation complete with bond enhancing latex additive.

2.3.6 Adhesive Systems:

- .1 Epoxy Adhesive: Thin set adhesive system using 100% solids epoxy resin and epoxy hardener meeting or exceeding requirements of ANSI A108.1; stain proof, chemical resistant and having high temperature resistance and water cleanable.
- .2 Organic Adhesive: Thin set wall tile adhesive system using non-flammable, water resistant, latex adhesives for interior use meeting or exceeding requirements of ANSI A108.1, Type 1.

2.3.7 Tile Grout Systems:

- .1 Unsanded Portland Cement Grout: factory blended dry-set stain resistant, latex modified Portland cement meeting or exceeding

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- requirements of ANSI A118.6, specifically formulated for joints less than or equal to 3mm in width.
- .2 Sanded Portland Cement Grout: Factory blended dry-set stain resistant, latex modified Portland cement and graded silica sand meeting or exceeding requirements of ANSI A118.6, specifically formulated for joints greater than 3mm in width.
 - .3 Polymer Modified Grout: factory blended stain resistant polymer modified Portland cement meeting or exceeding requirements of ANSI A118.7, specifically formulated for joints greater than 3mm in width.
 - .4 Epoxy Grout: Water cleanable, chemical resistant, factory blended modified Portland cement compound with 100% epoxy adhesives and hardeners meeting or exceeding requirements of ANSI A118.3.
- 2.4 **Accessories**
- 2.4.1 Reducers, edge trim, and transition strips: Schluter Systems purpose made aluminum.
 - 2.4.2 CT Edge Protection: Schluter RONDEC, size to suit tile thickness. Satin anodized aluminum. Trim to come with all connectors or end caps required for a complete and finished installation. As a minimum, provide edge protection at the following locations:
 - .1 Top of PC Base;
 - .2 Top of CT wall tile;
 - .3 All outside corners of wall tile or porcelain ceramic tile base.
 - 2.4.3 Sealant: as specified in Section 07 92 00.
- 2.5 **Mixes**
- 2.5.1 Mix premanufactured mortars and grouts in accordance with referenced standards, and mortar and grout manufacturer's written instructions; mix site mixed materials as follows:
 - .1 Scratch Coat (by volume): Mix 1 part Portland cement, 4 parts sand, and latex additive where required by Terrazzo, Tile and Marble Association of Canada (TTMAC)detail.

3 EXECUTION**3.1 Surface Conditions**

- 3.1.1 Surfaces on which tile is to be applied, shall be thoroughly cleaned down.
 - 3.1.2 Verify that concrete substrates have been allowed to cure for a minimum of 28 days in accordance with TTMAC requirements.
 - 3.1.3 Verify that substrates for bonding tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and are within starting flatness tolerances as specified in Section 03 30 00 and are ready for application of levelling materials specified in this Section.
-

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- 3.1.4 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of Work, and similar items located in or behind tile have been completed before installing tile.
- 3.1.5 Drywall surfaces on which wall tile is to be applied, shall be free from dust, excess plaster and shall be plain and true without any irregularities. Prepare existing gypsum board surfaces as recommended by TTMAC and product manufacturer to support tile installation.
- 3.1.6 Existing painted masonry or concrete wall surfaces to receive ceramic tile shall be thoroughly cleaned of all paint down to concrete or concrete block surfaces using paint stripper. Prepare painted surfaces in accordance with manufacturer's instructions and TTMAC recommendations.
- 3.1.7 In the event of discrepancies, immediately notify the Consultant and do not proceed with installation in such areas until all such discrepancies have been fully resolved.
- 3.1.8 Check that conditions of temperature, humidity, traffic and usage are suitable as required by Installation Manual specifications. Minimum temperature to be not less than 10°C.
- 3.1.9 Check that surfaces ready to receive tiling are cured, level and/or graded, plumb, smooth, firm, free from loose particles, droppings, projection, grease, solvent, paint and other foreign matter and from other unsuitable conditions.
- 3.1.10 Install transition strips, reducers and edge trim at exposed edges of all tiled walls in accordance with manufacturer's instructions.

3.2 Installation

- 3.2.1 Install tiling in accordance with requirements of TTMAC Tile Installation Manual and parts of ANSI A108 Series of tile installation standards that apply to types of bonding and grouting materials, and to methods required for complete tile installation.
 - 3.2.2 Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions:
 - .1 Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 - .2 Make cut edges smooth, even and free from chipping.
 - .3 Do not split tile.
 - 3.2.3 Accurately form intersections and returns; perform cutting and drilling of tile without marring visible surfaces:
 - .1 Cut, drill, and fit tile to accommodate work of other subcontractors penetrating or abutting work of this Section.
 - .2 Carefully grind cut edges of tile abutting trim, finish, or built in items for straight aligned joints.
 - .3 Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile and to provide a uniform joint appearance.
-

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- 3.2.4 Lay tile in pattern indicated on Drawings and as follows:
- .1 Align joints when adjoining tiles are the same size.
 - .2 Centre tile patterns between control and movement joints; notify Agency for further instructions where tile patterns do not align with control or movement joints.
 - .3 Cut tile accurately and without damage.
 - .4 Smooth exposed cut edges with abrasive stone, where exposed.
 - .5 Chipped or split edges are not acceptable.
- 3.2.5 Bonding Bed: Set tile in place while bond coat is wet and tacky and as follows:
- .1 Adjust amount of bonding materials placed on substrates based on temperature and humidity to prevent skinning over of bonding materials.
 - .2 Use sufficient bond coat to provide a minimum 80% contact for tiles smaller than 300mm x 300mm with bonding material evenly dispersed and pressed into back of tile; refer to back buttering requirements for larger materials and installations having Moderate or higher Load Bearing Performance requirements.
 - .3 Notch bond coat in horizontal straight lines and set on freshly placed bonding material while moving (sliding) tile back and forth at 90° to notches.
 - .4 Verify that corner and edges are fully supported by bonding material.
 - .5 Set tiles to prevent lippage greater than 1mm over a 3mm grout joint.
 - .6 Keep two-thirds of grout joint depth free of bonding materials.
 - .7 Clean excess bonding materials from tile surface prior to final set.
 - .8 Sound tiles after bonding materials have cured and replace hollow sounding tile before grouting.
- 3.2.6 Back Buttering: Obtain 100% mortar coverage in accordance with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108 series of tile installation standards for the following applications:
- .1 Tile installed with chemical resistant mortars and grouts
 - .2 Tile having tiles 300 mm or larger in any direction
 - .3 Tile having tiles with raised or textured backs
 - .4 Tile having tile installation rated for Heavy or Extra Heavy Duty.
 - .5 All porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.
- 3.2.7 Control and Movement Joints: Install control joints and expansion joints in tile work in accordance with TTMAC Detail 301MJ; keep control and expansion joints free of bonding materials and as follows:
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- .1 Cut tiles to establish line of joints; sawn joints after installation of tiles will not be acceptable.
- .2 Locate joints in tile surfaces directly above joints in concrete substrates.
- .3 Install prefabricated joint profiles in accordance with manufacturer's written instructions, set with top surface of joint profile slightly below top surface of tile.
- .4 Prepare joints and apply sealants in accordance with requirements of Section 07 92 00.
- .5 Keep control and movement joints free from setting materials.
- .6 Form an open joint for sealant in tile wherever a change in backing material occurs, at all vertical interior corners, around penetrating pipes and fixtures, and where tile abuts other materials or fixtures.
- .7 Install control joints where indicated or at not less than the following spacings:

| Environment | Minimum | Maximum | Joint Width (minimum) |
|-------------------|---------|---------|--------------------------|
| Interior/Shaded | 4800 mm | 6100 mm | 6 mm |
| Interior/Sunlight | 2400 mm | 3700 mm | 6 mm |

3.3 Grouting

- 3.3.1 Grouting: Install grout in accordance with manufacturer's written instructions, the requirements of TTMAC, and as follows:
 - .1 Allow proper setting time before application of grout.
 - .2 Pre-seal or wax tiles requiring protection from grout staining.
 - .3 Force grout into joints to a smooth, dense finish.
 - .4 Remove excess grout in accordance with manufacturer's written instructions and polish tile with clean cloths.
- 3.3.2 Grout all tile using specified grout in strict accordance with manufacturers written instructions all to give a flush, hard joint.
- 3.3.3 Joints in tile shall be filled solid and flush with grout.
- 3.3.4 Prepare joints and mix grout in accordance with manufacturer's printed instructions. Force maximum amount of grout into joints, avoiding air traps or voids.
- 3.3.5 Remove all excess grout by washing diagonally across the joints. Check for voids, air pockets and gaps and fill same. Remove all discoloured grout and replace with new.
- 3.3.6 Cure all joints.

3.4 Cleaning and Protection

- 3.4.1 Cleaning: Clean tile surfaces so they are free of foreign matter using manufacturer recommended cleaning products and methods after completion of placement and grouting and as follows:
 - .1 Remove grout residue from tile as soon as possible.

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- .2 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; protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
- .3 Flush surface with clean water before and after cleaning.
- 3.4.2 Protection: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies as follows:
 - .1 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
 - .2 Provide protective covering until Substantial Performance of the Work.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 51 13, Acoustic Panel Ceilings**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Furnish all labour, materials and equipment necessary to supply and install acoustic ceilings as indicated on the Contract Drawings and specified herein and including the following:

- .1 Suspension system
- .2 Acoustic panels.

1.3 Related Sections

1.3.1 Section 09 21 16: Gypsum Board Assemblies

1.4 References**1.4.1 ASTM International (ASTM)**

- .1 ASTM A307-21 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
- .2 ASTM A641/A641M-19 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .3 ASTM A653 / A653M – 23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .4 ASTM A1011/A1011M-23 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
- .5 ASTM C423-23 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- .6 ASTM C635/C635M-22 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay in Panel Ceilings.
- .7 ASTM C636/C636M-19 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .8 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials
- .9 ASTM E119-22 Standard Test Methods for Fire Tests of Building Construction and Materials
- .10 ASTM E1264-22 Standard Classification for Acoustical Ceiling Products
- .11 ASTM E1414/E1414M-21a Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling

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- Plenum
 - .12 ASTM E1477-98a(2022) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
 - 1.4.2 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
 - .1 Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
 - 1.5.3 Submit duplicate 300 x 300mm samples of each type of acoustical units.
 - 1.5.4 Submit one representative model of each type of ceiling suspension system.
 - .1 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.
 - 1.5.5 Provide maintenance data for acoustic panel ceilings for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.
 - 1.6 **Quality Assurance**
 - 1.6.1 Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
 - .1 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - .2 Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 Classification.
 - 1.6.2 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
 - 1.6.3 Mock-up:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up 10m² minimum of acoustical panel tile ceiling
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- including one inside corner and one outside corner.
 - .3 Construct mock-up where directed.
 - .4 Allow 48 hours for inspection of mock-up by Agency before proceeding with ceiling work.
 - .5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.
- 1.7 **Project Conditions**
- 1.7.1 Permit wet work to dry before beginning to install.
 - 1.7.2 Maintain uniform minimum temperature of 15° C and humidity of 20-40% before and during installation.
 - 1.7.3 Store materials in work area 48 hours prior to installation.
 - 1.7.4 Building areas to receive ceilings shall be free of construction dust and debris.
- 1.8 **Design Requirements**
- 1.8.1 Determine the superimposed loads that will be applied to suspension systems by components of the building other than the ceiling and ensure that adequate hangers are installed to support the additional loads in conjunction with the normal loads of the system.
 - 1.8.2 Design supplemental suspension members and hangers where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with location of hangers at required spacing to support standard suspension system members:
 - .1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 1.8.3 Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of L/360 to ASTM C635 deflection test.
- 1.9 **Performance Requirements**
- 1.9.1 Surface-Burning Characteristics: Conform to ULC S102 or ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1.9.2 Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to applicable code.
- 1.10 **Shipping, Handling and Storage**
- 1.10.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.10.2 Protect on site stored or installed absorptive material from moisture damage.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 51 13, Acoustic Panel Ceilings**

1.11 **Extra Materials**

- 1.11.1 Provide 25 ceiling tiles for future replacement.
- 1.11.2 Ensure extra materials are from same production run as installed materials.

2. **PRODUCTS**2.1 **Materials**

- 2.1.1 Acoustic units for suspended ceiling system: to ASTM E1264
- 2.1.2 Acoustic Tile: to be CGC Aspen Basic Illusion Two/24 panels, item 652, standard with SLT edges.
 - .1 Class A.
 - .2 Composition: Wet formed mineral fiber
 - .3 Flame spread: ASTM E1264, Class A (U.L.C.), 25 or less.
 - .4 Smoke developed 50 or less in accordance with ULC 102.
 - .5 Noise Reduction Coefficient (NRC):ASTM C423; Classified with UL label, 0.55
 - .6 Ceiling Attenuation Class (CAC): ASTM C1414; Classified with UL label, 35
 - .7 Light Reflectance (LR) range of 0.87 to ASTM E1477.
 - .8 Dimensional Stability: Standard
 - .9 Edge Profile: Shadowline tapered
 - .10 Colour: White.
 - .11 Size 610 x 1219 x 19mm thick.
- 2.2.3 Alternate manufacturer: Products as manufactured by the following are acceptable, subject to Agency's approval of style, finish, performance characteristics and texture:
 - .1 Armstrong Industries
 - .2 Certaineed
 - .3 Or Agency approved equivalent.

2.3 **Ceiling Suspension System**

- 2.3.1 Components: All main beams and cross tees, base metal and end detail shall be commercial quality hot-dipped galvanized steel as per ASTM C635. Main beams and cross tees shall be double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
 - 2.3.2 Face width: 22mm
 - 2.3.3 Edge Moldings and Trim: Hemmed angle moulding to match main beams and cross tees.
 - 2.3.4 Structural Classification: Intermediate Duty System, ASTM C635.
 - 2.3.5 Colour: White and match the actual colour of the specified ceiling tile.
 - 2.3.6 Standard of Acceptance:
 - .1 Armstrong Prelude XL
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 51 13, Acoustic Panel Ceilings**

- .2 Donn DXT
- .3 Certainteed Classic Environmental Stab.
- .4 Or Agency approved equivalent.
- 2.3.7 Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated or required.
- 2.3.8 Threaded Rod: to ASTM A397. Galvanized or zinc plated.
- 2.3.9 Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three design load, but not less than 2.06mm thick.
- 2.3.10 Channel Framing and Fittings: Strut type metal framing and components to ASTM A1011 or ASTM A653. Unistrut P1000SL or equivalent. Galvanized.

3. EXECUTION**3.1 Manufacturer's Instructions**

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

3.2 Examination

- 3.2.1 Do not install acoustical panels until work above ceiling has been inspected by the Consultant..

3.3 Preparation

- 3.3.1 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- 3.3.2 Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - .1 Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.4 Installation: Suspension System

- 3.4.1 Install suspension system and panels in compliance with ASTM C636; CISCA Seismic Guidelines and in accordance with the manufacturer's installation instructions.
 - 3.4.2 Install wall moldings at intersection of suspended ceiling and vertical surfaces.
 - 3.4.3 Do not erect ceiling suspension system until work above ceiling has been inspected by Agency.
 - 3.4.4 Secure hangers to overhead structure using attachment methods as indicated by manufacturer. Do not suspend ceiling systems from building services including plumbing lines, conduit, cable trays or duct work.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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- 3.4.5 Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.
 - 3.4.6 Install hangers spaced at maximum 1219mm centres and within 152mm from ends of main tees. Install hanger wires plumb and straight.
 - 3.4.7 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width.
 - 3.4.8 Ensure suspension system is coordinated with location of related components.
 - 3.4.9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles, and speakers.
 - 3.4.10 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150mm of each corner and at maximum 610mm around perimeter of fixture.
 - 3.4.11 Interlock cross member to main runner to provide rigid assembly.
 - 3.4.12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
 - 3.4.13 Install access splines to provide ceiling access.
 - 3.4.14 Finished ceiling system to be square with adjoining walls and level within 1:1000
- 3.5 **Installation: Acoustic Panels**
- 3.5.1 Coordinate layout and installation of ceilings with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression system.
 - 3.5.2 Install acoustical panels and tiles in ceiling suspension system.
 - 3.5.3 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width, with directional pattern running in same direction. Refer to reflected ceiling plan.
 - 3.5.4 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 65 19, Resilient Tile Flooring**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install resilient flooring and accessories as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 09 68 13: Carpet Tile

1.3.2 Section 09 69 00: Access Flooring

1.4 References

1.4.1 ASTM International (ASTM)

.1 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 ASTM F710-21 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.3 ASTM F1066-04(2018) Standard Specification for Vinyl Composition Floor Tile.

.4 ASTM F1344-21a Standard Specification for Rubber Floor Tile.

.5 ASTM F1861-21 Standard Specification for Resilient Wall Base.

1.4.2 Underwriters Laboratories of Canada (ULC).

.1 ULC 102.2-2018 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

1.4.3 South Coast Air Quality Management District (SCAQMD), California State.

.1 SCAQMD Rule 1168-03, Adhesives and Sealants Applications.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Submit duplicate samples of manufacturer's full range of colours for specified products for selection of colours by the Agency.

1.5.3 Submit a complete list of all materials proposed to be furnished and installed under this portion of the Work, stating manufacturer's name and catalogue number for each item, and product samples in colours specified.

.1 Submit two copies of the manufacturer's current recommended method of installation for each item.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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- 1.5.4 Provide maintenance data for resilient flooring for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.
 - 1.6 **Shipping, Handling and Storage**
 - 1.6.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
 - 1.6.2 Use all means necessary to protect resilient flooring materials before, during and after installation and to protect the installed work and materials of all other trades.
 - 1.7 **Maintenance Materials**
 - 1.7.1 Provide extra stock materials of resilient flooring, base and adhesives in accordance with Section 01 78 00 – Closeout Submittals.
 - .1 Provide 20 piece of each colour, pattern and type flooring material required for this project for future maintenance use.
 - .2 Provide one container of adhesive.
 - .3 Clearly identify each container of floor tile and each container of adhesive.
 - 1.7.2 Extra materials to be from same production run as installed materials.
 - 1.8 **Environmental Requirements**
 - 1.8.1 Maintain air temperature and structural base temperature at floor installation area above 20° C for 48 hours before, during and after installation.
 - 1.9 **Warranty**
 - 1.9.1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.
 - 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Vinyl Composition Tile: to CSA A126.1 or ASTM F1066, 305 x 305 x 3.0 mm thick, non-asbestos, Class 2 through pattern tile with static load of not less than 517 kPa and U.L.C. flame spread rating of 75 or less.
 - .1 Armstrong: Standard Excelon Imperial Texture.
 - .2 Amtico: Commercial Color-Thru Duravinyll.
 - .3 Or Agency approved equivalent.
 - 2.1.2 Resilient Base: To ASTM F1861, Tarkett Johnsonite Traditional Vinyl Cove or approved equal. Base to be top set, standard toe type, vinyl minimum
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1200mm long, 100mm high and 3.2mm thick. Colour to be RWDC-63 Burnt Umber.

- 2.1.3 Primers, Adhesives and Caulking: non-flammable, solvent free, waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
- 2.1.4 Sub-floor filler and leveler shall be white premixed latex compatible with flooring products and adhesive as recommended by flooring manufacturer for specific flooring types.
- 2.1.5 Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
- 2.1.6 Transition strips, mouldings and adaptors shall be rubber or vinyl, manufactured by Johnsonite, Roppe or Burke Mercer with lip to extend under floor tile with tapered edge, colour matched to flooring.
- 2.1.7 Sealer: water based, type recommended by flooring manufacturer.
- 2.1.8 Wax: type recommended by flooring manufacturer.
- 2.1.9 All colours and patterns shall be as selected by the Agency from the complete range of manufacturer's colours and patterns.

3. EXECUTION**3.1 Surface Conditions**

- 3.1.1 Conform to requirements of ASTM F710.
- 3.1.2 Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- 3.1.3 Confirm that resilient flooring and base may be installed in accordance with the original design and the manufacturer's recommendations.
- 3.1.4 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer. Concrete must be cured a minimum of 35 days prior to commencement of resilient flooring application.
- 3.1.5 In the event of discrepancy, immediately notify the Agency. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- 3.1.6 Perform subfloor moisture testing in accordance with ASTM F1869 and Bond Tests as described in manufacturer's installation guidelines to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80%. MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

3.2 Sub Floor Treatment

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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- 3.2.1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
 - 3.2.2 Install sub floor and levelling compound to manufacturer's recommended standard limits and deviations. Levelling compound shall be applied to all subfloors and shall meet flatness requirements of flooring manufacturer and in accordance with ASTM F710.
 - 3.2.3 Remove all substance and materials affecting adhesive bond.
 - 3.2.4 Vacuum clean floors.
 - 3.2.5 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler is cured and dry.
 - 3.2.6 Prime or seal substrates to flooring and adhesive manufacturer's instructions.
 - 3.2.7 Allow for excessive leveling of existing slabs.
- 3.3 **Application**
- 3.3.1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 hours after installation. Whenever possible, ventilate directly to outside. Do not allow contaminated air to re-circulate through the building ventilation system.
 - 3.3.2 Install all resilient flooring in strict accordance with the manufacturer's printed instructions and recommendations.
 - 3.3.3 Do not lay floor coverings and base until all trades, except painter, have completed their work and just prior to completion of the building.
 - 3.3.4 Apply adhesive uniformly with recommended trowels, at coverage as recommended by the manufacturer. Do not spread more adhesive than can be covered before initial set takes place.
 - 3.3.5 Lay flooring with joints parallel to building lines unless otherwise indicated, to produce symmetrical tile pattern. Patterns shall be as directed by the Agency. Allow for one field tile and one accent tile in each room or space. Border tiles shall be minimum ½ tile width.
 - 3.3.6 Install flooring to square grid pattern with all joints aligned unless otherwise indicated.
 - 3.3.7 As installation progresses, and after installation, roll flooring in 2 directions with a 45 kg roller to ensure full adhesion.
 - 3.3.8 Cut and fit tile neatly around fixed objects.
 - 3.3.9 Install feature strips or feature tiles where directed. Fit joints tightly.
 - 3.3.10 Continue flooring throughout areas to receive movable type partitions or fitments without interrupting floor pattern.
 - 3.3.11 Install flooring full depth of closets, toe spaces, and recesses.
 - 3.3.12 Terminate flooring at centre line of door in openings where adjacent floor finish or colour is dissimilar.
-

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- 3.3.13 Install transition strips at unprotected or exposed edges where flooring terminates. Locate transition strip at centre line of door where a door occurs.
- 3.4 **Base Application**
- 3.4.1 Lay out base to keep number of joints to a minimum. Locate joints at maximum available spacing or at internal or pre moulded corners.
- 3.4.2 Clean substrate and prime with one coat of adhesive.
- 3.4.3 Apply adhesive to back of base.
- 3.4.4 Set base against wall and floor surfaces tightly by using a 3kg hand roller.
- 3.4.5 Install straight and level to variation of 1:1000.
- 3.4.6 Scribe and fit to door frames and other obstructions. Use pre-moulded end pieces at flush door frames.
- 3.4.7 Cope internal corners. Use pre moulded corner units for right angle external corners. Use formed straight base materials for external corners of other angles, minimum 300 mm each leg.
- 3.4.8 Provide rubber base at all locations specified, regardless of floor finish.
- 3.5 **Cleaning**
- 3.5.1 Remove excess adhesive from resilient floor coverings, base and adjacent finished surfaces as the work progresses.
- 3.5.2 Clean, seal and wax floor and base surfaces to manufacturer's instructions. In carpeted areas, clean base before installation of carpet.
- 3.6 **Protection**
- 3.6.1 Protect new floors until time of final inspection.
- 3.6.2 Prohibit traffic on floors for 48 hours after installation.
- 3.6.3 Immediately prior to final inspection, remove protection, clean, dry or damp mop resilient flooring and apply one additional coat of wax.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 65 43, Linoleum Flooring**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Furnish all labour, materials and equipment necessary to supply and install linoleum flooring as indicated on the Contract Drawings and specified herein.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------|
| 1.3.1 | Section 07 92 00 | Joint Sealants |
| 1.3.2 | Section 09 21 16 | Gypsum Board |
| 1.3.3 | Section 09 65 19 | Resilient Tile Flooring |

1.4 References

1.4.1 ASTM International (ASTM)

- .1 ASTM D2047-17 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
- .2 ASTM E648-19ae1 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- .3 ASTM E662-21ae1 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- .4 ASTM F710-22 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- .5 ASTM F970-22 Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading
- .6 ASTM F2034-18 Standard Specification for Sheet Linoleum Floor Covering

1.4.2 South Coast Air Quality Management District (SCAQMD), California State

- .1 SCAQMD Rule 1168-03 Adhesives and Sealants Applications.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Selection Samples: Two sets of colour chips representing manufacturer's full range of available flooring tile colours.

1.5.3 Quality Assurance Submittals: Manufacturer's printed installation instructions; include product storage requirements.

1.5.4 Provide maintenance data for linoleum flooring for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.

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PROJECT 22701****Appendix 8.2, Division 09, Section 09 65 43, Linoleum Flooring**

1.6 Quality Assurance

- 1.6.1 Installer shall be competent in the installation of linoleum sheet flooring using heat-welded seams.
- 1.6.2 Provide types of flooring and accessories supplied by one manufacturer, including levelling and patching compounds, and adhesives.
- 1.6.3 If required, provide flooring material to meet the fire test performance criteria as tested by a recognized independent testing laboratory.

1.7 Shipping, Handling and Storage

- 1.7.1 Refer to Section 01 61 00 – Common Product Requirements.
- 1.7.2 Deliver materials in good condition to the job site in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- 1.7.3 Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
- 1.7.4 Store all materials in manufacturer's unopened packaging until installation.
- 1.7.5 Maintain storage area conditions for all materials in accordance with manufacturer's instructions.

1.8 Project Conditions

- 1.8.1 Maintain a minimum temperature in the spaces to receive the flooring and accessories of 18 °C and a maximum temperature of 38 °C for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 13 °C in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
- 1.8.2 Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

1.9 Warranty

- 1.9.1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

2. PRODUCTS**2.1 Materials**

- 2.1.1 Marmolium Tile Flooring: To ASTM F2034, Type I. Homogenous linoleum
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 65 43, Linoleum Flooring**

floor covering, single layer on jute backing. Wood and cork flour, linseed oil, natural resins, pigments.

2.1.2 Acceptable Manufacturers:

.1. Marmoleum Modular, 500mm x 500mm x 2.5mm thick linoleum recycled content floor tile by Forbo Systems. Colour as selected by Agency. Up to four colours will be selected. No substitution permitted

2.1.3 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I, ASTM E648.

2.1.4 Smoke Generation Maximum Specific Optical Density of 450 or less, ASTM E662.

2.1.5 Provide solid colour linoleum weld rod intended for heat welding of seams. Colour shall be compatible with field colour of flooring or as selected by Agency to contrast with field colour of flooring. Colour selected from the range currently available

2.2 **Adhesives**

2.2.1 Provide Linoleum Adhesive recommended by manufacturer used.

2.2.2 Adhesives shall be low VOC type to meet requirements of SCAQMD Rule 1168-03.

2.3 **Accessories**

2.3.1 For patching, smoothing, and levelling monolithic concrete subfloor, provide fast-setting cement-based patch and underlayment as recommended by the flooring manufacturer.

2.3.2 For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

2.3.3 Provide integral flash cove base accessories. Cove Strip/Filler: 15 mm radius provided or approved by floor covering manufacturer.

2.3.4 Provide transition/reducing strips tapered to meet abutting materials.

2.3.5 Provide top shield application for occupancy ready.

2.3.6 Provide threshold of thickness and width as shown on the drawings.

2.3.7 Provide resilient edge strips, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with colour to match or contrast with the flooring, or as selected by the Agency from standard colours available.

2.3.8 Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

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3. EXECUTION**3.1 Inspection**

- 3.1.1 Conform to requirements of ASTM F710.
- 3.1.2 Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- 3.1.3 Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- 3.1.4 Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- 3.1.5 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 Preparation

- 3.2.1 Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with fast-setting cement-based patch and skim coat as recommended by the flooring manufacturer.
 - 3.2.2 Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.
 - 3.2.3 Perform subfloor tests in accordance with the manufacturer's instructions to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.
 - 3.2.4 Perform subfloor moisture testing in accordance with ASTM F1869 and Bond Tests as described in manufacturer's installation guidelines to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80%. MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.
 - 3.2.5 Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.
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PROJECT 22701****Appendix 8.2, Division 09, Section 09 65 43, Linoleum Flooring**

3.3 Installation

- 3.3.1 Install flooring in strict accordance with the manufacturer's instructions.
- 3.3.2 Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- 3.3.3 Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- 3.3.4 Install cove base to a height of 100mm.
- 3.3.5 Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 45 kilogram roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
- 3.3.6 Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for colour shading and pattern at the seams in compliance with the manufacturer's recommendations.
- 3.3.7 Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- 3.3.8 Install flash cove base by certified master mechanic as per manufacturer instructions and where specified on the room finish schedule.
- 3.3.9 Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.

3.4 Cleaning

- 3.4.1 Perform initial maintenance according to the manufacturer's latest edition.
- 3.4.2 Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 68 13, Carpet Tile**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install carpet tile as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------|
| 1.3.1 | Section 03 30 00 | Cast-in-Place Concrete |
| 1.3.2 | Section 07 92 10 | Joint Sealing |
| 1.3.3 | Section 09 65 19 | Resilient Tile Flooring |
| 1.3.4 | Section 09 69 00 | Access Flooring |

1.4 References

1.4.1 ASTM International (ASTM)

- .1 ASTM D2859-16(2021) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
- .2 ASTM E662-21ae1 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- .3 ASTM E648-19ae1 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- .4 ASTM F710-22 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- .5 ASTM F1869-22 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- .6 ASTM F2170-19a Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.4.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-4.129-93 Carpet for Commercial Use;
- .2 CAN/CGSB-4-GP-156 Direct Glue-Down Carpet, Guide to Selection and Installation.

1.4.3 Carpet and Rug Institute (CRI)

- .1 CRI 104-2002 Standard for Installation of Commercial Carpet
- .2 CRI Indoor Air Quality Carpet Testing Program

1.4.4 American Association of Textile Chemists and Colorists (AATCC)

- .1 AATCC 16-E Color Fastness to Lightfastness
- .2 AATCC -134 under 3.5KV; Electrostatic Propensity of Carpet

1.4.5 Underwriters Laboratories of Canada (ULC)

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 68 13, Carpet Tile**

- .1 ULC 102.2 -2018 Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

 - 1.5 **Submittals**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5.2 Samples: Submit duplicate 610 mm square pieces of full line of each type of carpet tile specified for selection of colours by the Agency.
 - 1.5.3 Submit carpet layout with a complete list of all materials proposed to Agency for review prior to start of work.
 - 1.5.4 Submit manufacturer’s current recommended method of installation for each item.
 - 1.5.5 Provide maintenance data for carpet tile for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00- Closeout Submittals.

 - 1.6 **Quality Assurance**
 - 1.6.1 Flooring contractor shall be approved by the material manufacturer and shall have completed a minimum of three projects of similar scope.

 - 1.7 **Shipping, Handling and Storage**
 - 1.7.1 Deliver, handle and store materials in accordance with manufacturer’s printed instructions.
 - 1.7.2 Use all means necessary to protect carpet materials before, during and after installation and to protect the installed work and materials of all other trades.
 - 1.7.3 In the event of damage, immediately make all repairs and replacements necessary to the approval of the Agency.

 - 1.8 **Project Conditions**
 - 1.8.1 The temperature of the job site must stay within 15 °C and 25 °C throughout the installation and for 2-3 days beforehand.

 - 1.9 **Maintenance Materials**
 - 1.9.1 Provide extra materials as described below. Extra materials to be packaged with protective covering for storage. Identify extra materials with labels describing contents.
 - 1.9.2 Extra Stock: Provide 50 carpet tiles for future use by Agency. Store on site as directed.
 - 1.9.3 Maintenance materials to be from the same product run as installation materials.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 68 13, Carpet Tile**

1.10 **Warranty**

1.10.1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

2. **PRODUCTS**2.1 **Materials**

- .1 Carpet Tile: Interface 1462102500 Primary Stitch, Serpentine Accent. Provide sample for approval by the Agency before ordering.
- .2 Size: to be 50cm x 50cm.
- .3 Installation Method: 1/4 turn
- .4 Carpet Adhesive: to be vinyl compatible, quick release type, non-flammable and non-water soluble when dry, as recommended by carpet tile manufacturer.
- .5 Threshold and Binder Bars: Prefinished aluminum screw down type as recommended by carpet tile manufacturer.
- .6 Subfloor Filler: to be sand, cement, water grout, with liquid latex additive, mixed in accordance with manufacturer's instructions.
- .7 Rubber Base: as specified in Section 09 65 19.
- .8 Leveling and Patching Compounds: Portland cement-based formulation provided by or recommended by carpet tile manufacturer. Do not use gypsum based compounds.
- .9 All products shall meet the flame spread and smoke developed criteria under ULC 102.2.

3. **EXECUTION**3.1 **Inspection**

3.1.1 The labels on each carton shall indicate product style, pattern, colour, run number and dye lot. Confirm that the style, pattern and colour match the specifications for each area of installation. Do not mix run numbers or dye lots on the same area.

3.2 **Surface Conditions**

- 3.2.1 Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 3.2.2 Confirm that carpet tile may be installed in accordance with the original design and the manufacturer's recommendations.
 - 3.2.3 In the event of discrepancy, immediately notify the Agency.
 - 3.2.4 Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 68 13, Carpet Tile**

3.3 Installation

- 3.3.1 Install all carpet tiles in strict accordance with the manufacturer's recommendations and written installation instructions and CRI 104, Section 14, "Carpet Modules".
- 3.3.2 Do not lay carpet tiles until all trades, except painter, have completed their work and just prior to completion of the building.
- 3.3.3 Install carpet tile using a minimum number of pieces of carpet tile.
- 3.3.4 Fill all cavities, cracks, joints and all other surface imperfections in concrete substrate with latex fill or other approved subfloor filler in order to produce a smooth, flat, hard surface for receipt of carpet tile. Scrape off all ridges, droppings, scale and other projections. Clean floor with an industrial vacuum cleaner. Remove all substance and materials affecting adhesive bond.
- 3.3.5 Install carpet tile pattern parallel to walls and borders.
- 3.3.6 Dry fit (without adhesive) tiles along the entire length of vertical and horizontal centre lines. Make necessary adjustments prior to commencing installation.
- 3.3.7 Provide full coverage spread of specified release adhesive. Protect all elements and baseboards with plastic or other material before spraying. Apply adhesive in accordance to manufacturer's recommendations.
- 3.3.8 Tiles adjacent to fixtures, architectural elements and walls shall be cut. Follow the manufacturer's guidelines. Where tiles terminate at doorways, or where tiles of different type or colour butt together the joint shall centre on the door. Provide and install reducer strips where carpet tiles terminate against a concrete floor where no applied architectural floor finish is required. Reducer strip shall be installed below centre of door where a door occurs.
- 3.3.9 Lay tiles with all joints square and tightly butted together. Start installation from centre of rooms to ensure equal maximum size edge tiles. Pattern and direction of tile shall be as directed by the Agency.
- 3.3.10 Lay tiles at full depth of closets, toe spaces, and recesses. Cut and fit tiles tightly against openings, breaks, frames, fixtures, columns and other vertical surfaces. Apply adhesive to provide watertight joint around all cut areas.
- 3.3.11 Roll carpet tile for complete contact of carpet tile with adhesive and substrate.
- 3.3.12 Resilient base shall be installed under Section 09 65 19.

3.4 Cleaning

- 3.4.1 Perform cleaning operations immediately after installing carpet.
 - 3.4.2 Inspect the entire installation, paying close attention to joint and any tiles that have been cut.
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PROJECT 22701**

Appendix 8.2, Division 09, Section 09 68 13, Carpet Tile

- 3.4.3 Remove yarns that protrude from carpet surface.
- 3.4.4 Remove surplus adhesive from carpet tiles as the work progresses.
- 3.4.5 Vacuum carpet using commercial machine with rotating brush.
- 3.4.6 Protect installed carpet to comply with CRI 104, Section 16 protection of indoor installations. Protect carpet and carpet tile against damage from construction.
- 3.4.7 Immediately prior to Substantial Performance, remove protection and vacuum the floor with a pile lifter.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 69 00, Access Flooring**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 provide all labour, materials, products, equipment and services necessary to supply and install raised access flooring and understructure as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 09 65 19 Resilient Tile Flooring

1.3.2 Section 09 68 13 Carpet Tile

1.4 References

1.4.1 ASTM International (ASTM)

.1 ASTM E84-23c Standard Test Method for Surface Burning Characteristics of Building Materials

.2 ASTM E136-22 Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C

1.4.2 National Fire Prevention Association (NFPA)

.1 NFPA 75 Standard for the Fire Protection of Information Technology Equipment.

1.4.3 Ceilings & Interior Systems Construction Association (CISCA)

.1 Recommended Test Procedures for Access Floors.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Submit shop drawings:

.1 Indicate floor panel layout based on field verified dimensions, component details, anchorage methods, edge details, elevation differences, materials, finishes, fasteners and other data to permit a full evaluation of the entire access flooring system.

.2 Shop drawings shall be signed and sealed by a Professional Engineer.

1.5.3 Samples shall indicate manufacturer's standard material and colour selections and shall consist of actual units showing full range of colours, textures and patterns.

1.5.4 Provide maintenance data for access flooring for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00- Closeout Submittals.

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PROJECT 22701****Appendix 8.2, Division 09, Section 09 69 00, Access Flooring**

1.6 Definition

1.6.1 Access flooring shall mean a complete portable assembly of modular floor panels on an elevated support system (understructure) forming an accessible underfloor cavity to accommodate electrical and mechanical systems.

1.7 Quality Assurance

1.7.1 Structural components of the access flooring system shall be designed by a registered professional engineer, licensed to practice in the Province of Ontario, and qualified to provide engineering services of the type indicated which has resulted in the successful installation of systems similar to the type required for this project.

1.7.2 Installation of access floor only by experienced applicators authorized by manufacturer of system used.

1.7.3 Coordinate location of electrical and mechanical work in underfloor cavity to prevent interference with understructure.

1.7.4 Installer's qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installation of access flooring systems of a similar size and nature and that is approved by manufacturer. Submit applicator's current certificate of approval by the material manufacturer as proof of compliance.

1.7.5 Mock-up:

.1 Construct one 2m² mock-up of access flooring system in location acceptable to Agency.

.2 Arrange for Agency's review and acceptance, allow 48 hours after acceptance before proceeding with Work.

.3 Mock-up may remain as part of Work if accepted by Agency. .4 Remove and dispose of mock-ups which do not form part of Work.

.4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.7.6 Pre-installation meetings: Arrange with manufacturer's representative, installation Subcontractor, and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.8 Performance Requirements

1.8.1 Access flooring system to comply with requirements of NFPA 75 and the Ontario Building Code.

1.8.2 Design Load: Panel supported on actual understructure system shall be capable of supporting a point load of 1250 lbs. applied on a one square inch area at any location on the panel without experiencing permanent set in excess of 0.010 inches as defined by CISCA. The loading method used to determine design (allowable) load shall be in conformance with CISCA Concentrated Load test method but with panel tested on actual

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understructure instead of steel blocks.

- 1.8.3 Safety Factor: Panel supported on actual understructure system shall withstand a point load of no less than (2) two times its design load rating on a one square inch area anywhere on the panel without failure when tested in accordance with CISCA A/F, Section 2, "Ultimate Loading". Failure is defined as the point at which the system will no longer accept the load.
 - 1.8.4 Ultimate Load: Panel supported on actual understructure system shall be capable of supporting a point load of at least 2500 lbs. applied through a load indenter on a one square inch area at any location on the panel without failure (i.e. minimum safety factor if 2) when tested in accordance with CISCA A/F, Section 2, "Ultimate Loading".
 - 1.8.5 Rolling Load: Panel supported on actual understructure system shall be able to withstand the following rolling loads at any location on the panel without developing a local and overall surface deformation greater than 0.040 inches when tested in accordance with CISCA A/F Section 3, "Rolling Loads". Note: wheel 1 and wheel 2 tests shall be performed on two separate panels.
CISCA Wheel 1: Size: 3" dia x 1 13/16" wide Load: 1000 lbs. Passes: 10
CISCA Wheel 2: Size: 6" dia x 2" wide Load: 800 lbs. Passes: 10,000
 - 1.8.6 Impact Load: Panel and supporting understructure (the system) shall be capable of supporting an impact load of 150 lbs. dropped from a height of 36 inches onto a one square inch area (using a round or square indenter) at any location on the panel when tested in accordance with CISCA A/F, Section 8, "Drop Impact Load Test".
 - 1.8.7 Panel Cutout: Panel with an 8.625" diameter interior cutout shall be capable of withstanding an ultimate load of 2500 lbs. without failure without the use of additional supports.
 - 1.8.8 Flammability: Panel shall meet Class A Flame spread requirements for flame spread and smoke development. Tests shall be performed in accordance with ASTM E84.
 - 1.8.9 Combustibility: Panel shall qualify as non-combustible by demonstrating compliance with requirements of ASTM E136.
 - 1.8.10 Recycled Content: Panel and understructure system shall be required to have a minimum post-consumer recycled content of 18% and a minimum total recycled content of 49%.
 - 1.8.11 Axial Load: Pedestal support assembly shall provide a 6000 lb. axial load without permanent deformation when tested in accordance with CISCA A/F, Section 5, "Pedestal Axial Load Test".
 - 1.8.12 Overturning Moment: Pedestal support assembly shall provide an average overturning moment of 1000 in-lbs. when glued to a clean, sound, uncoated concrete surface when tested in accordance with CISCA A/F, Section 6, "Pedestal Overturning Moment Test".
 - 1.8.13 Stringer Concentrated Load: Stringer shall be capable of withstanding a
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concentrated load of 450 lbs. placed in its midspan on a one square inch area using a round or square indenter without exceeding a permanent set of 0.010" after the load is removed when tested in accordance with CISCA A/F, Section 4, "Stringer Load Testing".

1.9 Design Requirements

- 1.9.1 Access floor system, where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels supported on all four edges by structural steel members which are designed to bolt onto adjustable height pedestal assemblies forming a modular grid pattern.
- 1.9.2 Panel shall be easily removed by one person with a suction cup lifting device and shall be interchangeable except where cut for special conditions.
- 1.9.3 Quantities, finished floor heights (FFH) and location of accessories shall be as indicated on the Contract Drawings.

1.10 Shipping, Handling and Storage

- 1.10.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.10.2 Deliver access flooring components in original, unbroken containers, clearly labeled with manufacturer's name and item description.
- 1.10.3 Handle and store packages containing access flooring material as directed by the manufacturer, and in a manner so as to not overload the structure.

1.11 Sequencing and Scheduling

- 1.11.1 Mark pedestal locations on concrete subfloor so that mechanical and electrical work can be installed without interfering with the pedestals.
- 1.11.2 Do not proceed with installation of access flooring until after the completion of other construction within affected spaces.

1.12 Maintenance Materials

- 1.12.1 Deliver four spare floor panels and 16 square feet of understructure systems for each type used in the project for maintenance stock. Deliver to project in manufacturer's standard packaging clearly marked with the contents.
- 1.12.2 Floor finish materials to be same production run as installed materials.

1.13 Warranty

- 1.13.1 Warrant the work of this Section against defects of workmanship and material, for a period of three (3) years from the date of Ready-for-Takeover and agree to make good promptly any defects which occur or become apparent within the warranty period.

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PROJECT 22701****Appendix 8.2, Division 09, Section 09 69 00, Access Flooring**

2. PRODUCTS**2.1 Manufacturer**

- 2.1.1 Access floor system shall be as manufactured by Tate Access Floors, Inc. and shall consist of ConCore 1250 access floor panels and Classic Concrete panels supported by a bolted stringer understructure system.
- 2.1.2 Or Agency approved equivalent.

2.2 Pedestals

- 2.2.1 Pedestals: manufacturer's standard pedestal assembly including base, column with provision for height adjustment and head cap made either of steel or aluminum or of a combination of both.
- 2.2.2 Pedestal assemblies shall be corrosive resistant, all steel welded construction, and shall provide an adjustment range of +/- 1" for finished floor heights 6" or greater. Zinc electroplating shall be prohibited on all pedestal components, including head plate, threaded rod, adjustment nut, pedestal tube, base plate, and all fasteners.
- 2.2.3 Pedestal assemblies shall provide a means of leveling and locking the assembly at a selected height, which requires deliberate action to change height setting and prevents vibration displacement.
- 2.2.4 Hot dip galvanized steel pedestal head shall be welded to a threaded rod which includes a specially designed adjusting nut. The nut shall provide location lugs to engage the pedestal base assembly, such that deliberate action is required to change the height setting.
- 2.2.5 Threaded rod shall provide a specially designed anti-rotation device, such that when the head assembly is engaged in the base assembly, the head cannot freely rotate (for FFH of 7" or greater and Types 1A and 2B square tube bases only). Note: This prevents the assembly from inadvertently losing its leveling adjustment when panels are removed from the installation during use.
- 2.2.6 Hot dip galvanized pedestal base assembly shall consist of a formed steel plate 127 x 127 x 3.98mm thick square with not less than 161cm² of bearing area welded to a 22mm square steel tube and shall be designed to engage the head assembly.

2.3 Stringers

- 2.3.1 Stringers shall support each edge of panel.
- 2.3.2 Steel stringer shall have conductive galvanized coating. Zinc electroplating shall be prohibited on stringers and stringer fasteners.
- 2.3.3 Stringers shall be individually and rigidly fastened to the pedestal with one machine screw for each foot of stringer length. Bolts shall provide positive electrical contact between the stringers and pedestals. Connections depending on gravity or spring action are unacceptable.

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2.3.4 Stringer grid shall be 1219mm stringers in a basketweave configuration ensuring maximum lateral stability in all directions.

2.4 Panel Components

2.4.1 Panels shall consist of a top steel sheet welded to a formed steel bottom pan filled internally with a lightweight cementitious material. Mechanical or adhesive methods for attachment of the steel top and bottom sheets are unacceptable.

2.4.2 Floor panels shall be protected from corrosion by electro-deposited epoxy paint. The use of zinc electroplating shall be prohibited. Panels shall have a flame spread rating of 25 or less for approval for use in non-combustible construction.

2.4.3 Cementitious fill material shall be totally encased within the steel welded shell except where cut for special conditions.

2.2.4 Finish Flooring: Carpet tile as specified in Sections 09 68 13 and exposed concrete finish where indicated on Contract Drawings.

2.5 Exposed Concrete Floor Panels

2.5.1 Provide Tate Access Floors Classic Concrete panel with honed surface texture.

2.5.2 Panel Colour: Gray cement with blue/gray/white aggregate.

2.5.3 Top edge of panels shall have an eased edge with @ .08" radius.

2.5.4 Modular and removable panels shall be nominal 24" square x 1-5/16" deep with factory laminated steel bottom pan protected from corrosion by E-coat paint coating.

2.5.6 Panels shall exhibit moderate variation (V2 rating) with respect to shade, colour tone and sheen.

2.5.7 Panels shall be sealed after installation (by designated contractor). In all instances for any sealer selected, a suitably sized mock-up of the Classic Concrete system shall be constructed with the specified sealer applied and reviewed by all parties to ensure desired results prior to application on installed floor system. Subject to compliance with requirements, field apply the following sealer:

.1 Ghostshield Lithi-Tek Penetrating waterproofer and densifier or approved equivalent.

2.5.8 Bare panels shall weigh approximately 14 lbs./sq. ft.

2.6 Accessories

2.6.1 Panel lifting Devices: Manufacturer's standard as recommended for each panel type. Provide 2 panel lifting devices.

2.6.2 Adhesives: type as recommended by manufacturer of article to be bonded.

2.6.3 Cable cutout protection.

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- 2.6.4 Finish panel edges with manufacturer's standard edge trim. Edging shall be interlocked with top sheet and captured by up-turned edge of bottom sheet steel. Colour selected by Agency.
 - 2.6.5 Provide manufacturer's fascia plate, perimeter support and grommets where indicated on the Contract Drawings.
 - 2.7 **Fabrication Tolerances**
 - 2.7.1 Floor panel flatness measured on a diagonal: +/- 0.889mm
 - 2.7.2 Floor panel flatness measured along edges: +/- 0.635mm
 - 2.7.3 Floor panel width or length of required size: +/- 0.254mm
 - 2.7.4 Floor panel squareness tolerance: +/- 0.381mm
 - 3. **EXECUTION**
 - 3.1 **Manufacturer's Instructions**
 - 3.1.1 Install components to system manufacturer's instructions and under the supervision of the system manufacturer's authorized representative to ensure rigid, firm installation, free from vibration, rocking, rattle, squeaks and other unacceptable performance.
 - 3.2 **Preparation**
 - 3.2.1 Examine structural subfloor for unevenness, irregularities and dampness that would affect the quality and execution of the work. Do not proceed with installation until structural floor surfaces are level, clean and dry.
 - 3.2.2 Concrete sealers, if used shall be identified and proven to be compatible with pedestal adhesive. Verify that adhesive achieves bond to slab before commencing work.
 - 3.2.3 Verify dimensions on contract drawings, including level of interfaces including abutting floor, ledges and doorsills.
 - 3.2.3 Ensure area to receive access flooring is square. If area is out of square, layout work in such a way that perimeter panels are cut to fit and follow configuration of abutting vertical surface. Filling squareness differential with strips of access floor material is not acceptable.
 - 3.2.4 The Contractor shall provide clear access, dry subfloor area free of construction debris and other trades throughout installation of access floor system.
 - 3.2.5 Area to receive and store access floor materials shall be enclosed and maintained at ambient temperatures between 10° C to 32° C and relative humidity levels between 20% to 80%. At least 24 hrs. before installation begins, all floor panels shall be stored at ambient temperatures between 10° C to 32° C and relative humidity levels between 20% to 80% and shall remain within these environmental limits throughout occupancy.
 - 3.2.6 Commencement of work of this Section implies acceptance of surfaces and conditions
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PROJECT 22701****Appendix 8.2, Division 09, Section 09 69 00, Access Flooring**

3.3 Installation**3.3.1 Pedestals and Stringers:**

- .1 Arrange pedestal assemblies to meet grid spacing required.
- .2 Bond pedestals base plate to structural floor with adhesive to provide full bearing of the pedestal base on the concrete subfloor. Provide shims as recommended by manufacturer at sloped subfloor conditions.
- .3 Lay out the floor panel installation to keep the number of cut panels to a minimum. Scribe panel assemblies at perimeter to provide a close fit with no voids greater than 3.0mm where panels abut vertical surfaces.
- .4 Install additional pedestal assemblies where grid pattern is disturbed by columns, walls, ramps, openings and steps, and at cut-outs that impair floor load capacity.
- .5 Rigidly brace floor pedestals four ways with stringers in accordance with the manufacturer's recommended procedures.

3.3.2 Floor Panels:

- .1 Install floor panels and floor finish solidly on pedestals, level to maximum variation over entire floor of 1:2000.
- .2 Install metal channels to protect edges of all cut panels to meet Ministry of Housings BMEC approval for use in non-combustible construction.
- .3 Install concrete floor panels where indicated and apply minimum 2 coats of sealer in accordance with manufacturer's instructions. All perimeter joints between floor panels shall be sealed with caulking as specified in Section 07 92 00 and as recommended by manufacturer.

3.3.3 Provide electrical grounding connectors.**3.4 Protection**

- 3.4.1 Protect finished access floor from damage until time of Substantial Performance.
- 3.4.2 Prevent traffic over access floor areas, and protect finished floor with kraft paper, sealed at edges to prevent tearing.

3.5 Cleaning

- 3.5.1 Clean finished floor free of dust and other surface contaminants. Clean area under floor completely. Remove debris and vacuum clean entire underfloor wall, floor, and supporting structure.
- 3.5.2 Prior to Substantial Performance, remove protection and dispose of same and leave floor in a clean condition, free from defects.

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END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 09, Section 09 91 23, Interior Painting**

1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install painting as indicated on the Contract Drawings and specified in this Section of Specification.

1.3 Related Sections

| | | |
|-------|------------------|-------------------------|
| 1.3.1 | Section 05 50 00 | Metal Fabrications |
| 1.3.2 | Section 06 20 00 | Finish Carpentry |
| 1.3.3 | Section 08 11 00 | Metal Doors and Frames |
| 1.3.4 | Section 09 21 16 | Gypsum Board Assemblies |

1.4 References

1.4.1 ASTM International (ASTM)
.1 ASTM A780/A780M-20 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

1.4.2 Environmental Protection Agency (EPA)
.1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).

1.4.3 Master Painters Institute (MPI)
.1 MPI Architectural Painting Specifications Manual, 2018
.2 MPI Standard GPS-1-12 and GPS-2-12 MPI Green Performance Standard for Painting and Coatings.

1.4.4 Society for Protective Coatings (SSPC)
.1 Systems and Specifications, SSPC Painting Manual 2009

1.4.5 Underwriters Laboratories of Canada (ULC)
.1 ULC 102-18 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.4.6 South Coast Air Quality Management District, California State (SCAQMD)
.1 SCAQMD Rule 1113-96, Architectural Coatings.

1.4.7 Green Seal GS-11 Green Seal Environmental Standard for Paints and Coatings, January 1997.
.1 National Fire Code of Canada

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria,

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finish and limitations.

- 1.5.3 Samples:
 - .1 Submit full range colour sample chips.
 - .2 Submit duplicate 200 x 300mm sample panels of each paint, stain, clear coating and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- 1.5.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties and SCAQMD Rule 1113-96.
- 1.5.5 Provide maintenance data for paint products for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00-Closeout Submittals. Include following:
 - .1 Product name, number, type and use.
 - .2 Colour numbers.
 - .3 MPI Environmentally Friendly classification system rating.

1.6 Quality Assurance

- 1.6.1 Qualifications:
 - .1 Contractor: to have a minimum of five years proven satisfactory experience.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
 - 1.6.2 Conform to latest MPI requirements for painting work including preparation and priming.
 - 1.6.3 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
 - 1.6.4 Paint materials to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.
 - 1.6.5 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Agency.
 - 1.6.6 Provide mock-up in accordance with Section 01 45 00 - Quality Control.
 - .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen and textures. Locate where directed.
 - .2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
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- .3 Allow 24 hours for inspection of mock-up before proceeding with work.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- 1.7 **Shipping, Handling and Storage**
- 1.7.1 Deliver and store materials in original containers, sealed, with labels intact. Labels to indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
 - 1.7.2 Provide and maintain dry, temperature controlled, secure storage. Store materials and equipment in well-ventilated area with temperature range 7 ° C to 30 ° C. Store materials and supplies away from heat generating devices.
 - 1.7.3 Observe manufacturer's recommendations for storage and handling.
 - 1.7.4 Keep areas used for storage, cleaning and preparation, clean and orderly.
 - 1.7.5 After completion of operations, return areas to clean condition.
 - 1.7.6 Remove paint materials from storage only in quantities required for same day use.
 - 1.7.7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - 1.7.8 Remove damaged, opened and rejected materials from site.
- 1.8 **Fire Safety Requirements**
- 1.8.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - 1.8.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - 1.8.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- 1.9 **Waste Management and Disposal**
- 1.9.1 Place materials defined as hazardous or toxic in designated containers.
 - 1.9.2 Handle and dispose of hazardous materials in accordance with Municipal regulations.
 - 1.9.3 Unused materials must be disposed of at official hazardous material collections site.
 - 1.9.4 Paint and related materials are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from the Ministry of the Environment.
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- 1.9.5 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - 1.9.6 Place materials defined as hazardous or toxic waste in containers or areas designated for hazardous waste.

 - 1.10 **Maintenance**
 - 1.10.1 Extra Materials:
 - .1 Quantity: provide one four litre can of each type and colour of finish coating used on this project.
 - .2 Deliver to Agency and store where directed.

 - 1.11 **Ambient Conditions**
 - 1.11.1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 – Temporary Utilities.
 - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 ° C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .3 Provide continuous ventilation for seven days after completion of application of paint.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
 - 1.11.2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved in writing by Agency and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 ° C.
 - .2 Substrate temperature is above 32 ° C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 ° C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 ° C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .2 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .3 Perform painting work when maximum moisture content of the substrate is below:
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- .1 Allow new concrete to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .1 Test concrete and plaster surfaces for alkalinity as required.
 - 1.11.3 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
 - 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 All paint products shall be by Benjamin Moore. Substitutions are not permitted.
 - 2.1.2 Products to meet requirements of GS-11 or SCAQMD Rule 1113-96
 - 2.1.3 Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use.
 - 2.1.4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Non-flammable, biodegradable.
 - .2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .3 Manufactured without compounds which contribute to smog in the lower atmosphere.
 - .4 Do not contain methylene chloride, chlorinated hydrocarbons or toxic metal pigments.
 - .5 Recycled content of 15% post-consumer and ½ post-industrial waste.
 - 2.1.5 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
 - 2.1.6 Flash point: 61 °C or greater for water-borne surface coatings and recycled water-borne surface coatings.
 - 2.2 **Colours**
 - 2.2.1 Agency will provide Colour Schedule.
 - 2.2.2 Colour schedule will be based upon selection of eight base colours and six deep tint accent colours.
 - 2.2.3 Selection of colours will be from the manufacturer's full range of colours.
 - 2.2.4 Second coat in three coat system to be tinted slightly lighter colour than top
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coat to show visible difference between coats.

2.3 **Mixing and Tinting**

- 2.3.1 Perform colour tinting operations prior to delivery of paint to site.
- 2.3.2 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- 2.3.3 Thin paint for spraying in accordance with paint manufacturer's instructions.
- 2.3.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 **Gloss/Sheen Ratings**

- 2.4.1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

| 3.2 Gloss Category/ | Level | 3.3 Units @ 60 Degrees | 3.4 Units @ 85 Degrees |
|-----------------------------|-------|------------------------|------------------------|
| 3.5 G1 – matte finish | | 3.6 0 to 5 | 3.7 Max. 10 |
| 3.8 G2 – velvet finish | | 3.9 0 to 10 | 3.10 10 to 35 |
| 3.11 G3 – eggshell finish | | 3.12 10 to 25 | 3.13 10 to 35 |
| 3.14 G4 – satin finish | | 3.15 20 to 35 | 3.16 Min. 35 |
| 3.17 G5 – semi-gloss finish | | 3.18 35 to 70 | 3.19 |
| 3.20 G6 – gloss finish | | 3.21 70 to 85 | 3.22 |
| 3.23 G7 – high gloss finish | | 3.24 > 85 | 3.25 |

- 2.4.2 Gloss level ratings of painted surfaces as specified.

2.5 **Interior Painting Systems**

- 2.5.1 Metal Fabrications:
- .1 INT 5.3A Latex G5 semi-gloss finish
- 2.5.2 Galvanized Metal: interior doors, frames, railings, misc. steel, pipes, and ducts.
- .1 INT 5.3A Latex G5 semi-gloss finish
- 2.5.3 Electrical Equipment Backboards:
- .1 INT 6.4P Fire retardant, pigmented coating. Low odour/low VOC. Semi-gloss (UL/ULC rated).
- 2.5.4 Gypsum Board: Walls and Bulkheads.
- .1 INT 9.2A Latex G3 eggshell finish over latex sealer.
- 2.5.5 Gypsum Board: Ceilings and Bulkheads:
- .1 INT 9.2A Latex G2 velvet finish over latex sealer.

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- 2.5.6 Concrete Horizontal Surfaces:
 - .1 INT 3.2H Latex Zone/Traffic marking finish.
- 2.5.7 All other surfaces not noted above: high performance finish suitable for commercial and institutional environment and in accordance with MPI painting manual.

3. EXECUTION**3.1 General**

- 3.1.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- 3.1.2 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and application instructions, and data sheets.

3.2 Examination

- 3.2.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report damages, defects, unsatisfactory or unfavorable conditions to Consultant before proceeding with work.

3.3 Preparation**3.3.1 Protection:**

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking and in accordance with paint manufacturers and MPI recommendations. If damaged, clean and restore surfaces as directed by Agency.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.

3.3.2 Surface Preparation:

- .1 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .2 Place "WET PAINT" signs in occupied areas as painting operations progress.

3.3.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

- .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths, or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle
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- .3 brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
 - 3.3.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
 - 3.3.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
 - 3.3.6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements and SSPC-SP 6. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes blowing with clean dry compressed air or vacuum cleaning.
 - 3.3.7 Touch up of shop primers with primer as specified.
 - 3.3.8 Do not apply paint until prepared surfaces have been accepted by Consultant/Agency.
 - 3.4 **Application**
 - 3.4.1 Apply paint materials in accordance with paint manufacturer's written application instructions.
 - 3.4.2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks.
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- .5 Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
 - 3.4.3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, overlapping at edges of spray pattern.
 - .4 Back roll first coat application.
 - .5 Brush out immediately all runs and sags.
 - .6 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
 - 3.4.4 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
 - 3.4.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
 - 3.4.6 Sand and dust between coats to remove visible defects.
 - 3.4.7 Finish surfaces both above and below sight lines as specified for surrounding surfaces.
 - 3.4.8 Finish alcoves as specified for adjoining rooms.
 - 3.4.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
 - 3.5 **Mechanical/Electrical Equipment**
 - 3.5.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces.
 - 3.5.2 Mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
 - 3.5.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
 - 3.5.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
 - 3.5.5 Do not paint over nameplates.
 - 3.5.6 Keep sprinkler heads free of paint.
 - 3.5.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
 - 3.5.8 Paint fire protection piping red.
 - 3.5.9 Paint natural gas piping yellow.
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- 3.5.10 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- 3.5.11 Do not paint interior transformers and substation equipment.
- 3.6 **Field Quality Control**
 - 3.6.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - 3.6.2 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- 3.7 **Cleaning and Restoration**
 - 3.7.1 Remove protective coverings and warning signs as soon as practical after operations cease.
 - 3.7.2 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
 - 3.7.3 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant /Agency. Avoid scuffing newly applied paint.
 - 3.7.4 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant/Agency.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 Section Includes**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services necessary to supply and install toilet and bath accessories as indicated on the Contract Drawings and specified in this Section of the Specification.

1.3 Related Sections

1.3.1 Section 06 61 16 Solid Surfacing
1.3.2 Section 09 21 16 Gypsum Board Assemblies

1.4 References

1.4.1 ASTM International (ASTM)
.1 ASTM A653/A653M-23 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.2 ASTM A924/A924M-22a Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
.3 ASTM B456-17(2022) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
.4 ASTM D1187/D1187M-97(2018) Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
1.4.2 CSA Group (CSA)
.1 CSA/ASC B651:23 Accessible Design for the Built Environment.
.2 CSA G164-18(R2023) Hot Dip Galvanizing of Irregularly Shaped Articles.

1.5 Submittals

1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
1.5.2 Shop Drawings:
.1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
1.5.3 Samples:
.1 Submit samples when requested.
.2 Samples to be returned for inclusion into Work.
1.5.4 Closeout Submittals:

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- .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- 1.6 **Shipping, Handling and Storage**
- 1.6.1 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- 1.7 **Extra Materials**
- 1.7.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.
- 1.7.2 Deliver special tools to Agency.
2. **PRODUCTS**
- 2.1 **Materials**
- 2.1.1 Sheet steel: to ASTM A653 with ZF001 designation zinc coating.
- 2.1.2 Stainless steel sheet metal: Type 304, with Brushed finish.
- 2.1.3 Stainless steel tubing: Type 304, commercial grade, seamless welded, minimum 1.2 mm wall thickness.
- 2.1.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.
- 2.2 **Components and Manufacturer**
- Substitution of the products specified below will not be accepted.
- 2.2.1 TTD: Bobrick Product Code B-2892: Surface Mounted Twin Jumbo-Rol Toilet Tissue Dispenser. Door and cabinet shall be type-304 stainless steel with satin-finish: door shall be 18 gauge (1.2mm); cabinet shall be 20 gauge (1.0mm). Cabinet shall be equipped with a tumbler lock keyed like other Bobrick washroom accessories. Door shall have a wide viewing slot to reveal toilet tissue supply inside cabinet. Dispensing mechanism shall be constructed of high-impact ABS shall accommodate two toilet tissue rolls up to 10" (255mm) diameter with 3" (75mm) diameter core; and be equipped with a sliding access panel that exposes one roll at a time. Spindles shall be convertible in the field to dispense 2-1/4" (55mm) diameter core rolls by removing outer spindles furnished in-place. (Qty- 1) in Washroom
- 2.2.2 GB1: Grab Bar, Bobrick Model No. B-6806.99 x 12. 18-8S, type-304, 18-gauge (1.2mm) stainless steel tubing with satin-finish. 1-1/2" (38mm) outside diameter. Concealed Mounting Flanges-18-8 S, type-304, 1/8" (3mm) thick, stainless-steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with two holes for attachment to wall. Snap Flange Covers-18-8 S, type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-
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- 1/4" (85mm) diameter x 1/2" (13mm) deep. Each cover snaps over mounting flange to conceal mounting screws. (Qty 1) Washroom
- 2.2.3 GB2: 90-Degree Grab Bar, Bobrick Model No. B-6898.99 1 1/2" (38mm) Diameter Stainless Steel 30" x 30" (762 x 762mm) 90-Degree Grab Bar. Grab Bar-18-8, type-304, 18-gauge (1.2mm) stainless steel tubing with satin-finish with peened grip. 1-1/2" (38mm) outside diameter. Concealed Mounting Glanges-18.8, type-304, 1/8" (3mm) thick, stainless-steel plate: end flanges 2" x 3-1/8" (50 x 80mm) with two holes for attachment to wall. Snap Flange Covers-18-8, type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 1/2" (13mm) deep. Each cover snaps over mounting flange to conceal mounting screws. (Qty 1) Washroom
- 2.2.4 SD: Soap Dispenser: Deb, Model TF2CHR – Touch-Free Dispenser II, Black/Chrome, operates with batteries. (Qty 2) Washroom, Kitchen
- 2.2.5 FM: Framed Mirror: Bobrick Model No. B-165 2436 Mirror with stainless steel channel frame. Frame – Type-430 stainless steel, 1/2" x 1/2" x 3/8" (13 x 13 x 9.5mm) channel with 1/4" (6mm) return at rear for Snap Locking Design: 1/2" x 1/2" x 1/2" (13 x 13 x 13mm) channel for Lock Tab Design, with bright polished finish. One piece frame with 90-degree mitered corners. Mirror – No. 1 quality, 1/4" (6mm) select float glass; selected for silvering, electrolytically copper-plated by the galvanic process and guaranteed for 15 years against silver spoilage. Concealed Wall Hanger – Fabricated of galvanized steel. (Qty 1)
- 2.2.6 PTD: Paper Towel Dispenser: Frost, Product Code: 107, Multifold and "C" Fold Universal Paper Towel Dispenser. One piece 22-gauge type 430 stainless steel brushed satin finish.
34.0cm H x 27.9cm W x 10.5cm D (13.4" H x 11" W x 4.1" D)
(Qty 2) Washroom, Kitchen
- 2.2.7 SSS: Stainless Steel Shelf: Bobrick Model B-298x18, Shelf-18-8 S, type-304, 18-gauge (1.2mm) stainless steel with satin finish. 3/4" (19mm) return edges for maximum rigidity. Front edge is hemmed for safe handling. Mounting Brackets 18-8S, type-304, 16-gauge (1.66mm) stainless steel with satin finish. (Qty 2) Washroom, 1 and 1 hand over to the Agency
- 2.2.8 CH: Surface-Mounted Hat and Coat Hook: Bobrick Model B-682. Flange and Support Arm – 18-8 S, type-304, 22-gauge (0.8mm) stainless steel. Concealed, 16-gauge (1.6mm) stainless steel mounting bracket. Concealed Wall Plate – 18-8 S, type-304, 16-gauge (1.6mm) stainless steel. Hook – 18-8 S, type-304, 12-gauge (2.8mm) stainless steel. Welded to support arm. (Qty 6) 1 Washroom, 5 handover to Agency.
- 2.2.9 BR: Stainless Steel Grab Bar with Padded Back Rest: Bobrick B-5892. Grab bar-18-8, Type-304, 1.2mm (18-gauge) stainless steel tubing with satin finish. 30mm (1-1/4" outside diameter. Concealed Mounting Flanges – 18-8, Type 304, 3mm (11-gauge) thick, stainless-steel plate 50 x 80mm (2" x 3-1/8") with six holes for attachment to wall. Snap Flange Covers –

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18-8, Type-304, 0.8mm (22-gauge) drawn stainless steel with satin finish. 83mm (3-1/4") diameter x 5/8" (16mm) deep. Backrest – 360 x 160 x 40mm (14-1/4" x 6-3/8" x 1-5/8") white colored polyurethane integral foam. Secured to grab bar with 18-8, Type-304, 1.2mm (18-gauge) stainless steel C-clamps. (Qty 1) Washroom

- 2.2.10 WR: Floor-Standing Open-Top Waste Receptacle: Bobrick Model B-2300. Waste Receptacle – Floor-standing cylinder with open bottom. Exposed surface has satin finish. Dome-Top – Black cold-rolled steel. Riveted to waste receptacle. 6" (150mm) diameter opening has 1/2" (13mm) wide, contrasting metal rim that matches the finish on waste receptacle. Waste Container – Galvanized steel. Removable for servicing. Capacity" 15-gal. (56.8L). (Qty 6): Handover to Agency

2.3 Fabrication

- 2.3.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- 2.3.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- 2.3.3 Brake form sheet metal work with 1.5mm radius bends.
- 2.3.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- 2.3.5 Back paint components where contact is made with building finishes, to prevent electrolysis.
- 2.3.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- 2.3.7 Shop assemble components and package complete with anchors and fittings.
- 2.3.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- 2.3.9 Provide steel anchor plates and components for installation on studding and building framing.

2.4 Finishes

- 2.4.1 Chrome and nickel plating: to ASTM B456, satin finish.
- 2.4.2 Baked enamel: condition metal by applying one coat of metal conditioner to ASTM D1187, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Agency.
- 2.4.3 Manufacturer's or brand names on face of units not acceptable.

3. EXECUTION**3.1 Installation**

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 10, Section 10 28 10, Toilet and Bath Accessories**

- 3.1.1 Install toilet and bath accessories in accordance with the Ontario Building Code, CSA B651 and manufacturer's instructions.
- 3.1.2 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry or concrete: use bolt with lead expansion sleeve set into drilled hole.
- 3.1.3 Install grab bars on built-in anchors provided by manufacturer.
- 3.1.4 Use tamper proof screws/bolts for fasteners.
- 3.1.5 Fill units with necessary supplies shortly before final acceptance of building.
- 3.1.6 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - .1 Verify blocking has been installed properly.
 - .2 Verify location does not interfere with door swings or use of fixtures.
 - .3 Comply with manufacturer's recommendations for backing and proper support.
 - .4 Use fasteners and anchors suitable for substrate and project conditions.
 - .5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
 - .6 Conceal evidence of drilling, cutting, and fitting to room finish.
 - .7 Test for proper operation.
- 3.2 **Schedule**
 - 3.2.1 Locate accessories where indicated. Exact locations determined by Consultant/Agency.
- 3.3 **Cleaning**
 - 3.3.1 Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
 - 3.3.2 Touch-up, repair or replace damaged products until Substantial Performance.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 05 00, Common Work Results for Fire Suppression****1. GENERAL****1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, and equipment for supply, installation, testing of equipment and services as indicated on the Contract Drawings and Specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with this section.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.

1.3 Closeout Submittals

- 1.3.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with the Consultant before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 05 00, Common Work Results for Fire Suppression**

- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .5 Approvals:
 - .1 Submit [1] copy of draft Operation and Maintenance Manual to the Consultant for approval, including electronic form also. Submission of individual data will not be accepted unless directed by the Consultant.
 - .2 Make changes as required and re-submit as directed by the Consultant.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .7 Site records:
 - .1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
 - .5 Make available in electronic form.
 - .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12mm high as follows: - "as built drawings: this drawing has been revised to show mechanical systems as installed" (signature of contractor) (date).
 - .3 Submit to the Consultant for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
 - .9 Submit copies of as-built drawings for inclusion in final TAB report.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 05 00, Common Work Results for Fire Suppression**

- .10 Submit as-built drawings in electronic form as well in PDF and CAD formats.
 - 1.3 **Maintenance Material Submittals**
 - 1.3.1 Provide one set of special tools required to service equipment as recommended by manufacturers.
 - 1.3.2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.
 - 2. **PRODUCTS**
 - 2.1 **Fire Extinguishers**
 - 2.1.1 Fire extinguisher specifications as follows:
 - .1 Provide national fire equipment ltd., diamond fire extinguisher model ABC-050WWD 5lb multi-purpose dry chemical extinguishers c/w recessed fire extinguisher cabinet.
 - 2.1.2 Extinguisher locations are shown on Contract Drawings for reference purposes only. Actual locations and quantities shall be coordinated with NFPA, the Ontario Fire Code, the Fire Marshall and all Authorities Having Jurisdiction.
 - 3. **EXECUTION**
 - 3.1 **Examination**
 - 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing installation in accordance with manufacturer's written instructions.
 - .1 Inform The Agency of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.
 - 3.2 **Painting Repairs and Restoration**
 - 3.2.1 Prime and touch up marred finished paintwork to match original.
 - 3.2.2 Restore to new condition, finishes which have been damaged.
 - 3.3 **System Cleaning**
 - 3.3.1 Clean interior and exterior of all systems.
 - 3.4 **Field Quality Control**
 - 3.4.1 Site Tests: conduct following tests and submit report as described in part 1 - action and informational submittals.
 - 3.4.2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 05 00, Common Work Results for Fire Suppression**

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- 3.5 **Demonstration**
- 3.5.1 The Consultant / Agency will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
 - 3.5.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
 - 3.5.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.
 - 3.5.4 Instruction duration time requirements as specified in appropriate sections.
- 3.6 **Cleaning**
- 3.6.1 Progress Cleaning: leave Work area clean at end of each day.
 - 3.6.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
 - 3.6.3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- 3.7 **Protection**
- 3.7.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, installation, testing of sprinkler system as indicated on the Contract Drawings and Specified in this section of Specification.
- 1.1.3 Sprinkler system shall conform to applicable NFPA Standards and to all authorities requirements.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 21 05 00 – Common Work Results for Fire Suppression.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, [number of anchors, dimensions, construction and assembly details and accessories.
- 1.2.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Instructions: submit manufacturer's installation instructions.
- 1.2.6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.2 Closeout Submittals

- 1.2.1 Submit in accordance with Section 21 05 00 – Common Work Results for Fire Suppression.
 - 1.2.2 Manufacturer's catalogue Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Alarm valves.
 - .3 Valves, including gate, check, and globe.
 - .4 Water motor alarms.
 - .5 Sprinkler heads.
 - .6 Pipe hangers and supports.
 - .7 Pressure or flow switch.
 - .8 Fire department connections.
 - .9 Excess pressure pump.
 - .10 Mechanical couplings.
 - 1.2.3 Drawings:
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

- .1 Sprinkler heads and piping system layout.
 - .1 Prepare working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
 - .2 Show data essential for proper installation of each system.
 - .3 Show details, plan view, elevations, and sections of systems supply and piping.
 - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
 - .2 Electrical wiring diagrams.
 - 1.2.4 Design Data:
 - .1 Calculations of sprinkler system design.
 - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
 - 1.2.5 Field Test Reports:
 - .1 Preliminary tests on piping system.
 - 1.3 **Quality Assurance**
 - 1.3.1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems approved by landlord.
 - 1.3.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.
 - 1.4 **Maintenance Material Submittals**
 - 1.4.1 Extra Materials:
 - .1 Provide maintenance materials in accordance manufacturers recommendations.
 - .2 Provide six (6) spare sprinklers and tools in accordance with NFPA
 - 2. **PRODUCTS**
 - 2.1 **Design Requirements**
 - 2.1.1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area.
 - 2.1.2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
 - 2.1.3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
 - 2.1.4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

- 2.1.5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- 2.1.6 Design systems for earthquake protection for buildings in seismic zone as required.
- 2.1.7 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
 - .2 Uniformly space sprinklers on branch.
- 2.1.8 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
 - .2 Discharge from individual heads in hydraulically most remote area to be 100 % of specified density.
- 2.1.9 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
- 2.1.10 Sprinkler Discharge Area:
 - .1 Area: hydraulically most remote area as defined in NFPA 13.
- 2.1.11 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations of for outside hose streams.
- 2.1.12 Friction Losses:
 - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.
- 2.2 **Above Ground Piping Systems**
 - 2.2.1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings.
 - 2.2.2 Perform welding in shop; field welding will not be permitted.
 - 2.2.3 Conceal piping in areas with suspended ceiling.
- 2.3 **Pipe, Fittings and Valves**
 - 2.3.1 Pipe:
 - .1 Ferrous: Schedule 40 to NFPA 13.
 - .2 Copper tube: to NFPA 13.
 - 2.3.2 Fittings and joints to NFPA 13:
 - .1 Ferrous (schedule 40): screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed, grooved.

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PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

- .3 Provide welded, threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32mm and larger.
 - .5 Fittings: ULC approved for use in wet pipe sprinkler systems
 - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .7 Sprinkler pipe and fittings: metal.
 - 2.3.3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counterclockwise rotation.
 - .3 Check valves: flanged clear opening swing or spring actuated check type with flanged inspection and access cover plate for sizes 10 cm and larger.
 - .4 Provide gate valve in piping protecting elevator hoist ways, machine rooms, and machinery spaces.
 - 2.3.4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.
 - 2.4 **Sprinkler Heads**
 - 2.4.1 Shall be Simplex Grinnell, Viking or approved equal.
 - 2.4.1 General: to NFPA 13 and ULC listed for fire services.
 - 2.4.2 Sprinkler Head Type:
 - .1 As specified on Contract Drawings.
 - 2.4.3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 Release element of each head to be of ordinary temperature rating or higher as suitable for specific application.
 - .2 Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings.
 - .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .4 Provide number of sprinkler heads as required by hydraulic calculations and shop drawings; sprinkler heads on Contract Drawings as shown for general representation.
 - .5 Deflector: not more than 75mm below suspended ceilings.
 - .6 Ceiling plates: not more than 25mm deep.
 - 2.5 **Supervisory Switches**
 - 2.5.1 General
 - .1 To NFPA 13 and ULC listed for fire service.
 - .2 Potter OSYSU Series or approved equal.
 - 2.5.2 Valves:
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

- .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
 - 2.5.3 Pressure or flow switch type:
 - .1 With normally open and normally closed contacts and supervisory capability.
 - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
 - .3 Connect into building fire alarm system.
 - .4 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
 - 2.5.4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.
 - 2.6 **Pipe Sleeves**
 - 2.6.1 Provide pipe sleeves where piping passes through walls, floors, and roofs.
 - 2.6.2 Secure sleeves in position and location during construction.
 - 2.6.3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.
 - 2.6.4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.
 - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass, provide mechanically adjustable segmented elastomeric seal.
 - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
 - 2.6.5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
 - 2.6.6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide 0.61mm thick galvanized steel sheet.
 - 2.7 **Escutcheon Plates**
 - 2.7.1 Provide one piece type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
 - 2.7.2 Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces.
 - 2.7.3 Provide paint finish on metal plates in unfinished spaces.
 - 2.8 **Spare Parts Cabinet**
 - 2.8.1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

3. EXECUTION**3.1 Manufacturer's Instructions**

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

3.2 Installation

3.2.1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

3.3 Pipe Installation

3.3.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

3.3.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

3.3.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

3.3.4 Inspect piping before placing into position.

3.4 Electrical Connections

3.4.1 Provide fire alarm system under Section 28 31 02 (Multiplex Fire Alarm System)

3.4.2 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.

3.4.3 Provide wiring in rigid metal conduit or intermediate metal conduit.

3.5 Disinfection

3.5.1 Disinfect new piping and existing piping.

3.5.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.

3.5.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

3.5.4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.6 Field Painting

3.6.1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.

3.6.2 Apply coatings to clean, dry surfaces, using clean brushes.

3.6.3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

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PROJECT 22701****Appendix 8.2, Division 21, Section 21 13 13, Wet Pipe Sprinkler Systems**

- 3.6.4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0ml.
- 3.6.5 Shield sprinkler heads with protective covering while painting is in progress.
- 3.6.6 Upon completion of painting, remove protective covering from sprinkler heads.
- 3.6.7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- 3.6.8 Provide primed surfaces with following:
 - .1 Piping in Finished Areas:
 - .1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.
 - .2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.
 - .3 Provide piping with self-adhering red plastic bands spaced at maximum of 6m intervals throughout piping systems.
 - .2 Piping in Unfinished Areas:
 - .1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
 - .2 Provide piping with self-adhering red plastic bands spaced at maximum of 6m intervals.
- 3.7 **Field Quality Control**
 - 3.7.1 Site Test, Inspection:
 - .1 Test, inspect, and approve piping before covering or concealing.
 - .2 Preliminary Tests:
 - .1 Hydrostatically test each system at 200psig for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
 - .3 Formal Tests and Inspections:

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- .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
 - .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.
 - .5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.
 - .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.
- 3.7.2 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in Part 1 - quality assurance.
- 3.7.3 Site Tests:
- .1 Field test each fire pump, driver and controllers in accordance with NFPA 20. Testing shall include:
 - .1 Verification of proper installation, system initiation, adjustment and fine tuning.
 - .2 Verification of the sequence of operations and alarm systems.
 - .2 Testing to be witnessed by authority having jurisdiction.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 05 00, Common Work Results for Plumbing**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, and equipment for supply, installation, testing of equipment and services as indicated on the Contract Drawings and Specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with this section.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.

1.3 Closeout Submittals

- 1.3.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, The Agency before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:

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- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .5 Approvals:
 - .1 Submit [1] copy of draft Operation and Maintenance Manual to Consultant for approval, including electronic form also. Submission of individual data will not be accepted.
 - .2 Make changes as required and re-submit as directed by the Consultant.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .7 Site records:
 - .1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
 - .5 Make available in electronic form.
 - .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12mm high as follows: - "as built drawings: this drawing has been revised to show mechanical systems as installed" (signature of contractor) (date).
 - .3 Submit to the Consultant for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
 - .9 Submit copies of as-built drawings for inclusion in final TAB report.
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- .10 Submit as-built drawings in electronic form as well in PDF and CAD formats.
- 1.3 **Maintenance Material Submittals**
- 1.3.1 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One glass for each gauge glass.
 - 1.3.2 Provide one set of special tools required to service equipment as recommended by manufacturers.
 - 1.3.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.
2. **PRODUCTS:** NOT APPLICABLE
3. **EXECUTION**
- 3.1 **Examination**
 - 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing installation in accordance with manufacturer's written instructions.
 - .1 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.
 - 3.2 **Painting Repairs and Restoration**
 - 3.2.1 Prime and touch up marred finished paintwork to match original.
 - 3.2.2 Restore to new condition, finishes which have been damaged.
 - 3.3 **System Cleaning**
 - 3.3.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.
 - 3.4 **Field Quality Control**
 - 3.4.1 Site Tests: conduct following tests and submit report as described in Part 1 -action and informational submittals.
 - 3.4.2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
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3.5 Demonstration

- 3.5.1 The Agency will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- 3.5.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- 3.5.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.
- 3.5.4 Instruction duration time requirements as specified in appropriate sections.

3.6 Cleaning

- 3.6.1 Progress Cleaning: leave Work area clean at end of each day.
- 3.6.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- 3.6.3 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 Insulation

- 3.7.1 Refer to Section 23 07 19 – HVAC Piping Insulation for application of insulation to Plumbing Systems.

3.8 Protection

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

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 05 29, Hangers and Supports for Plumbing Piping
and Equipment**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation, of Hangers and Supports for plumbing piping and equipment as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 22 05 00 - Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- 1.2.4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

2. PRODUCTS**2.1 System Description**

- 2.1.1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
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PROJECT 22701****Appendix 8.2, Division 22, Section 22 05 29, Hangers and Supports for Plumbing Piping
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- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 General

- 2.2.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.
- 2.2.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.
- 2.2.3 Manufacturer of supports, hangers, etc. shall be Taylor or approved equal.

2.3 Pipe Hangers**2.3.1 Finishes:**

- .1 Pipe hangers and supports: galvanized after manufacture.
- .2 Use electro-plating galvanizing process or hot dipped galvanizing process.
- .3 Ensure steel hangers in contact with copper piping are copper plated.

2.3.2 Upper attachment structural: suspension from lower flange of I-Beam:

- .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
- .2 Rod: 9mm UL listed.
- .3 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed MSS-SP58 and MSS-SP69.

2.3.3 Upper attachment structural: suspension from upper flange of I-Beam:

- .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP69.
- .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.

2.3.4 Upper attachment to concrete:

- .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.
- .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed MSS SP69.

2.3.5 Shop and field-fabricated assemblies:

- .1 Trapeze hanger assemblies:
- .2 Steel brackets:

2.3.6 Hanger rods: threaded rod material to MSS SP58:

- .1 Ensure that hanger rods are subject to tensile loading only.
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- .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22mm or 28mm rod.
 - 2.3.7 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel [black] [galvanized].
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
 - 2.3.8 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for riveting to insulation shields.
 - 2.3.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
 - 2.3.10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: black.
 - .2 Finishes for copper, glass, brass or aluminum pipework: black.
 - 2.3.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.
- 2.4 **Riser Clamps**
- 2.4.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.
 - 2.4.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
 - 2.4.3 Bolts: to ASTM A307.
 - 2.4.4 Nuts: to ASTM A563.
- 2.5 **Insulation Protection Shields**
- 2.5.1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3m span.
 - 2.5.2 Insulated hot piping:
 - .1 Curved plate 300mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.
- 2.6 **Constant Support Spring Hangers**
- 2.6.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR)
 - 2.6.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
 - 2.6.3 Provide upper and lower factory set travel stops.
 - 2.6.4 Provide load adjustment scale for field adjustments.
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- 2.6.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25mm minimum.
 - 2.6.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.
 - 2.7 **Variable Support Spring Hangers**
 - 2.7.1 Vertical movement: 13mm minimum, 50mm maximum, use single spring pre-compressed variable spring hangers.
 - 2.7.2 Vertical movement greater than 50mm: use double spring pre-compressed variable spring hanger with [2] springs in series in single casing.
 - 2.7.3 Variable spring hanger complete with factory calibrated travel stops. [Provide certificate of calibration for each hanger].
 - 2.7.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
 - 2.8 **Equipment Supports**
 - 2.8.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.
 - 2.9 **Equipment Anchor Bolts and Templates**
 - 2.9.1 Provide templates to ensure accurate location of anchor bolts.
 - 2.10 **House-Keeping Pads**
 - 2.10.1 Provide 100mm high concrete housekeeping pads for base-mounted equipment; size pads 50mm larger than equipment; chamfer pad edges.
 - 2.11 **Other Equipment Supports**
 - 2.11.1 Fabricate equipment supports from structural grade steel.
 - 2.11.2 Submit structural calculations with shop drawings.
 - 3. **EXECUTION**
 - 3.1 **Manufacturer's Instructions**
 - 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
 - 3.2 **Installation**
 - 3.2.1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
 - 3.2.2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
 - 3.2.3 Clamps on riser piping:
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- .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
 - 3.2.4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, [one] at each corner.
 - 3.2.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
 - 3.2.6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
 - 3.2.7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.
 - 3.3 **Hanger Spacing**
 - 3.3.1 Plumbing piping: to the Ontario Building Code and the authority having jurisdiction.
 - 3.3.2 Fire protection: to applicable fire code.
 - 3.3.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8m.
 - 3.3.4 Copper piping: up to NPS 1/2: every 1.5m.
 - 3.3.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
 - 3.3.6 Within 300mm of each elbow.
 - 3.3.7 Pipework greater than NPS 12: to MSS SP69.
 - 3.4 **Hanger Installation**
 - 3.4.1 Install hanger so that rod is vertical under operating conditions.
 - 3.4.2 Adjust hangers to equalize load.
 - 3.4.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
 - 3.5 **Horizontal Movement**
 - 3.5.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
 - 3.5.2 Where horizontal pipe movement is less than 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.
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and Equipment**

3.6 Final Adjustment**3.6.1 Adjust hangers and supports:**

- .1 Ensure that rod is vertical under operating conditions.
- .2 Equalize loads.

3.6.2 Adjustable clevis:

- .1 Tighten hanger load nut securely to ensure proper hanger performance.
- .2 Tighten upper nut after adjustment.

3.6.3 C-clamps:

- .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

3.6.4 Beam clamps:

- .1 Hammer jaw firmly against underside of beam.

3.7 Field Quality Control**3.7.1 Manufacturer's Field Services:**

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 07 19, Plumbing Piping Insulation**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of insulation on plumbing piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals**1.2.1 Product Data:**

- .1 Submit manufacturer's printed product literature, specifications, and datasheet in accordance with Section 22 05 00 - Common Work Results for Plumbing. Include product characteristics, performance criteria, and limitations.

1.2.2 Shop Drawings:

- .1 Submit drawings stamped and signed by the contractor including initials, date and status.
- .2 Quality assurance submittals: submit manufacturer's installation instructions.

1.3 Quality Assurance**1.3.3 Qualifications:**

- .1 Installer: specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards and a member of TIAC.

1.4 Delivery, Storage and Handling

- 1.4.1 In accordance with Section 22 05 00 - Common Work Results for Plumbing.

2. PRODUCTS**2.1 Manufacturer**

- 2.1.1 Insulation, adhesives, vapour barrier, etc., shall be Johns Manville, Manson or Agency approved equal.
- 2.1.2 Jacketing shall be Johns Mansville, 3M or Agency approved equal.

2.2 Fire And Smoke Rating**2.2.1 In accordance with CAN/ULC-S102.**

- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

2.3 Insulation

- 2.3.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- 2.3.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

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PROJECT 22701****Appendix 8.2, Division 22, Section 22 07 19, Plumbing Piping Insulation**

- 2.3.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Maximum "k" factor: to CAN/ULC-S702.
 - 2.3.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52 Ma
 - .3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.
 - 2.3.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52 Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.

 - 2.4 **Insulation Securement**
 - 2.4.1 Tape: self-adhesive, aluminum, reinforced, 50mm wide minimum.
 - 2.4.2 Contact adhesive: quick setting.
 - 2.4.3 Canvas adhesive: washable.
 - 2.4.4 Tie wire: 1.5mm diameter stainless steel.
 - 2.4.5 Bands: stainless steel, 19mm wide, 0.5mm thick.

 - 2.5 **Cement**
 - 2.5.1 Thermal insulating and finishing cement:
 - .1 Hydraulic setting or Air drying on mineral wool, to ASTM C449/C449M.

 - 2.6 **Vapour Retarder Lap Adhesive**
 - 2.6.1 Water based, fire retardant type, compatible with insulation.

 - 2.7 **Indoor Vapour Retarder Finish**
 - 2.7.1 Vinyl emulsion type acrylic, compatible with insulation.

 - 2.8 **Outdoor Vapour Retarder Finish**
 - 2.8.1 Vinyl emulsion type acrylic, compatible with insulation.
 - 2.8.2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

 - 2.9 **Jackets**
 - 2.9.1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required
 - .2 Colours: to match adjacent finish paint.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
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- .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .7 Special requirements:
 - .1 Indoor: standard.
 - .2 Outdoor: UV rated material at least 0.5mm thick.
 - .8 Locations:
 - .1 Indoor exposed installations; not required for concealed installation including return air plenums and ceiling spaces.
- 2.9.2 Canvas:
- .1 220 and 120 gm/m² cotton, plain weave, treated with dilute fire-retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.

3. EXECUTION**3.1 Manufacturer's Instructions**

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

3.2 Pre-Installation Requirement

- 3.2.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- 3.2.2 Surfaces clean, dry, free from foreign material.

3.3 Installation

- 3.3.1 Install in accordance with TIAC National Standards
- 3.3.2 Apply materials in accordance with manufacturer's instructions and this specification.
- 3.3.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75mm.
- 3.3.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- 3.3.5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 Removable, Pre-Fabricated, Insulation and Enclosures

- 3.4.1 Application: at expansion joints, valve, primary flow measuring elements, flanges and unions at equipment.

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Appendix 8.2, Division 22, Section 22 07 19, Plumbing Piping Insulation

3.4.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

3.4.3 Insulation:

- .1 Insulation, fastenings and finishes: same as system.
- .2 Jacket: PVC.

3.5 Installation of Elastomeric Insulation

3.5.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

3.5.2 Provide vapour retarder as recommended by manufacturer.

3.6 Piping Insulation Schedules

3.6.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

3.6.2 TIAC Code: A-1.

- .1 Securements: Tape at 300mm on centre.
- .2 Seals: lap seal adhesive, lagging adhesive.
- .3 Installation: TIAC Code 1501-H.

3.6.3 TIAC Code: A-3.

- .1 Securements: Tape at 300mm on centre.
- .2 Seals: VR lap seal adhesive, VR lagging adhesive.
- .3 Installation: TIAC Code: 1501-C.

3.6.4 TIAC Code: C-2 with vapour retarder jacket.

- .1 Seals: lap seal adhesive, lagging adhesive.
- .2 Installation: TIAC Code: 1501-C.

3.6.5 Thickness of insulation as listed in following table.

- .1 Run-outs to individual units and equipment not exceeding 4000mm long.
- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

| Application | Temp °C | TIAC code | Pipe sizes (NPS) and insulation thickness (mm) | | | | | |
|--------------------------------------|------------|--------------|---|---------|---------------|---------------|-----------|-------------|
| | | | Run out | to 1 | 1 1/4 to 2 | 2 1/2 to 4 | 5 to 6 | 8 & over |
| Domestic HWS | | [A-1] | 25 | 25 | 25 | 38 | 38 | 38 |
| Domestic CWS | | [A-3] | 25 | 25 | 25 | 25 | 25 | 25 |
| Domestic CWS with vapour retarder | | [C-2] | 25 | 25 | 25 | 25 | 25 | 25 |

3.6.7 Finishes:

- .1 Concealed and exposed indoors: PVC jacket.
- .2 Exposed in mechanical rooms: PVC jacket.
- .3 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation
- .4 Finish attachments: SS bands, at 50mm on centre. Seals: closed.
- .5 Installation: to appropriate TIAC code CRF/1 through CPF/5

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END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 11 16, Domestic Water Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of domestic water piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submittals in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish, and limitations.
- 1.2.3 Closeout Submittals:
 - .1 Submit in accordance with Section 22 05 00 Common Work Results for Plumbing.

2. PRODUCTS**2.1 Piping**

- 2.1.1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground:
 - .1 Copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded:
 - .1 Copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints

2.2 Fittings

- 2.2.1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- 2.2.2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- 2.2.3 Cast copper, solder type: to ANSI/ASME B16.18.
- 2.2.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- 2.2.5 NPS 2 and larger:
 - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242
- 2.2.6 NPS 1 ½ and smaller:
 - .1 Wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380kPa.

2.3 Joints

- 2.3.1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.
- 2.3.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- 2.3.3 Solder: 95/5 tin copper alloy lead-free.

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- 2.3.4 Teflon tape: for threaded joints.
 - 2.3.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket. Gasket to be classified in accordance with ANSI/NSF 61 for potable water service. Couplings to be manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.
 - 2.3.6 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.
- 2.4 **Gate Valves**
- 2.4.1 NPS 2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 22 - Valves - Bronze
 - 2.4.2 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 22 - Valves - Bronze
- 2.5 **Globe Valves**
- 2.5.1 NPS2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860kPa, bronze body, renewable composition disc, screwed over bonnet.
 - .2 Lockshield handles.
 - 2.5.2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1MPa, bronze body, screwed over bonnet, renewable composition disc as specified.
 - .2 Lockshield handles.
- 2.6 **Swing Check Valves**
- 2.6.1 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat as specified.
 - 2.6.2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat as specified.
- 2.7 **Ball Valves**
- 2.7.1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland, steel lever handle as specified.
 - 2.7.2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
-

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- .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland, steel lever handle, with NPT to copper adaptors as specified.

2.8 Manufacturers

- 2.8.1 Shall be Kitz, Jenkins, Crane, or Agency approved equal.

3. EXECUTION**3.1 Application**

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

3.2 Installation

- 3.2.1 Install in accordance with Ontario Building Code (OBC) and local authority having jurisdiction.
- 3.2.2 Install pipe work in accordance with Section 23 05 01 – Installation of Pipework, supplemented as specified herein.
- 3.2.3 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- 3.2.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- 3.2.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- 3.2.6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.
- 3.2.7 Valves
 - .1 Isolate equipment, fixtures and branches with ball valves.
 - .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 Pressure Tests

- 3.3.1 Conform to requirements of Section 22 05 00 Common Work Results for Plumbing.
- 3.3.2 Test pressure: greater of 1 times maximum system operating pressure or 860kPa.

3.4 Flushing and Cleaning

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

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3.5 Pre-Start-Up Inspections

- 3.5.1 Systems to be complete, prior to flushing, testing and start-up.
- 3.5.2 Verify that system can be completely drained.
- 3.5.3 Ensure that pressure booster systems are operating properly.
- 3.5.4 Ensure that air chambers, expansion compensators are installed properly.

3.6 Disinfection

- 3.6.1 Flush out, disinfect and rinse system to AWWA C651, the requirements of authority having jurisdiction and the approval of the Consultant.
- 3.6.2 Upon completion, provide laboratory test reports on water quality to Consultant for approval.

3.7 Start-Up

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

3.8 Performance Verification

- 3.8.1 Timing:
 - .1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.
- 3.8.2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterlize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.

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- .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
- .8 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.
- 3.8.3 Reports:
 - .1 Provide testing in accordance with the Ontario Building Code and industry best practices.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
- 3.9 **Operation Requirements**
 - 3.9.1 Co-ordinate operation and maintenance requirements including cleaning and maintenance of specified materials and products. with Section 23 05 01 – Installation of Pipework.
 - 3.9.2 Operational requirements to include:
 - .1 Cleaning materials and schedules.
 - .2 Repair and maintenance materials and instructions.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 11 19, Domestic Water Piping Specialist**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of domestic water piping specialties as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action And Informational Submittals

- 1.2.1 Submit in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, [number of anchors, dimensions, construction and assembly details and accessories.
- 1.2.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Instructions: submit manufacturer's installation instructions.
- 1.2.6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.2 Closeout Submittals

- 1.2.1 Submit in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

2. PRODUCTS**2.1 Manufacturers**

- 2.1.1 Shall be Watts, Zurn, or Agency approved equal.

2.2 Floor Drains

- 2.2.1 Floor Drains and Trench Drains: to CSA B79.

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- 2.2.2 Refer to Plumbing Fixture Schedule on mechanical contract drawings for equipment specifications.
- 2.3 **Cleanouts**
- 2.3.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- 2.3.2 Access Covers:
- .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
- .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
- .1 Plugs: bolted bronze with neoprene gasket.
- .2 Cover for Unfinished Concrete Floors: nickel bronze round, gasket, vandal-proof screws.
- .3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
- .4 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.
- 2.4 **Water Hammer Arrestors**
- 2.4.1 Provide equal to Zurn 1260XL low lead model.
- 2.5 **Back Flow Preventers**
- 2.5.1 Preventers: to CSA-B64 Series, application as indicated Backflow Device Schedule and mechanical contract drawings.
- 2.6 **Pressure Regulators**
- 2.6.1 Capacity: as indicated on contract drawings.
- 2.6.2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.
- 2.6.3 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- 2.6.4 Semi-steel spring chambers with bronze trim.
- 2.7 **Trap Seal Primers**
- 2.7.1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection. Provide as indicated on mechanical contract drawings.
- 2.8 **Strainers**
- 2.8.1 860kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- 2.8.2 NPS2 and under, bronze body, screwed ends, with brass cap.
-

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2.8.3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap.

3. EXECUTION**3.1 Manufacturer's Instructions**

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

3.2 Installation

3.2.1 Install in accordance with the Ontario Building Code (OBC) and local authority having jurisdiction.

3.2.2 Install in accordance with manufacturer's instructions and as specified.

3.3 Cleanouts

3.3.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

3.3.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

3.3.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.4 Water Hammer Arrestors

3.4.1 Install on branch supplies to fixtures or group of fixtures where fast-closing valves are present, such as water closet and urinal flush valves.

3.5 Back Flow Preventers

3.5.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code

.1 Drains.

.2 Backwater Valves.

.3 Water Make-up Assembly.

.4 Grease Interceptors.

3.5.2 Pipe discharge to terminate over nearest drain or service sink.

3.6 Trap Seal Primers

3.6.1 Install for floor drains and elsewhere, as indicated.

3.6.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of the Consultant.

3.6.3 Install plastic tubing to floor drain.

3.7 Strainers

3.7.1 Install with sufficient room to remove basket for maintenance.

3.8 Start-Up

3.8.1 Timing: start-up only after:

.1 Pressure tests have been completed.

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- .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- 3.8.2 Provide continuous supervision during start-up.

3.9 Testing and Adjusting

- 3.9.1 Timing:
- .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- 3.9.2 Application tolerances:
- .1 Pressure at fixtures: +/- 70kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- 3.9.3 Adjustments:
- .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- 3.9.4 Floor drains:
- .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- 3.9.5 Vacuum breakers, backflow preventers, backwater valves:
- .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- 3.9.6 Access doors:
- .1 Verify size and location relative to items to be accessed.
- 3.9.7 Cleanouts:
- .1 Verify covers are gas-tight, secure, yet readily removable.
- 3.9.8 Water hammer arrestors:
- .1 Verify proper installation of correct type of water hammer arrester.
- 3.9.9 Pressure regulators, PRV assemblies:
- .1 Adjust settings to suit locations, flow rates, pressure conditions.
- 3.9.10 Strainers:
- .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.

3.10 Closeout Activities

- 3.10.1 Commissioning Reports: in accordance with Section 22 05 00 Common Work Results for Plumbing.
-

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END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 13 16, Sanitary Waste and Vent Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of Sanitary Waste and Vent Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS**2.1 Copper Tube and Fittings**

- 2.1.1 Above ground sanitary, storm and vent piping Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.
 - .2 Wrought copper: to CAN/CSA-B125.
 - .2 Solder: lead free, tin-95:5, type TA, to ASTM B32.

2.2 Cast Iron Piping and Fittings

- 2.2.1 Buried sanitary, storm and vent minimum NPS 2 to CAN/CSA-B70, with one layer of protective coating of bituminous.
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Neoprene gasket: to CSA B70.
 - .2 Cold caulking compounds.
- 2.2.2 Above ground sanitary, storm and vent to CAN/CSA-B70:
 - .1 Joints:
 - .1 Mechanical joints: Neoprene or butyl rubber compression gaskets with stainless steel clamps.

2.3 Plastic Piping and Fittings

- 2.3.1 For buried and above ground DWV piping to CAN/CSA B1800.
 - 1. Joints
 - .1 Solvent weld for PVC: to ASTM D2564
 - .2 Solvent weld for ABS: to ASTM D2235 (only for buried).

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PROJECT 22701****Appendix 8.2, Division 22, Section 22 13 16, Sanitary Waste and Vent Piping**

- 2.3.2 Shall be manufactured by IPEX, Royal Pipe Systems, or Agency approved equal.

3. EXECUTION**3.1 Application**

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

3.2 Installation

- 3.2.2 In accordance with Section 23 05 01 – Installation of Pipework.
3.2.3 Install in accordance with The Ontario Building Code and the local authority having jurisdiction.

3.3 Testing

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

3.4 Performance Verification

- 3.4.1 Cleanouts:
.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify that cleanout rods can probe as far as the next cleanout, at least.
3.4.2 Test to ensure traps are fully and permanently primed.
3.4.3 Storm water drainage:
.1 Verify domes are secure.
.2 Ensure weirs are correctly sized and installed correctly.
.3 Verify provisions for movement of roof system.
3.4.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.
3.4.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5m (whichever is less).

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1 GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of Facility Storm Drainage Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action And Informational Submittals

- 1.2.1 Submit in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, [number of anchors, dimensions, construction and assembly details and accessories.
- 1.2.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Instructions: submit manufacturer's installation instructions.
- 1.2.6 Manufacturers' Field Reports: manufacturers' field reports specified.

2. PRODUCTS**2.1 Floor Drains**

- 2.1.1 Floor Drains and Trench Drains: to CSA B79.
- 2.1.2 Refer to Plumbing Fixture Schedule on mechanical contract drawings for equipment specifications.
- 2.1.3 Shall be manufactured by Watts, Zurn or Agency approved equal.

2.2 Cleanouts

- 2.2.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
 - 2.2.2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
-

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PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 13, Facility Storm Drainage Piping**

- .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: nickel bronze round, gasket, vandal-proof screws.
 - .3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .4 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.
 - 2.2.3 Shall be manufactured by Watts, Zurn or approved equal.
 - 2.3 **Trap Seal Primers**
 - 2.3.1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection. Provide as indicated on mechanical contract drawings.
 - 2.3.2 Shall be manufactured by PPP, Watts or approved equal.
 - 3. **EXECUTION**
 - 3.1 **Manufacturer's Instructions**
 - 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.
 - 3.2 **Installation**
 - 3.2.1 Install in accordance with the Ontario Building Code (OBC) and local authority having jurisdiction.
 - 3.2.2 Install in accordance with manufacturer's instructions and as specified.
 - 3.3 **Cleanouts**
 - 3.3.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
 - 3.3.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
 - 3.3.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.
 - 3.4 **Trap Seal Primers**
 - 3.4.1 Install for floor drains and elsewhere, as indicated.
 - 3.4.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of The Agency.
 - 3.4.3 Install plastic tubing to floor drain.
 - 3.5 **Start-Up**
 - 3.5.1 Timing: start-up only after:
 - .1 Pressure tests have been completed.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 13, Facility Storm Drainage Piping**

- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.
- 3.5.2 Provide continuous supervision during start-up.

- 3.6 **Testing and Adjusting**
 - 3.6.1 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
 - 3.6.2 Access doors:
 - .1 Verify size and location relative to items to be accessed.
 - 3.6.3 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.

- 3.7 **Closeout Activities**
 - 3.7.1 Commissioning Reports: in accordance with Section 22 05 00 Common Work Results for Plumbing.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 19, Sanitary Waste Piping Specialist**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of Sanitary Waste Piping Specialist Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS**2.1 Cast Iron Piping and Fittings**

- 2.1.1 Buried storm piping minimum NPS 2 to CAN/CSA-B70, with one layer of protective coating of bituminous.
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Neoprene gasket: to CSA B70.
 - .2 Cold caulking compounds.
- 2.1.2 Above ground storm piping to CAN/CSA-B70:
 - .1 Joints:
 - .1 Mechanical joints: Neoprene or butyl rubber compression gaskets with stainless steel clamps.

2.2 Plastic Piping and Fittings

- 2.2.1 For buried and above ground storm, DWV piping to CAN/CSA B1800.
 - 1. Joints
 - .1 Solvent weld for PVC: to ASTM D2564
- 2.2.2 Shall be manufactured by IPEX, Royal Pipe Systems, or approved equal.

3. EXECUTION**3.1 Application**

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

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 19, Sanitary Waste Piping Specialist**

3.2 Installation

3.2.2 In accordance with Section 23 05 01 – Installation of Pipework.

3.2.3 Install in accordance with The Ontario Building Code and the local authority having jurisdiction.

3.3 Testing

3.3.1 Pressure test buried systems before backfilling.

3.3.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 Performance Verification

3.4.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

3.4.2 Test to ensure traps are fully and permanently primed.

3.4.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

3.4.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

3.4.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5m (whichever is less).

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 26, Facility Storm Drains**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of Facility Storm Drains as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action And Informational Submittals

- 1.2.1 Submit in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, [number of anchors, dimensions, construction and assembly details and accessories.
- 1.2.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Instructions: submit manufacturer's installation instructions.
- 1.2.6 Manufacturers' Field Reports: manufacturers' field reports specified.

2. PRODUCTS**2.1 Cleanouts**

- 2.1.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- 2.1.2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: nickel bronze round, gasket, vandal-proof screws.

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PROJECT 22701****Appendix 8.2, Division 22, Section 22 14 26, Facility Storm Drains**

- .3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .4 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.
 - 2.1.3 Shall be manufactured by Watts, Zurn or approved equal.
 - 2.2 **Roof Drains**
 - 2.2.1 Refer to Plumbing Fixture Schedule on mechanical contract drawings for equipment specifications. All new roof drains are to match base building standards.
 - 2.2.2 Shall be manufactured by Watts, Zurn or approved equal.
 - 2.2.3 Flow control characteristics to match existing on roof.
 - 3. **EXECUTION**
 - 3.1 **Manufacturer's Instructions**
 - 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.
 - 3.2 **Installation**
 - 3.2.1 Install in accordance with the Ontario Building Code (OBC) and local authority having jurisdiction.
 - 3.2.2 Install in accordance with manufacturer's instructions and as specified.
 - 3.3 **Cleanouts**
 - 3.3.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
 - 3.3.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
 - 3.3.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.
 - 3.4 **Start-Up**
 - 3.4.1 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
 - 3.4.2 Provide continuous supervision during start-up.
 - 3.5 **Testing and Adjusting**
 - 3.5.1 Access doors:
 - .1 Verify size and location relative to items to be accessed.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 22, Section 22 14 26, Facility Storm Drains

3.5.2 Cleanouts:

- .1 Verify covers are gas-tight, secure, yet readily removable.

3.6 **Closeout Activities**

- 3.6.1 Commissioning Reports: in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 3.6.2 Training: provide training in accordance with Section 22 05 00 Common Work Results for Plumbing.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 42 00, Commercial Plumbing Fixtures**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply, and installation of Commercial Plumbing Fixtures as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 Closeout Submittals

- 1.3.1 Provide maintenance data in accordance with Section 22 05 00 Common Work Results for Plumbing.
- 1.3.2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

2. PRODUCTS**2.1 Manufactured Units**

- 2.1.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
 - 2.1.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
 - 2.1.3 Exposed plumbing brass to be chrome plated.
 - 2.1.4 Number, locations: architectural contract drawings to govern.
 - 2.1.5 Fixtures to be product of one manufacturer.
 - 2.1.6 Trim to be product of one manufacturer.
 - 2.1.7 Stainless steel counter- top sinks.
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by Kindred, Stern-Williams or Agency approved equal.
 - 2.1.8 Fixture piping:
 - .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on each fixture not having integral trap.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 22, Section 22 42 00, Commercial Plumbing Fixtures**

- .2 Chrome plated in all exposed places.
 - 2.1.9 Chair carriers:
 - .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.
 - .2 Manufactured by Watts, Zurn or Agency approved equal.
 - 2.1.10 Water closets:
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by Watts, Zurn or Agency approved equal.
 - 2.1.11 Water Closet Flush Valves:
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by Royal, Sloan or Agency approved equal.
 - 2.1.12 Electronic Water Closet Flush Valves:
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by Royal, Sloan or Agency approved equal.
 - 2.1.13 Water Closet Seats.
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by Centoco, American Standard or Agency approved equal.
 - 2.1.14 Washroom Lavatories:
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by American Standard, Zurn or Agency approved equal.
 - 2.1.15 Washroom Lavatory Trim
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by American Standard, Sloan or Agency approved equal.
 - 2.1.16 Washroom Lavatory Electronic Trim:
 - .1 As indicated on plumbing fixture schedule.
 - .2 Manufactured by American Standard, Sloan or Agency approved equal.
3. **EXECUTION**
- 3.1 **Application**
 - 3.1.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
 - 3.2 **Installation**
 - 3.2.1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Wall-hung fixtures: as per the Ontario Building Code and architectural contract drawings, measured from finished floor.
 - .3 Barrier-free: to comply with the Ontario Building Code and CAN/CSA-B651.
-

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PROJECT 22701**

Appendix 8.2, Division 22, Section 22 42 00, Commercial Plumbing Fixtures

3.3 **Adjusting**

3.3.1 Conform to water conservation requirements specified this section.

3.3.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

3.3.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

3.3.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 00, Common Work Results for HVAC**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, and equipment to provide services for Common Work Results for HVAC as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action And Informational Submittals**1.2.1 Product Data:**

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

1.2.2 Shop Drawings:

- .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.

1.3 Closeout Submittals**1.3.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.**

- .1 Operation and maintenance manual approved by, and final copies deposited with, The Agency before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 00, Common Work Results for HVAC**

- .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .5 Approvals:
 - .1 Submit [1] copy of draft Operation and Maintenance Manual to the Consultant for approval, including electronic form also. Submission of individual data will not be accepted unless directed by the Consultant.
 - .2 Make changes as required and re-submit as directed by the Consultant.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .7 Site records:
 - .1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
 - .5 Make available in electronic form.
 - .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "as built drawings: this drawing has been revised to show mechanical systems as installed" (Signature of Contractor) (Date).
 - .3 Submit to The Agency for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
 - .9 Submit copies of as-built drawings for inclusion in final TAB report.
-

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- .10 Submit as-built drawings in electronic form as well in PDF and CAD formats.

1.4 Maintenance Material Submittals

- 1.4.1 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One head gasket set for each heat exchanger.
 - .4 One glass for each gauge glass.
 - .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- 1.4.2 Provide one set of special tools required to service equipment as recommended by manufacturers.
- 1.4.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 Use of Systems

- 1.5.1 Use of existing permanent heating and ventilating systems for supplying temporary heat and ventilation is permitted only under following conditions:
 - .1 There is no possibility of damage.
 - .2 Supply ventilation systems are protected by 60 % filters, inspected daily, changed every week, or more frequently as required.
 - .3 Return systems have approved filters over openings, inlets, outlets.
 - .4 Systems will be:
 - .1 Operated as per manufacturer's recommendations and instructions.
 - .2 Operated by Contractor.
 - .3 Monitored continuously by Contractor.
 - .5 Regular preventive and other manufacturers recommended maintenance routines are performed by Contractor at own expense.
 - .6 Clean internally and externally, restore to "existing" condition, replace filters in air systems.
- 1.5.2 Filters specified in this Section are over and above those specified in other Sections of this project.
- 1.5.3 Exhaust systems are not included in approvals for temporary heating ventilation.

2. PRODUCTS**2.1 Materials**

- 2.1.1 HVAC and R Equipment:
 - .1 Refrigerant:
 - .1 HydroFluroCarbons (HFC) based refrigerant.

3. EXECUTION**3.1 Examination**

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 00, Common Work Results for HVAC**

- 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of 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 **Painting Repairs and Restoration**
 - 3.2.1 Prime and touch up marred finished paintwork to match original.
 - 3.2.2 Restore to new condition, finishes which have been damaged.

- 3.3 **System Cleaning**
 - 3.3.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

- 3.4 **Field Quality Control**
 - 3.4.1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

- 3.5 **Demonstration**
 - 3.5.1 The Agency will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
 - 3.5.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
 - 3.5.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.
 - 3.5.4 Instruction duration time requirements as specified in appropriate sections.
 - 3.5.5 The Consultant/Agency will record these demonstrations on video tape for future reference.
 - 3.7.3 Repair damage to adjacent materials caused by thermometer and gauge installation.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 01, Installation of Pipe Work**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Pipe Work as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Quality Assurance**1.2.1 Sustainability Standards Certification:**

- .1 Low-Emitting Materials: provide listing of sealants and coatings used in building, comply with VOC and chemical component limits or restriction requirements.

1.3 Delivery, Storage and Handling

- 1.3.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- 1.3.2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- 1.3.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials.

2. PRODUCTS**2.1 Material**

- 2.1.1 Paint: zinc-rich to CAN/CGSB-1.181
 - .1 Primers, paints and coatings: in accordance with manufacturer's recommendations for surface conditions.
 - .2 Primer: maximum VOC limit [250]g/L.
 - .3 Paints: maximum VOC limit [150]g/L.
- 2.1.2 Sealants:
 - .1 Sealants: maximum VOC limit SCAQMD Rule 1168.
- 2.1.3 Sealants: maximum VOC limit SCAQMD Rule 1168.
- 2.1.4 Adhesives: maximum VOC limit SCAQMD Rule 1168.
- 2.1.5 Fire Stopping: in accordance ULC, NFPA and the Ontario Building Code.

3. EXECUTION**3.1 Application**

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

3.2 Connections to Equipment

- 3.2.1 In accordance with manufacturer's instructions unless otherwise indicated.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 01, Installation of Pipe Work**

- 3.2.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
 - 3.2.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.
 - 3.3 **Clearances**
 - 3.3.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
 - 3.3.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.
 - 3.4 **Drains**
 - 3.4.1 Install piping with grade in direction of flow except as indicated.
 - 3.4.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
 - 3.4.3 Pipe each drain valve discharge separately to above floor drain.
 - .1 Discharge to be visible.
 - 3.4.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.
 - 3.5 **Air Vents**
 - 3.5.1 Install manual air vents to CAN/CSA B139 at high points in piping systems.
 - 3.5.2 Install isolating valve at each automatic air valve.
 - 3.5.3 Install drain piping to approved location and terminate where discharge is visible.
 - 3.6 **Dielectric Couplings**
 - 3.6.1 General: compatible with system, to suit pressure rating of system.
 - 3.6.2 Locations: where dissimilar metals are joined.
 - 3.6.3 NPS 2 and under: isolating unions or bronze valves.
 - 3.6.4 Over NPS 2: isolating flanges.
 - 3.7 **Pipework Installation**
 - 3.7.1 Install pipework to CAN/CSA B139.
 - 3.7.2 Screwed fittings jointed with Teflon tape.
 - 3.7.3 Protect openings against entry of foreign material.
 - 3.7.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
 - 3.7.5 Assemble piping using fittings manufactured to ANSI standards
 - 3.7.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
-

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- 3.7.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- 3.7.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- 3.7.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- 3.7.10 Install, except where indicated, to permit separate thermal insulation of each pipe.
- 3.7.11 Group piping wherever possible [and as indicated].
- 3.7.12 Ream pipes, remove scale and other foreign material before assembly.
- 3.7.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- 3.7.14 Provide for thermal expansion as indicated.
- 3.7.15 Valves:
 - .1 Install in accessible locations.
 - .2 Remove interior parts before soldering.
 - .3 Install with stems above horizontal position unless indicated.
 - .4 Valves accessible for maintenance without removing adjacent piping.
 - .5 Install globe valves in bypass around control valves.
 - .6 Use gate, ball or butterfly valves at branch take-offs for isolating purposes except where specified.
 - .7 Install butterfly valves on chilled water and related condenser water systems only.
 - .8 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .9 Install ball valves for glycol service.
 - .10 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400mm above floor in Mechanical Rooms.
- 3.7.16 Check Valves:
 - .1 Install silent check valves [on discharge of pumps] [and] [in vertical pipes with downward flow] and as indicated.
 - .2 Install swing check valves in horizontal lines [on discharge of pumps] and as indicated.

3.8 Sleeves

- 3.8.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- 3.8.2 Material: schedule 40 black steel pipe.
- 3.8.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- 3.8.4 Sizes: 6mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- 3.8.5 Installation:

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 01, Installation of Pipe Work**

- .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
 - .2 Other floors: terminate 25mm above finished floor.
 - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- 3.8.6 Sealing:
- .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere:
 - .1 Provide space for fire stopping.
 - .2 Maintain the fire-resistance rating integrity of the fire separation.
 - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.
- 3.9 **Escutcheons**
- 3.9.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
 - 3.9.2 Construction: one piece type with set screws.
 - .1 Chrome or nickel plated brass or type 302 stainless steel..
 - 3.9.3 Sizes: outside diameter to cover opening or sleeve.
 - .1 Inside diameter to fit around pipe or outside of insulation if so provided.
- 3.10 **Preparation For Fire Stopping**
- 3.10.1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation.
 - 3.10.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.
 - 3.10.3 Insulated pipes: ensure integrity of insulation and vapour barriers.
- 3.11 **Flushing Out of Piping Systems**
- 3.11.1 Flush system in accordance with Section 23 08 16 - Cleaning and Start-Up of Mechanical Piping Systems.
 - 3.11.2 Before start-up, clean interior of piping systems supplemented as specified in relevant mechanical sections.
 - 3.11.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.
- 3.12 **Pressure Testing of Equipment and Pipework**
- 3.12.1 Advise Consultant 48 hours minimum prior to performance of pressure tests.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 01, Installation of Pipe Work**

- 3.12.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.
 - 3.12.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
 - 3.12.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
 - 3.12.5 Conduct tests in presence of the Consultant.
 - 3.12.6 Pay costs for repairs or replacement, retesting, and making good. The Consultant to determine whether repair or replacement is appropriate.
 - 3.12.7 Insulate or conceal work only after approval and certification of tests by the Consultant.
- 3.13 **Existing Systems**
- 3.13.1 Connect into existing piping systems at times approved by the Agency.
 - 3.13.2 Request written approval by building personnel 10 days minimum, prior to commencement of work.
 - 3.13.3 Be responsible for damage to existing plant by this work.
- 3.14 **Cleaning**
- 3.14.1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - 3.14.2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 13, Common Motor Requirements for HVAC
Equipment**

- 1 **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
 - 1.1.2 Provide all labour, materials, products, and equipment to provide services for Common Motor Requirements for HVAC Equipment as indicated on the Contract Drawings and specified in this section of Specification.
 - 1.2 **Action and Informational Submittals**
 - 1.2.1 Submittals: in accordance with Section 23 05 00 Common Work Results for HVAC.
 - 1.2.2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets. Include product characteristics, performance criteria, and limitations.
 - 1.2.3 Quality Control:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - 1.2.4 Closeout Submittals
 - .1 Provide maintenance data for motors, drives and guards for incorporation into manual in accordance with Section 23 05 00 Common Work Results for HVAC.
 2. **PRODUCTS**
 - 2.1 **General**
 - 2.1.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.
 - 2.2 **Motors**
 - 2.2.1 Provide motors for mechanical equipment as specified.
 - 2.2.2 Motors under 373W [1/2HP]: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120V, unless otherwise specified or indicated.
 - 2.2.3 Motors 373W [1/2HP] and larger: Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise [40] degrees C, 3 phase, 575V, unless otherwise indicated.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 13, Common Motor Requirements for HVAC
Equipment**

2.3 Temporary Motors

2.3.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by the Consultant for temporary use. Work will only be accepted when specified motor is installed.

2.4 Belt Drives

2.4.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

2.4.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

2.4.3 For motors under 7.5kW [10 HP]: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

2.4.4 For motors 7.5kW [10 HP] and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

2.4.5 Correct size of sheave determined during commissioning.

2.4.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

2.4.7 Motor slide rail adjustment plates to allow for centre line adjustment.

2.4.8 Supply one set of spare belts for each set installed in accordance with Section 23 05 00 Common Work Results for HVAC

2.5 Drive Guards

2.5.1 Provide guards for unprotected drives.

2.5.2 Guards for belt drives;

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.2mm thick sheet metal tops and bottoms.

.3 [38]mm dia holes on both shaft centres for insertion of tachometer.

.4 Removable for servicing.

2.5.3 Provide means to permit lubrication and use of test instruments with guards in place.

2.5.4 Install belt guards to allow movement of motors for adjusting belt tension.

2.5.5 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6mm thick galvanized mild steel.

.2 Securely fasten in place.

.3 Removable for servicing.

2.5.6 Unprotected fan inlets or outlets:

.1 Wire or expanded metal screen, galvanized, 19mm mesh.

.2 Net free area of guard: not less than 80% of fan openings.

.3 Securely fasten in place.

.4 Removable for servicing.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 13, Common Motor Requirements for HVAC
Equipment**

3. EXECUTION**3.1 Manufacturer's Instructions**

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

3.2 Installation

3.2.1 Fasten securely in place.

3.2.2 Make removable for servicing, easily returned into, and positively in position.

3.3 Field Quality Control

3.3.1 Site Tests: conduct tests and submit report in accordance with Section 23 05 00 Common Work Results for HVAC.

3.3.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Section 23 05 00 Common Work Results for HVAC.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in Section 23 05 00- Common Work Results for HVAC.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 16, Expansion Fittings and Loops for HVAC
Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of expansion fittings and loops for HVAC piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 23 05 00 Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Manufacturer, model number, line contents, pressure and temperature rating.
 - .2 Movement handled, axial, lateral, angular and the amounts of each.
 - .3 Nominal size and dimensions including details of construction and assembly.

2. PRODUCTS**2.1 Bellows Type Expansion Joints**

- 2.1.1 For axial, lateral or angular movements, as indicated.
 - 2.1.2 Maximum operating pressure: 1034kPa.
 - 2.1.3 Maximum operating temperature: 260 degrees C.
 - 2.1.4 Type A: controlled, free flexing, factory tested to 1 ½ times maximum working pressure. Provide test certificates.
 - 2.1.5 Bellows:
 - .1 Multiple bellows, hydraulically formed, two ply, austenitic stainless steel for specified fluid, pressure and temperature, water treatment and pipeline cleaning procedures.
 - 2.1.6 Reinforcing or control rings:
 - .1 2 piece nickel iron.
 - 2.1.7 Ends:
 - .1 Raised face, flanges to match pipe.
 - 2.1.8 Liner:
 - .1 Austenitic stainless steel in direction of flow.
 - 2.1.9 Shroud:
 - .1 Carbon steel, painted.
 - 2.1.10 Manufactured by US Bellows, McMaster Carr or approved equal.
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Piping**

- 2.2 **Flexible Connection**
 - 2.2.1 Application: to suit motion.
 - 2.2.2 Minimum length in accordance with manufacturer's recommendations to suit offset.
 - 2.2.3 Inner hose: stainless steel corrugated.
 - 2.2.4 Braided wire mesh stainless steel.
 - 2.2.5 Diameter and type of end connection: to match pipe diameter.
 - 2.2.6 Operating conditions:
 - .1 Working pressure: 1034kPa.
 - .2 Working temperature: 260 degrees C.
 - .3 To match system requirements.
 - 2.2.7 Three flexible grooved couplings placed in close proximity to vibration source for vibration attenuation and stress relief.
 - 2.2.8 Manufactured by Senior Flexonics, Flex-Pression Ltd. or Agency approved equal.

- 3. **EXECUTION**
 - 3.1 **Application**
 - 3.1.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

 - 3.2 **Installation**
 - 3.2.1 Install expansion joints with cold setting. Make record of cold settings.
 - 3.2.2 Install expansion joints and flexible connections in accordance with manufacturer's instructions.

 - 3.3 **Pipe Cleaning and Start-Up**
 - 3.3.1 In accordance with Section 23 08 00 – Commissioning of HVAC.

 - 3.4 **Performance Verification**
 - 3.4.1 In accordance with Section 23 08 00 – Commissioning of HVAC.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 19, Meters and Gauges for HVAC Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of meters and gauges for HVAC piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for thermometers and pressure gauges and include product characteristics, performance criteria, physical size, finish, and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
- 1.2.4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Test and Evaluation Reports:
 - .1 Submit certified test reports for [thermometers and pressure gauges] from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

2. PRODUCTS**2.1 General**

- 2.1.1 Design point to be at mid-point of scale or range.
- 2.1.2 Ranges: as required.
- 2.1.3 Manufactured by Carremm Controls or approved equal.

2.2 Direct Reading Thermometers

- 2.2.1 Industrial, variable angle type, mercury-free, liquid filled, 125mm scale length: to CAN/CGSB-14.4 and ASME B40.200.
 - .1 Resistance to shock and vibration.

2.3 Thermometer Wells

- 2.3.1 Copper pipe: copper or bronze.
- 2.3.2 Steel pipe: brass or stainless steel.

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 19, Meters and Gauges for HVAC Piping**

2.4 Pressure Gauges

- 2.4.1 112mm, dial type: to ASME B40.100, Grade 2A, stainless steel, phosphor bronze bourdon tube having 0.5% accuracy full scale unless otherwise specified.
- 2.4.2 Provide:
 - .1 Siphon for steam service.
 - .2 Snubber for pulsating operation.
 - .3 Diaphragm assembly for corrosive service.
 - .4 Gasketed pressure relief back with solid front.
 - .5 Bronze stop cock.
 - .6 Oil filled for high vibration applications.

3. EXECUTION**3.1 Examination**

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

3.2 General

- 3.2.1 Install thermometers and gauges so they can be easily read from floor or platform.
 - .1 If this cannot be accomplished, install remote reading units.
- 3.2.2 Install between equipment and first fitting or valve.

3.3 Thermometers

- 3.3.1 Install in wells on piping. Include heat conductive material inside well.
- 3.3.2 Install in locations as indicated and on inlet and outlet of:
 - .1 Heat exchangers.
 - .2 Water heating and cooling coils.
 - .3 Water boilers.
 - .4 Chillers.
 - .5 Cooling towers.
 - .6 DHW tanks.
- 3.3.3 Install wells as indicated only for balancing purposes.
- 3.3.4 Use extensions where thermometers are installed through insulation.

3.4 Pressure Gauges

- 3.4.1 Install in locations as follows:
 - .1 Suction and discharge of pumps.
 - .2 Upstream and downstream of PRV's.

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Appendix 8.2, Division 23, Section 23 05 19, Meters and Gauges for HVAC Piping

- .3 Upstream and downstream of control valves.
- .4 Inlet and outlet of coils.
- .5 Inlet and outlet of liquid side of heat exchangers.
- .6 Outlet of boilers.
- .7 In other locations [as indicated].
- 3.4.2 Install gauge cocks for balancing purposes, elsewhere [as indicated].
- 3.4.3 Use extensions where pressure gauges are installed through insulation.
- 3.5 **Nameplates**
 - 3.5.1 Install engraved Lamicoid nameplates in accordance with Section 23 05 53 Identification for HVAC Piping and Equipment.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Hydronic Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Submit data for valves specified in this Section.

2. PRODUCTS**2.1 Materials - Bronze**

- 2.1.1 Valves:
 - .1 Except for specialty valves, to be single manufacturer.
 - .2 Products to have CRN registration numbers.
 - 2.1.2 End Connections:
 - .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
 - .2 Copper tube systems: solder ends or grooved ends to ANSI/ASME B16.18.
 - 2.1.3 Lockshield Keys:
 - .1 Where lockshield valves are specified, provide [10] keys of each size: malleable iron cadmium plated.
 - 2.1.4 Gate Valves:
 - .1 Requirements common to gate valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.
 - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic
 - .5 Packing: non-asbestos.
 - .6 Handwheel: non-ferrous.
 - .7 Handwheel Nut: bronze to ASTM B62.
 - .2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125
-

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Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping

- .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
- .2 Operator: Handwheel.
- .3 NPS 2 and under, non-rising stem, solid wedge disc, Class 150:
 - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
 - .2 Operator: handwheel.
- .4 NPS 2 and under, rising stem, split wedge disc, Class 125:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem
 - .3 Operator: handwheel.
- .5 NPS 2 and under, rising stem, solid wedge disc, Class 125:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Operator: handwheel.
- .6 NPS 2 and under, rising stem, solid wedge disc, Class 150:
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Operator: handwheel.

2.1.5 Globe Valves:

- .1 Requirements common to globe valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.
 - .4 Pressure testing: to MSS SP-80. Tests to be hydrostatic
 - .5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
 - .6 Handwheel: non-ferrous.
 - .7 Handwheel Nut: bronze to ASTM B62.
- .2 NPS 2 and under, composition disc, Class 125:
 - .1 Body and bonnet: screwed bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc composition to suit service conditions, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
 - .3 Operator: handwheel.
- .3 NPS 2 and under, composition disc, Class 150:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
 - .3 Operator: handwheel.
- .4 NPS 2 and under, plug disc, Class 150, screwed ends:
 - .1 Body and bonnet: union bonnet.

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Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping

- .2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A276, loosely secured to stem
- .3 Operator: handwheel.
- .5 Angle valve, NPS 2 and under, composition disc, Class 150:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.
 - .3 Operator: [handwheel] [lockshield].
- 2.1.6 Check Valves:
 - .1 Requirements common to check valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Connections: screwed with hexagonal shoulders.
 - .2 NPS 2 and under, swing type, bronze disc, Class 125:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .3 NPS 2 and under, swing type, bronze disc:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .4 NPS 2 and under, swing type, composition disc, Class 200:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc: renewable rotating disc of number [6] composition to suit service conditions, bronze two-piece hinge disc construction.
 - .5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
 - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap.
 - .2 Disc: renewable PTFE no. 6 composition rotating disc in disc holder having guides top and bottom, of bronze to ASTM B62.
 - .6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
 - .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.
- 2.1.7 Silent Check Valves:
 - .1 NPS 2 and under:
 - .1 Body: cast high tensile bronze to ASTM B62 with integral seat
 - .2 Pressure rating: Class 125.

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Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping

- .3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders
- .4 Disc and seat: renewable rotating disc.
- .5 Stainless steel spring, heavy duty.
- .6 Seat: regrindable.
- 2.1.8 Ball Valves:
 - .1 NPS 2 and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: Class125, 2760-kPa CWP.
 - .3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders.
 - .4 Stem: tamperproof ball drive.
 - .5 Stem packing nut: external to body.
 - .6 Ball and seat: replaceable stainless steel solid ball and Teflon seats.
 - .7 Stem seal: TFE with external packing nut.
 - .8 Operator: removable lever handle.
- 2.1.9 Butterfly Valves:
 - .1 NPS 2 1/2 through NPS 6, 2068 kPa with grooved ends.
 - .1 Body: cast bronze, with copper-tube dimensioned grooved ends.
 - .2 Disc: elastomer coated ductile iron with integrally cast stem.
 - .3 Operator: handwheel.
- 2.2 **Material – Cast Iron**
 - 2.2.1 Valves:
 - .1 Except for specialty valves, to be of single manufacturer.
 - 2.2.2 Standard specifications:
 - .1 Gate valves: MSS SP-70
 - .2 Globe valves: MSS SP-85
 - .3 Check valves: MSS SP-71
 - 2.2.3 Requirements common to valves, unless specified otherwise:
 - .1 Body, bonnet: cast iron to ASTM B209 Class B.
 - .2 Connections: flanged ends plain face with 2 mm raised face with serrated finish and grooved ends to ANSI B16.1.
 - .3 Inspection and pressure testing: to MSS SP-82.
 - .4 Bonnet gasket: non-asbestos.
 - .5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
 - .6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.
 - .7 Gland packing: non-asbestos.
 - .8 Handwheel: die-cast aluminum alloy to ASTM B85/B85M or malleable iron to ASTM A49. Nut of bronze to ASTM B62.
 - .9 Identification tag: with catalogue number, size, other pertinent data.

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2.2.4 All products to have CRN registration numbers.

2.2.5 Gate Valves

- .1 NPS 2 1/2 - 8, non rising stem, inside screw, [bronze] [iron] trim, solid wedge disc:
 - .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, Class 125.
 - .2 Disc: solid offset taper wedge, bronze to ASTM B62.
 - .3 Seat rings: renewable bronze to ASTM B62, screwed into body
 - .4 Stem: bronze to ASTM B62
 - .5 Disc: solid offset taper wedge, cast iron to ASTM A126 Class B, secured to wrought steel stem
 - .6 Seat: integral with body.
 - .7 Stem: wrought steel.
 - .8 Operator: handwheel.
 - .9 Bypass: complete with union and gate.
- .2 NPS 2 1/2-8, outside screw and yoke (OS&Y), bronze trim, solid wedge disc:
 - .1 Body and multiple-bolted bonnet: with [bosses in body and bonnet for taps and drains,] full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut. Class 125.
 - .2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection
 - .3 Seat rings: renewable bronze screwed into body.
 - .4 Stem: [nickel-plated steel] [manganese-bronze].
 - .5 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.
 - .6 Seat rings: integral with body.
 - .7 Stem: nickel-plated steel.
 - .8 Pressure-lubricated operating mechanism.
 - .9 Operator: handwheel.
 - .10 Bypass: complete with union and gate.

2.2.6 Underwriters Approved Gate Valve

- .1 NPS 2 1/2 - 14, OS&Y:
 - .1 Approvals: UL and FM approved for fire service
 - .2 UL and FM Label: on valve yoke
 - .3 Body, Bonnet: cast iron to ASTM A126 Class B. Wall thicknesses to ANSI B16.1 and ULC C-262 (B), ductile iron to ASTM A536 Grade 65-45-12.
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SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA, PROJECT 22701

Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping

- .4 Bonnet bushing, yoke sleeve: bronze, to FM requirements
- .5 Packing gland: bronze.
- .6 Stem: manganese bronze. Diameter to ULC C-262 (B).
Brass, ASTM B16.
- .7 Stuffing box dimensions, gland bolt diameter: to ULC C-262
(B)
- .8 Bosses for bypass valve, drain: on NPS 4 and over.
- .9 Disc: solid taper wedge. Up to NPS 3: bronze. NPS 4 and
over: EPDM coated cast iron with bronze disc rings.
- .10 Disc seat ring: self-aligning, Millwood undercut on NPS 3 -
12.
- .11 Pressure rating:
 - .1 NPS 2-1/2 - 12: 1.7 Mpa CWP.
 - .2 NPS 14-1.2: 1.2 MPa CWP.
- .12 Operator: handwheel.
- .13 Bypass: complete with union and gate valve as Section
23 05 23.01 - Valves – Bronze.

2.2.7 Globe Valves

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

2.2.8 Bypasses For Gate And Globe Valves

- .1 Locations: on valves as indicated.
- .2 Size of bypass valve:
 - .1 Main valve up to NPS 8: NPS 3/4.
 - .2 Main valve NPS 10 and over: NPS 1.
- .3 Type of bypass valves:
 - .1 On gate valve: globe, with composition bronze] disc, bronze
trim.
 - .2 On globe valve: globe, with composition bronze disc, bronze
trim.

2.2.9 Valve Operators

- 2.6.1 Install valve operators as follows:
 - .1 Handwheel: on valves except as specified.

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Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping

- .2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in boiler rooms and mechanical equipment rooms.

2.2.10 Check Valves

- .1 Swing check valves, Class 125:
 - .1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Grooved or flanged ends: plain faced with smooth finish.
 - .1 Up to NPS 16: cast iron to ASTM A126 Class B.
 - .2 NPS 18 and over: cast iron to ASTM A126 Class C
 - .2 Ratings:
 - .1 NPS 2 1/2 - 12: 860 kPa steam; 1.4 MPa CWP.
 - .2 NPS 14 - 16: 860 kPa steam; 1.03 MPa CWP.
 - .3 NPS 18 and over: 1.03 MPa CWP.
 - .3 Disc: rotating for extended life.
 - .1 Up to NPS 6: bronze to ASTM B62.
 - .2 NPS 8 and over: bronze-faced cast iron.
 - .4 Seat rings: renewable bronze to ASTM B62 screwed into body
 - .5 Hinge pin, bushings: renewable bronze to ASTM B62.
 - .6 Disc: A126 Class B, secured to stem, rotating for extended life.
 - .7 Seat: cast iron, integral with body.
 - .8 Hinge pin: exelloy; bushings: malleable iron.
 - .9 Identification tag: fastened to cover.
 - .10 Hinge: galvanized malleable iron.

2.7.2 Swing check valves, NPS 2 1/2 – 8 Class 250:

- .1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin
- .2 Flanged ends: 2 mm raised face with serrated finish.
- .3 Rating: 250 psi steam; 500 psi CWP.
- .4 Disc: rotating for extended life.
 - .1 Up to NPS 3: bronze to ASTM B61
 - .2 NPS 4 - 8: iron faced with ASTM B61 bronze
- .5 Seat rings: renewable bronze to ASTM B61, screwed into body
- .6 Hinge pin, bushings: renewable, bronze to ASTM B61
- .7 Hinge: galvanized malleable iron.
- .8 Identification tag: fastened to cover.

2.8 Silent Check Valves

2.8.1 Construction:

- .1 Body: ductile iron with integral seat.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 23, General Duty Valves for HVAC Piping**

- .2 Pressure rating: Class 125, WP = 860 kPa.
- .3 Connections: grooved ends.
- .4 Disc: bronze renewable rotating disc.
- .5 Seat: renewable, EPDM.
- .6 Stainless steel spring, heavy duty.

3. EXECUTION**3.1 Installation**

- 3.1.1 Install rising stem valves in upright position with stem above horizontal.
- 3.1.2 Remove internal parts before soldering.
- 3.1.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment**

1 GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Hangers and Supports for HVAC Piping and Equipment as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- 1.2.4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.2.5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

2. PRODUCTS**2.1 System Description**

- 2.1.1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
-

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Equipment**

- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
- 2.2 **General**
- 2.2.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.
 - 2.2.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.
- 2.3 **Pipe Hangers**
- 2.3.1 Finishes:
 - .1 Pipe hangers and supports: galvanized after manufacture.
 - .2 Use electro-plating galvanizing process or hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are copper plated.
 - 2.3.2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
 - .2 Rod: 9mm UL listed.
 - .3 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed MSS-SP58 and MSS-SP69.
 - 2.3.3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP69.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.
 - 2.3.4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed MSS SP69.
 - 2.3.5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies:
 - .2 Steel brackets:
 - 2.3.6 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 23, Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment

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- .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22mm or 28mm rod.
 - 2.3.7 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel [black] [galvanized].
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
 - 2.3.8 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for riveting to insulation shields.
 - 2.3.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
 - 2.3.10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: black.
 - .2 Finishes for copper, glass, brass or aluminum pipework: black.
 - 2.3.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.
 - 2.3.12 Manufactured by Taylor, Hilti or approved equal.
- 2.4 **Riser Clamps**
- 2.4.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.
 - 2.4.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
 - 2.4.3 Bolts: to ASTM A307.
 - 2.4.4 Nuts: to ASTM A563.
 - 2.4.5 Manufactured by Taylor, FNW or approved equal.
- 2.5 **Insulation Protection Shields**
- 2.5.1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3m span
 - 2.5.2 Insulated hot piping:
 - .1 Curved plate 300mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.
 - 2.5.3 Manufactured by Taylor, FNW or approved equal.
- 2.6 **Constant Support Spring Hangers**
- 2.6.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR)
-

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment**

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- 2.6.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
 - 2.6.3 Provide upper and lower factory set travel stops.
 - 2.6.4 Provide load adjustment scale for field adjustments.
 - 2.6.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25mm minimum.
 - 2.6.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.
 - 2.6.7 Manufactured by Taylor, FNW or Agency approved equal.
- 2.7 **Variable Support Spring Hangers**
- 2.7.1 Vertical movement: 13mm minimum, 50mm maximum, use single spring pre-compressed variable spring hangers.
 - 2.7.2 Vertical movement greater than 50mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
 - 2.7.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.
 - 2.7.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
 - 2.7.5 Manufactured by Taylor, FNW or approved equal.
- 2.8 **Equipment Supports**
- 2.8.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.
- 2.9 **Equipment Anchor Bolts and Templates**
- 2.9.1 Provide templates to ensure accurate location of anchor bolts.
- 2.10 **Housekeeping Pads**
- 2.10.1 Provide 100mm high concrete housekeeping pads for base-mounted equipment; size pads 150mm larger than equipment; chamfer pad edges.
 - 2.10.2 Paint edges yellow to prevent tripping hazard.
- 2.11 **Other Equipment Supports**
- 2.11.1 Fabricate equipment supports from structural grade steel.
 - 2.11.2 Submit structural calculations with shop drawings.
3. **EXECUTION**
- 3.1 **Manufacturer's Instructions**
 - 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 29, Hangers and Supports for HVAC Piping and
Equipment**

3.2 Installation

- 3.2.1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- 3.2.2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- 3.2.3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- 3.2.4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, [one] at each corner.
- 3.2.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- 3.2.6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- 3.2.7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 Hanger Spacing

- 3.3.1 Plumbing piping: to the Ontario Building Code and the authority having jurisdiction.
- 3.3.2 Fire protection: to applicable fire code.
- 3.3.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8m.
- 3.3.4 Copper piping: up to NPS 1/2: every 1.5m.
- 3.3.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- 3.3.6 Within 300mm of each elbow.
- 3.3.7 Pipework greater than NPS 12: to MSS SP69.

3.4 Hanger Installation

- 3.4.1 Install hanger so that rod is vertical under operating conditions.
- 3.4.2 Adjust hangers to equalize load.

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- 3.4.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

- 3.5 **Horizontal Movement**
 - 3.5.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
 - 3.5.2 Where horizontal pipe movement is less than 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

- 3.6 **Final Adjustment**
 - 3.6.1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
 - 3.6.2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
 - 3.6.3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
 - 3.6.4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

- 3.7 **Field Quality Control**
 - 3.7.1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 - action and informational submittals.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work.
 - 3.7.2 Waste Management: separate waste materials for reuse and recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and
Equipment**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of equipment name plates for HVAC Piping and Equipment as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets. Include product characteristics, performance criteria, and limitations.
- 1.2.2 Submittals: in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.3 Product data to include paint colour chips, other products specified in this section.
- 1.2.4 Samples:
 - .1 Submit samples for approval.
 - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

2. PRODUCTS**2.1 Manufacturer's Equipment Nameplates**

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

2.2 System Nameplates

- 2.2.1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
 - 2.2.2 Construction:
 - .1 3mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
 - 2.2.3 Sizes:
 - .1 Conform to following table:
-

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Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and Equipment

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

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

2.2.4 Locations:

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

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

2.2.5 Identification for PSPC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

2.3 **Existing Identification Systems**

2.3.1 Apply existing identification system to new work.

2.3.2 Where existing identification system does not cover for new work, use identification system specified this section.

2.3.3 Before starting work, obtain written approval of identification system from the Consultant.

2.4 **Piping Systems Governed by Codes**

2.4.1 Identification:

.1 Natural gas: to CSA/CGA B149.1 and authority having jurisdiction.

.2 Propane gas: to CSA/CGA B149.1 and authority having jurisdiction.

.3 Sprinklers: to NFPA 13.

.4 Standpipe and hose systems: to NFPA 14.

2.5 **Identification of Piping Systems**

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

2.5.2 Pictograms:

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Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and Equipment

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- .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- 2.5.3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- 2.5.4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75mm: 100mm long x 50mm high.
- .2 Outside diameter of pipe or insulation 75mm and greater: 150mm long x 50mm high.
- .3 Use double-headed arrows where flow is reversible.
- 2.5.5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
- .2 Length to accommodate pictogram, full length of legend and arrows.
- 2.5.6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- 2.5.7 Colours and Legends:
- .1 Where not listed, obtain direction from The Agency.
- .2 Colours for legends, arrows: to following table:
- | Background colour | Legend, arrows |
|-------------------|----------------|
| Yellow | BLACK |
| Green | WHITE |
| Red | WHITE |
- .3 Background colour marking and legends for piping systems:

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Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and Equipment

| Contents | Background colour marking | Legend |
|----------------------------|---------------------------|-------------------|
| Condenser water supply | Green | COND. WTR. SUPPLY |
| Condenser water return | Green | COND. WTR. RETURN |
| Chilled water supply | Green | CH. WTR. SUPPLY |
| Chilled water return | Green | CH. WTR. RETURN |
| Hot water heating supply | Yellow | HEATING SUPPLY |
| Hot water heating return | Yellow | HEATING RETURN |
| Domestic hot water supply | Green | DOM. HW SUPPLY |
| Dom. HWS recirculation | Green | DOM. HW CIRC |
| Domestic cold water supply | Green | DOM. CWS |
| Storm water | Green | STORM |
| Sanitary | Green | SAN |
| Plumbing vent | Green | SAN. VENT |
| Refrigeration suction | Yellow | REF. SUCTION |
| Refrigeration liquid | Yellow | REF. LIQUID |
| Refrigeration hot gas | Yellow | REF. HOT GAS |
| Natural gas | to Codes | |
| Sprinklers | Red | SPRINKLERS |

2.6 Identification Ductwork Systems

- 2.6.1 50mm high stencilled letters and directional arrows 150mm long x 50mm high.
- 2.6.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 Valves, Controllers

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

2.8 Controls Components Identification

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

2.9 Language

- 2.9.1 Identification in English.

3. EXECUTION

3.1 Manufacturer's Instructions

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and
Equipment**

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
 - 3.2 **Timing**
 - 3.2.1 Provide identification only after painting has been completed.
 - 3.3 **Installation**
 - 3.3.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
 - 3.3.2 Provide ULC and/or CSA registration plates as required by respective Agency
 - 3.3.3 Identify systems, equipment to conform to PWGSC PMSS.
 - 3.4 **Nameplates**
 - 3.4.1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
 - 3.4.2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
 - 3.4.3 Protection:
 - .1 Do not paint, insulate or cover.
 - 3.5 **Location of Identification On Piping and Ductwork Systems**
 - 3.5.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
 - 3.5.2 Adjacent to each change in direction.
 - 3.5.3 At least once in each small room through which piping, or ductwork passes.
 - 3.5.4 On both sides of visual obstruction or where run is difficult to follow.
 - 3.5.5 On both sides of separations such as walls, floors, partitions.
 - 3.5.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
 - 3.5.7 At beginning and end points of each run and at each piece of equipment in run.
 - 3.5.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
 - 3.5.9 Identification easily and accurately readable from usual operating areas and from access points.
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**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 53, Identification for HVAC Piping and
Equipment**

- .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.
- 3.6 **Valves, Controllers**
- 3.6.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
 - 3.6.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by The Agency. Provide one copy (reduced in size if required) in each operating and maintenance manual.
 - 3.6.3 Number valves in each system consecutively.
- 3.7 **Field Quality Control**
- 3.7.1 Verification requirements in accordance with Section 23 05 00 – Common Work Results for HVAC, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 93, Testing, Adjusting and Balancing for HVAC****1. GENERAL****1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to test, adjust and balance all air and water/hydronic systems to verify conformance to specified parameters and to the design intent of the mechanical systems as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Qualifications of TAB Personnel

- 1.2.1 Submit names of personnel to perform Testing, Adjusting and Balancing (TAB) to the Consultant within 90 days of award of contract.
- 1.2.2 Provide documentation confirming qualifications, successful experience.
- 1.2.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC National Standards for Total System Balance, MN-1-2002.
 - .2 National Environmental Balancing Bureau (NEBB) TABES Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA, HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- 1.2.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- 1.2.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- 1.2.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- 1.2.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- 1.2.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used AABC, NEBB, or TABB, requirements and recommendations contained in these procedures and requirements are mandatory.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 05 93, Testing, Adjusting and Balancing for HVAC****1.3 Purpose of TAB**

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

1.4 Exceptions

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

1.5 Co-Ordination

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

1.6 Pre-Tab Review

- 1.6.1 Review Contract Documents before project construction is started and confirm in writing to the Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- 1.6.2 Review specified standards and report to the Consultant in writing proposed procedures which vary from standard.
- 1.6.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 Start-Up

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

1.8 Operation of Systems During Tab

- 1.8.1 Operate systems for length of time required for TAB and as required by the Consultant for verification of TAB reports.

1.9 Start of Tab

- 1.9.1 Notify The Agency 7 days prior to start of TAB.
- 1.9.2 Start TAB when building is essentially completed, including:
- 1.9.3 Installation of ceilings, doors, windows, other construction affecting TAB.

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- 1.9.4 Application of weatherstripping, sealing, and caulking.
 - 1.9.5 Pressure, leakage, other tests specified elsewhere Division 23.
 - 1.9.6 Provisions for TAB installed and operational.
 - 1.9.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.
 - 1.10 **Application Tolerances**
 - 1.10.1 Do TAB to following tolerances of design values:
 - .1 Other HVAC systems: plus 5 %, minus 5 %.
 - .2 Hydronic systems: plus or minus 10 %.
 - 1.11 **Accuracy Tolerances**
 - 1.11.1 Measured values accurate to within plus or minus 2 % of actual values.
 - 1.12 **Instruments**
 - 1.12.1 Prior to TAB, submit to the Consultant list of instruments used together with serial numbers.
 - 1.12.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
 - 1.12.3 Calibrate within 3 months of TAB. Provide certificate of calibration to the Consultant.
 - 1.13 **Action and Informational Submittals**
 - 1.13.1 Submit, prior to commencement of TAB:
-

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- 1.13.2 Proposed methodology and procedures for performing TAB if different from referenced standard.
 - 1.14 **Preliminary Tab Report**
 - 1.14.1 Submit for checking and approval of the Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.
 - 1.15 **Tab Report**
 - 1.15.1 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
 - 1.15.2 Submit an electronic copy of TAB Report to the Consultant for verification and approval.
 - 1.16 **Verification**
 - 1.16.1 Reported results subject to verification by the Consultant.
 - 1.16.2 Provide personnel and instrumentation to verify up to 30 % of reported results.
 - 1.16.3 Pay costs to repeat TAB as required to satisfaction of the Consultant.
 - 1.17 **Settings**
 - 1.17.1 After TAB is completed to satisfaction of The Agency, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
 - 1.17.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.
 - 1.18 **Completion of Tab**
 - 1.18.1 TAB considered complete when final TAB Report received and approved by the Consultant.
 - 1.19 **Air Systems**
 - 1.19.1 Standard: TAB to most stringent of this section, TAB standards of AABC, NEBB, SMACNA, and ASHRAE.
 - 1.19.2 Do TAB of systems, equipment, components, controls specified Division 23.
 - 1.19.3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB, qualified to standards of AABC or NEBB.
 - 1.19.4 Quality assurance: perform TAB under direction of supervisor qualified by the standards of AABC or NEBB.
-

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- 1.19.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
 - 1.19.6 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
 - 1.19.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).
2. **PRODUCTS** : NOT APPLCABLE
3. **EXECUTION** : NOT APPLCABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1 GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of duct insulation as indicated on the Contract Drawings and specified in this section of Specification.

1.12 Action and Informational Submittals

- 1.2.1 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
- 1.2.4 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, and cleaning procedures.

1.3 Quality Assurance

- 1.3.1 Qualifications:
 - 1.3.1 Installer: specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards and a member of TIAC.

1.4 Delivery, Storage and Handling

- 1.4.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC/CSA markings.
- 1.4.2 Waste Management and Disposal:
 - .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials.

2. PRODUCTS**2.1 Fire and Smoke Rating**

- 2.1.1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
-

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- .2 Maximum smoke developed rating: 50.

2.2 Insulation

- 2.2.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- 2.2.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- 2.2.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612>, with factory applied vapour retarder jacket to CGSB 51-GP-52 Ma (as scheduled in PART 3 of this section).
- 2.2.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 without factory applied vapour retarder jacket to CGSB 51-GP-52 Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553
 - .2 Jacket: to CGSB 51-GP-52 Ma
 - .3 Maximum "k" factor: to ASTM C553
- 2.2.5 Manufactured by Johns Manville, Manson or approved equal.

2.3 Jackets

- 2.3.1 Aluminum:
 - .1 To ASTM B209 with and without moisture barrier as scheduled in PART 3 of this section.
 - .2 Thickness: 0.50mm sheet.
 - .3 Finish: Stucco embossed.
 - .4 Jacket banding and mechanical seals: 12mm wide, 0.5mm thick stainless steel.
 - .5 Manufactured by Johns Manville, 3M or approved equal.
- 2.3.2 Stainless steel:
 - .1 Type: 304 for indoor installation and 316 for outdoor installation.
 - .2 Thickness: 0.40mm sheet.
 - .3 Finish: Stucco embossed.
 - .4 Jacket banding and mechanical seals: 12mm wide, 0.5mm thick stainless steel.
 - .5 Manufactured by Johns Manville, 3M or approved equal.

2.4 Accessories

- 2.4.1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - 2.4.2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
 - 2.4.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
 - 2.4.4 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - 2.4.5 Outdoor Vapour Retarder Mastic:
-

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- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².
- 2.4.6 Tape: self-adhesive, aluminum, reinforced, 75mm wide minimum.
- 2.4.7 Contact adhesive: quick-setting
- 2.4.8 Canvas adhesive: washable.
- 2.4.9 Tie wire: .5]mm stainless steel.
- 2.4.10 Banding: 12mm wide, 0.5mm thick stainless steel.
- 2.4.11 Facing: 25mm stainless steel hexagonal wire mesh stitched on both faces of insulation.
- 2.4.12 Fasteners: 4mm diameter pins with 35mm diameter square clips, length to suit thickness of insulation.

3. EXECUTION**3.1 Application**

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

3.2 Pre-Installation Requirements

- 3.2.1 Pressure test ductwork systems complete, witness and certify.
- 3.2.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 Installation

- 3.3.1 Install in accordance with TIAC National Standards
- 3.3.2 Apply materials in accordance with manufacturers instructions and as indicated.
- 3.3.3 Use [2] layers with staggered joints when required nominal thickness exceeds 75mm.
- 3.3.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- 3.3.5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for All Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- 3.3.6 Fasteners: install at 300mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 Ductwork Insulation Schedule

- 3.4.1 Insulation types and thicknesses: conform to following table:

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| Type | TIAC Code | Vapour Retarder | Thickness (mm) |
|--|------------------|------------------------|-----------------------|
| Rectangular cold and dual temperature supply air ducts (exposed) | C-1 | yes | 50 |
| Round cold and dual temperature supply air ducts (concealed) | C-2 | yes | 50 |
| Rectangular warm air ducts (exposed) | C-1 | no | 25 |
| Round warm air ducts (exposed) | C-1 | no | 25 |
| Rectangular cold and dual temperature supply air ducts (concealed) | C-2 | Yes | 25 |
| Round cold and dual temperature supply air ducts (exposed) | C-1 | yes | 50 |
| Rectangular warm air ducts (concealed) | C-2 | No | 25 |
| Round warm air ducts (concealed) | C-2 | No | 25 |
| Supply, return and exhaust ducts exposed in space being served | | | none |
| Outside air ducts to mixing plenum | C-1 | yes | 50 |
| Mixing plenums | C-1 | yes | 25 |
| Exhaust duct between dampers and louvers | C-1 | no | 50 |
| Rectangular ducts outside | C-1 | special | 50 |
| Round ducts outside | C-1 | special | 50 |

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- 3.4.2 Exposed round ducts 600mm and larger, smaller sizes where subject to abuse. Use TIAC code C-1 insulation, scored to suit diameter of duct. Finishes: conform to following table:

| Location | TIAC Code | | Insulation Thickness |
|--|-------------|-------|----------------------|
| | Rectangular | Round | |
| Indoor, concealed | none | none | - |
| Indoor, exposed within mechanical room | CRF/1 | CRD/2 | 25mm (1") |
| Indoor, exposed elsewhere | CRF/2 | CRD/3 | 25mm (1") |
| Outdoor, exposed to precipitation | CRF/3 | CRD/4 | 75mm (3") |
| Outdoor, elsewhere | CRF/4 | CRD/5 | 75mm (3") |

- 3.4.3 All outdoor air intake ductwork from outside louvres to mixing plenum of air handling unit or to motorized damper in other systems in 50mm (2") thickness.
- 3.4.4 All exhaust and relief ductwork from outside louvres back 1.5m (5 ft) upstream of motorized dampers or where there are no motorized dampers, from louvre to fan discharge in 50mm (2") thickness.
- 3.4.5 Mixed air plenums in 50mm (2") thickness.
- 3.4.6 Behind unused portion of louvers in 50mm (2") thickness.

END OF SECTION

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1 GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of HVAC Piping Insulation as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals**1.2.1 Product Data:**

- .1 Submit manufacturer's printed product literature, specifications, and datasheet in accordance with Section 23 05 00 - Common Work Results for HVAC. Include product characteristics, performance criteria, and limitations.

1.2.2 Shop Drawings:

- .1 Submit drawings stamped and signed by the contractor including initials, date and status.
- .2 Quality assurance submittals: submit manufacturer's installation instructions.

1.3 Quality Assurance**1.3.3 Qualifications:**

- .1 Installer: specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards and a member of TIAC.

2. PRODUCTS**2.1 Fire And Smoke Rating****2.1.1 In accordance with CAN/ULC-S102.**

- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

2.2 Insulation**2.2.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.****2.2.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.****2.2.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.**

- .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
- .2 Maximum "k" factor: to CAN/ULC-S702.

2.2.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

- .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
- .2 Jacket: to CGSB 51-GP-52 Ma

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- .3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.
 - 2.2.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52 Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.
 - 2.2.6 TIAC Code A-6: flexible unicellular tubular elastomer
 - .1 Insulation: with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52 Ma
 - .3 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
 - 2.2.7 Manufactured by Johns Manville, Manson or Agency approved equal.
 - 2.3 **Insulation Securement**
 - 2.3.1 Tape: self-adhesive, aluminum, reinforced, 50mm wide minimum.
 - 2.3.2 Contact adhesive: quick setting.
 - 2.3.3 Canvas adhesive: washable.
 - 2.3.4 Tie wire: 1.5mm diameter stainless steel.
 - 2.3.5 Bands: stainless steel, 19mm wide, 0.5mm thick.
 - 2.4 **Cement**
 - 2.4.1 Thermal insulating and finishing cement:
 - .1 Hydraulic setting or Air drying on mineral wool, to ASTM C449/C449M.
 - 2.4.2 Manufactured by Childers or Agency approved equal.
 - 2.5 **Vapour Retarder Lap Adhesive**
 - 2.5.1 Water based, fire retardant type, compatible with insulation.
 - 2.5.2 Manufactured by Sika, Foster or Agency approved equal.
 - 2.6 **Indoor Vapour Retarder Finish**
 - 2.6.1 Vinyl emulsion type acrylic, compatible with insulation.
 - 2.7 **Outdoor Vapour Retarder Finish**
 - 2.7.1 Vinyl emulsion type acrylic, compatible with insulation.
 - 2.7.2 Reinforcing fabric: fibrous glass, untreated 305 g/m².
 - 2.8 **Jackets**
 - 2.8.1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required
 - .2 Colours: to match adjacent finish paint.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
-

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Appendix 8.2, Division 23, Section 23 07 19, HVAC Piping Insulation

- .5 Moisture vapour transmission: 0.02 perm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .7 Special requirements:
 - .1 Indoor: standard.
 - .2 Outdoor: UV rated material at least 0.5mm thick.
 - .8 Locations:
 - .1 Indoor exposed installations; not required for concealed installation including return air plenums and ceiling spaces.
 - .9 Manufactured by Johns Manville, Brock White or Agency approved equal.
- 2.8.2 Canvas:
- .1 220 and 120 gm/m² cotton, plain weave, treated with dilute fire-retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.
 - .3 Manufactured by Johns Manville, Brock White or approved equal.
- 2.8.3 Aluminum:
- .1 To ASTM B209.
 - .2 Thickness: 0.50mm sheet.
 - .3 Finish: stucco embossed.
 - .4 Joining: longitudinal and circumferential slip joints with 50mm laps.
 - .5 Fittings: 0.5mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 9]mm wide, 0.5mm thick at 300mm spacing.
 - .7 Manufactured by 3M, Johns Manville or Agency approved equal.

3. **EXECUTION**

3.1 **Manufacturer's Instructions**

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

3.2 **Pre-Installation Requirement**

- 3.2.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed by the Consultant and certified.
- 3.2.2 Surfaces clean, dry, free from foreign material.

3.3 **Installation**

- 3.3.1 Install in accordance with TIAC National Standards
-

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- 3.3.2 Apply materials in accordance with manufacturer's instructions and this specification.
 - 3.3.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75mm.
 - 3.3.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
 - 3.3.5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

 - 3.4 **Removable, Pre-Fabricated, Insulation and Enclosures**
 - 3.4.1 Application: at expansion joints, valve, primary flow measuring elements, flanges and unions at equipment.
 - 3.4.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
 - 3.4.3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: PVC.

 - 3.5 **Installation of Elastomeric Insulation**
 - 3.5.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
 - 3.5.2 Provide vapour retarder as recommended by manufacturer.

 - 3.6 **Piping Insulation Schedules**
 - 3.6.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
 - 3.6.2 TIAC Code: A-1.
 - .1 Securements: Tape at 300mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
 - 3.6.3 TIAC Code: A-3.
 - .1 Securements: Tape at 300mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
 - 3.6.4 TIAC Code: A-6.
 - .1 Seals: lap seal adhesive, lagging adhesive.
 - 3.6.5 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Seals: lap seal adhesive, lagging adhesive.
 - .2 Installation: TIAC Code: 1501-C.
 - 3.6.7 Thickness of insulation as listed in following table.
-

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Appendix 8.2, Division 23, Section 23 07 19, HVAC Piping Insulation

- .1 Run-outs to individual units and equipment not exceeding 4000mm long.
- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

| Application | Temp °C | TIAC code | Pipe sizes (NPS) and insulation thickness (mm) | | | | | |
|---|-------------|--------------|---|---------|---------------|---------------|-----------|-------------|
| | | | Run out | to 1 | 1 1/4 to 2 | 2 1/2 to 4 | 5 to 6 | 8 & over |
| Hot Water Heating | 60 - 94 | [A-1] | 25 | 38 | 38 | 38 | 38 | 38 |
| Hot Water Heating | up to 59 | [A-1] | 25 | 25 | 25 | 25 | 38 | 38 |
| Glycol Heating | 60 - 94 | [A-1] | 25 | 38 | 38 | 38 | 38 | 38 |
| Glycol Heating | up to 59 | [A-1] | 25 | 25 | 25 | 25 | 38 | 38 |
| Chilled Water | 4 - 13 | [A-3] | 25 | 25 | 25 | 25 | 25 | 25 |
| Chilled Water or Glycol | below 4 | [A-3] | 25 | 25 | 38 | 38 | 38 | 38 |
| Condenser Water Indoors | | | - | - | - | - | - | - |
| Refrigerant [hot gas] [liquid] [suction] | 4 - 13 | [A-6] | 25 | 25 | 25 | 25 | 25 | 25 |
| Refrigerant [hot gas] [liquid] [suction] | below 4 | [A-6] | 25 | 25 | 38 | 38 | 38 | 38 |
| RWL and RWP | | [C-2] | 25 | 25 | 25 | 25 | 25 | 25 |
| Cooling Coil cond. drain | | [C-2] | 25 | 25 | 25 | 25 | 25 | 25 |

3.6.8 Finishes:

- .1 Concealed and exposed indoors: PVC jacket, including refrigerant piping.
- .2 Exposed in mechanical rooms: PVC jacket, including refrigerant piping.
- .3 Concealed, indoors: canvas on valves, fittings with PVC jacket.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation
- .5 Outdoors: water-proof aluminum jacket for all piping.
- .6 Finish attachments: SS bands, at 50mm on centre. Seals: closed.
- .7 Installation: to appropriate TIAC code CRF/1 through CPF/5

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 08 00, Commissioning of HVAC**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services to complete the commissioning work as specified in this section of Specification.
- 1.1.3 Commissioning work shall be a team effort to ensure that all equipment and systems have been completely and properly installed, function correctly to meet the design intent, and to document system performance parameters for fine tuning of control sequences and operational procedures.

1.2 Action and Informational Submittals**1.1.1 Product Data:**

- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 23 05 00 - Common Work Results for HVAC. Include product characteristics, performance criteria, and limitations.

2. PRODUCTS**2.1 Cleaning Solutions**

- 2.1.1 Tri-sodium phosphate: 0.40 kg per 100L water in system.
- 2.1.2 Sodium carbonate: 0.40 kg per 100L water in system.
- 2.1.3 Low-foaming detergent: 0.01 kg per 100L water in system.

3. EXECUTION**3.1 Cleaning and Start-Up of Mechanical Piping Systems**

- 1.1.1 In accordance with 3.6 of this section.

3.2 Hydronic Systems - Performance Verification (PV)

- 3.2.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.
- 3.2.2 When systems are operational, perform following tests:
 - .1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.
 - .2 Verify performance of hydronic system circulating pumps as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.
 - .1 Pump operation.
 - .2 Boiler and/or chiller operation.
 - .3 Pressure bypass open/closed.
 - .4 Control pressure failure.
 - .5 Maximum heating demand.
 - .6 Maximum cooling demand.

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- .7 Boiler and/or chiller failure.
- .8 Cooling tower (and/or industrial fluid cooler) fan failure.
- .9 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

3.3 Hydronic System Capacity Test

3.3.1 Perform hydronic system capacity tests after:

- .1 TAB has been completed.
- .2 Verification of operating, limit, safety controls.
- .3 Verification of primary and secondary pump flow rates.
- .4 Verification of accuracy of temperature and pressure sensors and gauges.

3.3.2 Calculate system capacity at test conditions.

3.3.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

3.3.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

3.3.5 Submit sample of system water to approved testing agency to determine if chemical treatment is correct. Include cost.

3.3.6 Heating system capacity test:

- .1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:
 - .1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions) or
 - .2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.
- .2 Test procedures:
 - .1 Open fully heat exchanger, heating coil and radiation control valves.
 - .2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.
 - .3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

3.4 Glycol Systems

3.4.1 Test to prove concentration will prevent freezing to minus 40 degrees C Test inhibitor strength and include in procedural report. Refer to ASTM E202.

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3.5 Manufacturer's Instructions

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

3.6 Cleaning Hydronic Systems

3.6.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

3.6.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

3.6.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete [by water treatment specialist].

3.6.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least [4] weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

3.6.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

3.6.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

3.6.7 Hydronic Systems:

.1 Fill system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35kPa (does not apply to diaphragm type expansion tanks).

.3 Use water metre to record volume of water in system to +/- 0.5%.

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- .4 Add chemicals under direct supervision of chemical treatment supplier.
- .5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
- .6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
- .7 Add chemical solution to system.
- .8 Establish circulation, raise temperature slowly to [maximum design] [82 degrees C minimum]. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding sodium sulphite (test for residual sulphite).

3.7 Start-Up of Hydronic Systems**3.7.1 After cleaning is completed and system is filled:**

- .1 Establish circulation and expansion tank level, set pressure controls. Ensure air is removed.
- .2 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
- .3 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
- .4 Clean out strainers repeatedly until system is clean.
- .5 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment Systems.
- .6 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
- .7 Repeat with water at design temperature.
- .8 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
- .9 Bring system up to design temperature and pressure [slowly] [over a [48] hour period].
- .10 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .11 Adjust pipe supports, hangers, springs as necessary.
- .12 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

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- .13 If [sliding type expansion joints bind] [or if] [bellows type expansion joints flex incorrectly], shut down system, re-align, repeat start-up procedures.
- .14 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
- .15 Check operation of drain valves.
- .16 Adjust valve stem packings as systems settle down.
- .17 Fully open balancing valves (except those that are factory-set).
- .18 Check operation of over-temperature protection devices on circulating pumps.
- .19 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 09 33, Electric and Electronic Control System for
HVAC**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for electric and electronic control system for HVAC as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 Delivery, Storage and Handling

- 1.3.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- 1.3.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- 1.3.3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect electric and electronic control systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- 1.3.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials.

2. PRODUCTS**2.1 Thermostat (Line Voltage-Heating and Cooling)**

- 2.1.1 Line voltage, wall-mounted thermostat with:
 - .1 Full load rating: 16A at 120V.
 - .2 Temperature setting range: 5 degrees C to 30 degrees C.
 - .3 Thermometer range: 5 degrees C to 30 degrees C.
 - .4 Markings in 5 degree increments.
 - .5 Differential temperature fixed at 1.1 degrees C.
 - .6 Manufactured by Honeywell, Johnson Controls or Agency approved equal.
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2.2 Thermostat (Line Voltage, Heating)

2.2.1 Line voltage electric heating thermostat with:

- .1 Full load rating: 22A at 120V.
- .2 Temperature setting range: 5 degrees C to 30 degrees C.
- .3 Thermometer range: 5 degrees C to 30 degrees C.
- .4 Scale markings: off-5-10-15-20-25 degrees C.
- .5 Manufactured by Honeywell, Ouellet or Agency approved equal.

2.3 Thermostat (Low Voltage)

2.3.1 Low voltage wall thermostat:

- .1 For use on 24V circuit at 1.5A capacity.
- .2 With heat anticipator adjustable 0.1 to 1.2A.
- .3 Temperature setting range: 10 degrees C to 25 degrees C.
- .4 Manufactured by Honeywell, Johnson Controls or Agency approved equal.

3. EXECUTION**3.1 Examination**

3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electric and electronic control systems installation in accordance with manufacturer's written instructions.

- .1 Inform the Consultant of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after Receipt of Written Approval to Proceed from the Consultant.

3.2 Installation

3.2.1 Install control devices.

3.2.2 On outside wall, mount thermostats on bracket or insulated pad [25]mm from exterior wall.

3.2.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 21 16, Hydronic Piping Specialties**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Hydronic Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Indicate on drawings:
 - .1 Components and accessories.

1.3 Closeout Submittals

- 1.3.1 Submit in accordance with Section 23 05 00 - Common Work Results for Mechanical.
- 1.3.2 Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
- 1.3.3 Submit hardcopy and electronic form of operation and maintenance manual.

1.4 Extra Stock Materials

- 1.4.1 Supply spare parts as follows:
 - .1 Valve seats: [1] minimum for every ten valves, each size. Minimum one.
 - .2 Discs: [1] minimum for every ten valves, each size. Minimum one.
 - .3 Stem packing: [1] minimum for every ten valves, each size. Minimum one.
 - .4 Valve handles: [2] minimum of each size.
 - .5 Gaskets for flanges: [1] minimum for every ten flanges.

2. PRODUCTS**2.1 Pipe**

- 2.1.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 To NPS 6: Schedule 40.
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2.2 Pipe Joints

- 2.2.1 NPS 2 and under: screwed fittings with PTFE tape or lead-free pipe dope.
- 2.2.2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.
- 2.2.3 Roll grooved: rigid coupling to CSA B242
- 2.2.4 Flanges: plain, slip-On or weld neck to ANSI/AWWA C111/ A21.11.
- 2.2.5 Orifice flanges: slip-on raised face, 2100kPa.
- 2.2.6 Flange gaskets: to ANSI/AWWA C111/ A21.11.
- 2.2.7 Pipe thread: taper.
- 2.2.8 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.
- 2.2.9 Roll grooved coupling gaskets: type EPDM.

2.3 Fittings

- 2.3.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
- 2.3.2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ASME B16.1, Class 125.
 - .2 Steel: to ASME B16.5
- 2.3.3 Butt-welding fittings: steel, to ASME B16.9
- 2.3.4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.
- 2.3.5 Fittings for roll grooved piping: malleable iron to ASTM A47/A47M or ductile iron to ASTM A536.

2.4 Valves

- 2.4.1 Connections:
 - .1 NPS 2 and smaller: screwed ends.
 - .2 NPS 2-1/2 and larger: flanged or grooved ends.
 - 2.4.2 Gate valves: to MSS-SP-70 or MSS-SP-80, application: isolating equipment, control valves, pipelines:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: Class 125, non-rising stem, split wedge disc, as specified in – Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 Elsewhere: Class 125, non-rising stem, solid wedge disc, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 NPS 2-1/2 and over:
 - .1 Mechanical Rooms: non-rising stem, split wedge disc, lead free bronze trim, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 Elsewhere: non-rising stem, solid wedge disc, lead free bronze trim, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - 2.4.3 Butterfly valves: to MSS-SP-67, application: isolating cells or section of multiple component equipment:
-

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- .1 NPS 2-1/2 and over: lug type or grooved ends: as specified Section 23 05 17 - Pipe Welding.
 - 2.4.4 Globe valves: to MSS-SP80/85, application: throttling, flow control, emergency bypass:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: with PTFE disc, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 Elsewhere: globe, with composition disc, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 NPS 2-1/2 and over:
 - .1 With composition lead free bronze disc, lead free bronze trim, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - 2.4.5 Balancing, for TAB:
 - .1 Sizes: calibrated balancing valves, as specified this section.
 - .2 NPS 2 and under:
 - .1 Mechanical Rooms: globe, with plug disc as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 Elsewhere: globe, with plug disc as in Section 23 05 23 General Duty Valves for HVAC Piping.
 - 2.4.6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified in Section 23 05 23 General Duty Valves for HVAC Piping. .
 - 2.4.7 Swing check valves: to MSS-SP-71.
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with [composition] disc, as specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 NPS 2-1/2 and over:
 - .1 Flanged and grooved ends: as specified in Section 23 05 23 General Duty Valves for HVAC.
 - 2.4.8 Silent check valves:
 - .1 NPS 2 and under:
 - .1 As specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - .2 NPS 2-1/2 and over:
 - .1 Flanged and grooved ends: as specified in Section 23 05 23 General Duty Valves for HVAC Piping .
 - 2.4.9 Ball valves:
 - .1 NPS 2 and under: as specified Section 23 05 23 General Duty Valves for HVAC Piping. Section 23 05 23 General Duty Valves for HVAC Piping.
 - 2.4.10 Lubricated Plug Valves
 - .1 NPS 2-1/2 and over:
 - .1 As specified in Section 23 05 23 General Duty Valves for HVAC Piping.
 - 2.4.11 Manufactured by Kitz, Jenkins, Crane or approved equal.
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2.5 Automatic Air Vent

- 2.5.1 Standard float vent: brass body and NPS 1/2 connection and rated at 310 kPa working pressure.
- 2.5.2 Industrial float vent: cast iron body and NPS 1/2 connection and rated at 5860kPa working pressure.
- 2.5.3 Float: solid material suitable for 15 degrees C working temperature.
- 2.5.4 Manufactured by Watts, Armstrong, Taco or approved equal.

2.6 Air Separator - In-Line

- 2.6.1 Provide as indicated on mechanical contract drawings.
- 2.6.2 Manufactured by Watts, Armstrong, Taco, Amtrol or approved equal.

2.7 Pipe Line Strainer

- 2.7.1 NPS 1/2 to 2: bronze body to ASTM B62, screwed connections, Y pattern.
- 2.7.2 NPS 2 1/2 to 12: cast steel body to ASTM A278/A278M, Class 30, cast iron body to ASTM A278/A278M, Class 30, flanged connections.
- 2.7.3 NPS 2 to 12: T type with ductile iron body to ASTM A536, malleable iron body to ASTM A47M, grooved ends.
- 2.7.4 Blowdown connection: NPS 1.
- 2.7.5 Screen: stainless steel with 1.19mm perforations.
- 2.7.6 Working pressure: 860kPa.
- 2.7.7 Manufactured by Watts, McMaster Carr or approved equal.

3. EXECUTION**3.1 Application and Examination**

- 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for HVAC fan installation in accordance with manufacturer's written instructions.
 - .1 Inform The Agency of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from The Agency.
- 3.1.2 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Connections to Equipment

- 3.2.1 In accordance with manufacturer's instructions unless otherwise indicated.
- 3.2.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- 3.2.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

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3.3 Clearances

- 3.3.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- 3.3.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment, components.

3.4 Drains

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

3.5 Air Vents

- 3.5.1 Install manual air vents to CAN/CSA B139 at high points in piping systems.
- 3.5.2 Install isolating valve at each automatic air valve.
- 3.5.3 Install drain piping to approved location and terminate where discharge is visible.

3.6 Dielectric Couplings

- 3.6.1 General: compatible with system, to suit pressure rating of system.
- 3.6.2 Locations: where dissimilar metals are joined.
- 3.6.3 NPS 2 and under: isolating unions or bronze valves.
- 3.6.4 Over NPS 2: isolating flanges.

3.7 Pipework Installation

- 3.7.1 Install pipework to CAN/CSA B139.
 - 3.7.2 Screwed fittings jointed with Teflon tape.
 - 3.7.3 Protect openings against entry of foreign material.
 - 3.7.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
 - 3.7.5 Assemble piping using fittings manufactured to ANSI standards
 - 3.7.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
 - 3.7.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
 - 3.7.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
-

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- 3.7.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- 3.7.10 Install, except where indicated, to permit separate thermal insulation of each pipe.
- 3.7.11 Group piping wherever possible [and as indicated].
- 3.7.12 Ream pipes, remove scale and other foreign material before assembly.
- 3.7.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- 3.7.14 Provide for thermal expansion as indicated.
- 3.7.15 Valves:
 - .1 Install in accessible locations.
 - .2 Remove interior parts before soldering.
 - .3 Install with stems above horizontal position unless indicated.
 - .4 Valves accessible for maintenance without removing adjacent piping.
 - .5 Install globe valves in bypass around control valves.
 - .6 Use gate, ball or butterfly valves at branch take-offs for isolating purposes except where specified.
 - .7 Install butterfly valves on chilled water and related condenser water systems only.
 - .8 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .9 Install ball valves for glycol service.
 - .10 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400mm above floor in Mechanical Rooms.
- 3.7.16 Check Valves:
 - .1 Install silent check valves [on discharge of pumps] [and] [in vertical pipes with downward flow] and as indicated.
 - .2 Install swing check valves in horizontal lines [on discharge of pumps] and as indicated.

3.8 Sleeves

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

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

 - 3.10 **Preparation For Fire Stopping**
 - 3.10.1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation.
 - 3.10.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.
 - 3.10.3 Insulated pipes: ensure integrity of insulation and vapour barriers.

 - 3.11 **Flushing Out of Piping Systems**
 - 3.11.1 Flush system in accordance with Section 23 08 00 Commissioning of HVAC.
 - 3.11.2 Before start-up, clean interior of piping systems supplemented as specified in relevant mechanical sections.
 - 3.11.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

 - 3.12 **Pressure Testing of Equipment and Pipework**
 - 3.12.1 Advise the Consultant 48 hours minimum prior to performance of pressure tests.
 - 3.12.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.
 - 3.12.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
 - 3.12.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
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- 3.12.5 Conduct tests in presence of the Consultant
 - 3.12.6 Pay costs for repairs or replacement, retesting, and making good. The Consultant to determine whether repair or replacement is appropriate.
 - 3.12.7 Insulate or conceal work only after approval and certification of tests by The Agency.

 - 3.13 **Existing Systems**
 - 3.13.1 Connect into existing piping systems at times approved by building personnel.
 - 3.13.2 Request written approval by building personnel 10 days minimum, prior to commencement of work.
 - 3.13.3 Be responsible for damage to existing plant by this work.

 - 3.14 **Circuit Balancing Valves**
 - 3.14.1 Install flow measuring stations [and flow balancing valves] as indicated.
 - 3.14.2 Remove handwheel after installation and when TAB is complete.
 - 3.14.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

 - 3.15 **Strainers**
 - 3.15.1 Install in horizontal or down flow lines.
 - 3.15.2 Ensure clearance for removal of basket.
 - 3.15.3 Install ahead of each pump.
 - 3.15.4 Install ahead of each automatic control valve [larger than NPS 1] [and radiation] [except at radiation] and as indicated.

 - 3.16 **Cleaning, Flushing and Start-Up**
 - 3.16.1 In accordance with Section 23 08 00 Commissioning of HVAC.

 - 3.17 **Testing**
 - 3.17.1 Test system in accordance with Section 23 05 00 - Common Work Results for HVAC.

 - 3.18 **Balancing**
 - 3.18.1 Balance water systems to within plus or minus 5 % of design output.
 - 3.18.2 In accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

 - 3.19 **Glycol Charging**
 - 3.19.1 Include mixing tank and positive displacement pump for glycol charging.
 - 3.19.2 Retest for concentration to ASTM E202 after cleaning

 - 3.20 **Performance Verification**
 - 3.20.1 In accordance with Section 23 08 00 – Commissioning of HVAC Systems.
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END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 23 00, Refrigerant Piping**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Refrigerant Piping as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Administrative Requirements**1.2.1 Pre-installation Meetings:**

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

1.3 Action and Informational Submittals

- 1.3.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.3.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [refrigerant piping, fittings and equipment] and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.3.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- 1.3.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

2. PRODUCTS**2.1 Tubing**

- 2.1.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
 - .1 Hard copper: to ASTM B280, type ACR-B.
 - .2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 Fittings

- 2.2.1 Service: design pressure 2070kPa and temperature 121 degrees C.
- 2.2.2 Brazed:

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- .1 Fittings: wrought copper to ASME B16.22.
 - .2 Joints: silver solder, 15% Ag-80% Cu-5%P or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.
 - 2.2.3 Flanged:
 - .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300
 - .2 Gaskets: suitable for service.
 - .3 Bolts, nuts and washers: to ASTM A307, heavy series
 - 2.2.4 Flared:
 - .1 Bronze or brass, for refrigeration, to ASME B16.26.
 - 2.3 **Pipe Sleeves**
 - 2.3.1 Hard copper or steel, sized to provide 6mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.
 - 2.4 **Valves**
 - 2.4.1 22mm and under: Class 500, 3.5MPa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.
 - 2.4.2 Over 22mm: Class 375, 2.5MPa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.
 - 3. **EXECUTION**
 - 3.1 **Examination**
 - 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for refrigerant piping installation in accordance with manufacturer's written instructions.
 - .1 Inform The Agency of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.
 - 3.2 **Manufacturer's Instructions**
 - 3.2.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
 - 3.3 **General**
 - 3.3.1 Install in accordance with CSA B52, EPS 1/RA/1 and ASME B31.5 and Section 23 05 01 - Installation of Pipe Work.
 - 3.4 **Brazing Procedures**
 - 3.4.1 Bleed inert gas into pipe during brazing.
 - 3.4.2 Remove valve internal parts, solenoid valve coils, sight glass.
-

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3.4.3 Do not apply heat near expansion valve and bulb.

3.5 Piping Installation**3.5.1 General:**

.1 Soft annealed copper tubing: bend without crimping or constriction. Minimize use of fittings.

3.5.2 Hot gas lines:

- .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
- .2 Provide trap at base of risers greater than 2400mm high and at each 7600mm thereafter.
- .3 Provide inverted deep trap at top of risers.
- .4 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: install traps as specified.
 - .2 Small riser: size for 5.1m³/s at minimum load. Connect upstream of traps on large riser.

3.6 Pressure and Leak Testing

- 3.6.1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- 3.6.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively
- 3.6.3 Test procedure: build pressure up to 35kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.7 Field Quality Control**3.7.1 Site Tests/Inspection:**

.1 Close service valves on factory charged equipment.

3.7.2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

3.7.3 Use copper lines of largest practical size to reduce evacuation time.

3.7.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.

3.7.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

3.7.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa absolute and hold for 4 hours.

.2 Break vacuum with refrigerant to 14kPa.

.3 Final to 5 Pa absolute and hold for at least 12 hours.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit test results to the Consultant.

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- 3.7.7 Charging:
- .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
 - .3 Re-purge charging line if refrigerant container is changed during charging process.
- 3.7.8 Checks:
- .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.
 - .2 Record and report measurements to the Consultant.
- 3.7.9 Manufacturer's Field Services:
- .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports within 3 days of review and submit, immediately, to the Consultant.

END OF SECTION

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Appendix 8.2, Division 23, Section 23 31 13, Metal Ducts

1. **GENERAL**

1.1 **General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Metal Ducts as indicated on the Contract Drawings and specified in this section of Specification.

1.2 **Action and Informational Submittals**

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the Contractor including initials, date and status.
- 1.2.4 Test and Evaluation Reports:
 - .1 Certification of Ratings:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

2. **PRODUCTS**

2.1 **Seal Classification**

2.1.1 Classification as follows:

| Maximum Pressure Pa | SMACNA Seal Class |
|---------------------|-------------------|
| 500 | [C] |
| 250 | [C] |
| 125 | [C] |
| 125 | [Unsealed] |

2.1.2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.
- .3 Class C: transverse joints and connections made airtight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.
- .4 Unsealed seams and joints.

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- 2.2 **Sealant**
 - 2.2.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.
 - 2.2.2 Manufactured by Duro Dyne, Hardcast or approved equal.

 - 2.3 **Tape**
 - 2.3.1 Tape: polyvinyl treated, open weave fiberglass tape, 50mm wide.

 - 2.4 **Duct Leakage**
 - 2.4.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

 - 2.5 **Fittings**
 - 2.5.1 Fabrication: to SMACNA.
 - 2.5.2 Radiused elbows:
 - .1 Rectangular: standard radius: 1.5 times width of duct.
 - .2 Round: smooth radius, five-piece, centerline radius: 1.5 times diameter.
 - 2.5.3 Mitered elbows, rectangular:
 - .1 To 407mm: with single thickness turning vanes.
 - .2 Over 407mm: with double thickness turning vanes.
 - 2.5.4 Branches:
 - .1 Rectangular main and branch: with [radius on branch 1.5 times width of duct, 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
 - 2.5.5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
 - 2.5.6 Offsets:
 - .1 Full-radiused elbows.
 - 2.5.7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

 - 2.6 **Fire Stopping**
 - 2.6.1 Retaining angles around duct, on both sides of fire separation in accordance with NFPA and the authorities having jurisdiction.
 - 2.6.2 Coordinate to ensure fire stopping materials and installation does not distort duct.

 - 2.7 **Galvanized Steel**
 - 2.7.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
 - 2.7.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.
-

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Appendix 8.2, Division 23, Section 23 31 13, Metal Ducts

- 2.7.3 Joints: to ASHRAE and SMACNA proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 Hangers and Supports

- 2.8.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for All Piping and Equipment.

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

- .1 Maximum size duct supported by strap hanger: 500.

- .2 Hanger configuration: to ASHRAE and SMACNA.

- .3 Hangers: black galvanized steel angle with black galvanized steel rods to ASHRAE and SMACNA following table:

| Duct Size (mm) | Angle Size (mm) | Rod Size (mm) |
|-------------------|--------------------|------------------|
| up to 750 | 25 x 25 x 3 | 6 |
| 751 to 1050 | 40 x 40 x 3 | 6 |
| 1051 to 1500 | 40 x 40 x 3 | 10 |
| 1501 to 2100 | 50 x 50 x 3 | 10 |
| 2101 to 2400 | 50 x 50 x 5 | 10 |
| 2401 and over | 50 x 50 x 6 | 10 |

- .4 Upper hanger attachments:

- .1 For concrete: manufactured concrete inserts.

- .2 For steel joist: manufactured joist clamp with steel plate washer.

- .3 For steel beams: manufactured beam clamps:

3. EXECUTION

3.1 Examination

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

- .1 Inform the Consultant of unacceptable conditions immediately upon discovery.

- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

3.2 General

- 3.2.1 Do work in accordance with ASHRAE, SMACNA as indicated.

- 3.2.2 Do not break continuity of insulation vapour barrier with hangers or rods.

- .1 Insulate strap hangers 100mm beyond insulated duct] [Ensure diffuser is fully seated.

- 3.2.3 Support risers in accordance with ASHRAE, SMACNA as indicated.

- 3.2.4 Install breakaway joints in ductwork on sides of fire separation.

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Appendix 8.2, Division 23, Section 23 31 13, Metal Ducts

3.2.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.3 Hangers

3.3.1 Strap hangers: install in accordance with SMACNA.

3.3.2 Angle hangers: complete with locking nuts and washers.

3.3.3 Hanger spacing: in accordance with ASHRAE and SMACNA as follows:

| Duct Size | Spacing |
|------------------|----------------|
| (mm) | (mm) |
| to 1500 | 3000 |
| 1501 and over | 2500 |

3.4 Sealing and Taping

3.4.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

3.4.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 00, Air Duct Accessories**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Air Duct Accessories as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

2. PRODUCTS**2.1 General**

- 2.1.1 Manufacture in accordance with Sheet Metal and Air-Conditioning Contractor's National Association (SMACNA) – HVAC Duct Construction Standards.

2.2 Flexible Connections

- 2.2.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- 2.2.2 Material:
 - .1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².
- 2.2.3 Manufactured by Ductmate, Duro Dyne or Agency approved equal.

2.3 Access Doors In Ducts

- 2.3.1 Non-Insulated Ducts: Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame.
 - 2.3.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame and 25mm thick rigid glass fibre insulation.
-

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 00, Air Duct Accessories**

2.3.3 Gaskets: neoprene.

2.3.4 Hardware:

.1 Up to 300 x 300mm: two sash locks complete with safety chain.

.2 301 to 450mm: four sash locks complete with safety chain.

.3 451 to 1000mm: piano hinge and minimum two sash locks.

.4 Doors over 1000mm: piano hinge and two handles operable from both sides.

.5 Hold open devices.

2.3.5 Manufactured by Ductmate, Duro Dyne or Agency approved equal.

2.4 **Turning Vanes**

2.4.1 Factory or shop fabricated, single thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 **Instrument Test**

2.5.1 1.6mm thick steel zinc plated after manufacture.

2.5.2 Cam lock handles with neoprene expansion plug and handle chain.

2.5.3 28mm minimum inside diameter. Length to suit insulation thickness.

2.5.4 Neoprene mounting gasket.

2.6 **Spin-In Collars**

2.6.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

2.6.2 Sheet metal thickness to co-responding round duct standards.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic specialties installation in accordance with manufacturer's written instructions.

.1 Inform the Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

3.2 **Installation**

3.2.1 Flexible Connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100mm.

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- .3 Minimum distance between metal parts when system in operation:
75mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- 3.2.2 Access Doors and Viewing Panels:
 - .1 Size:
 - .1 Provide in accordance with best practices.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
- 3. Instrument Test Ports:
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations:
 - .1 For traverse readings:
 - .2 For temperature readings:
- 3.2.4 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 16, Dampers**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Dampers as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS**2.1 General**

- 2.1.1 Manufacture to SMACNA standards
- 2.1.2 General dampers manufactured by EH Price or Agency approved equal.
- 2.1.3 Fire dampers manufactured by EH Price or Agency approved equal.

2.2 Splitter Dampers

- 2.2.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.
- 2.2.2 Single thickness construction.
- 2.2.3 Control rod with locking device and position indicator.
- 2.2.4 Rod configuration to prevent end from entering duct.
- 2.2.5 Pivot: piano hinge.
- 2.2.6 Folded leading edge.

2.3 Single Blade Dampers

- 2.3.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- 2.3.2 Size and configuration to recommendations of SMACNA, except maximum height 100mm.
- 2.3.3 Locking quadrant with shaft extension to accommodate insulation thickness.
- 2.3.4 Inside and outside nylon end bearings.
- 2.3.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 Multi-Bladed Dampers

- 2.4.1 Factory manufactured of material compatible with duct.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 16, Dampers**

- 2.4.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
 - 2.4.3 Maximum blade height: 100mm.
 - 2.4.4 Bearings: self-lubricating nylon.
 - 2.4.5 Linkage: shaft extension with locking quadrant.
 - 2.4.6 Channel frame of same material as adjacent duct, complete with angle stop.
- 2.5 **Multi-Leaf Dampers**
- 2.5.1 Opposed or parallel blade type as indicated.
 - 2.5.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
 - 2.5.3 Pressure fit self-lubricated bronze bearings.
 - 2.5.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
 - 2.5.5 Performance:
 - .1 Leakage: in closed position less than 2% of rated air flow.
 - 2.5.6 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with RSI 0.88.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.
- 2.6 **Disc Type Dampers**
- 2.6.1 Frame: brake formed, welded, 1.6mm thick, galvanized steel to ASTM A653/A653M.
 - 2.6.2 Disc: spin formed, 1.6mm thick, galvanized steel to ASTM A653/A653M.
 - 2.6.3 Gasket: extruded neoprene, field replaceable, with 10 year warranty.
 - 2.6.4 Bearings: roller self lubricated and sealed.
 - 2.6.5 Operator: compatible with damper, linear stroke operator, spring loaded actuator, zinc-aluminum foundry alloy casting cam follower.
 - 2.6.6 Performance:
 - .1 Leakage: in closed position less than 0.001% of rated air flow.
- 2.7 **Back Draft Dampers**
- 2.7.1 Automatic gravity operated, single] leaf, extruded aluminum construction with nylon bearings, vinyl blade seals, mill aluminum finish, with heavy gauge aluminum brackets with aluminum linkage bar.
- 2.8 **Relief Dampers**
- 2.8.1 Automatic multi-leaf aluminum dampers with ball bearing centre pivoted and counter-weights.
-

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 16, Dampers**

2.9 Fire Dampers

- 2.9.1 Fire dampers: arrangement Type A listed and bear label of ULC, meet requirements of the Ontario Building Code, NFPA 90A, and the authorities having jurisdiction. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- 2.9.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
 - .1 Fire dampers: provide in accordance with fire ratings as listed on architectural contract drawings.
 - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- 2.9.3 Top hinged: offset single damper, round or square; interlocking guillotine type, sized to maintain full duct cross section.
- 2.9.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- 2.9.5 40 x 40 x 3mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- 2.9.6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- 2.9.7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- 2.9.8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- 2.9.9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.
- 2.9.10 Unless otherwise indicated, the installation details given in SMACNA, and install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

3. EXECUTION**3.1 Examination**

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

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3.2 Installation

- 3.2.1 Install where indicated.
- 3.2.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- 3.2.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- 3.2.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- 3.2.5 Dampers: vibration free.
- 3.2.6 Ensure damper operators are observable and accessible.
- 3.2.7 Seal multiple damper modules with silicon sealant.
- 3.2.8 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
- 3.2.9 Fire Dampers:
 - .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
 - .2 Maintain integrity of fire separation.
 - .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
 - .4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
 - .5 Coordinate installation of fire stopping with general contractor.
 - .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
 - .7 Install break-away joints of approved design on each side of fire separation.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 46, Flexible Ducts**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Flexible Ducts as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for flexible ducts and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Thermal properties.
 - .2 Friction loss.
 - .3 Acoustical loss.
 - .4 Leakage.
 - .5 Fire rating.
- 1.2.3 Test and Evaluation Reports:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

2. PRODUCTS**2.1 General**

- 2.1.1 Factory fabricated to CAN/ULC-S110.
- 2.1.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- 2.1.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 Metallic - Uninsulated

- 2.2.1 Type 1: spiral wound flexible aluminum, equal to Flexmaster Triple Lock aluminum ductwork.
- 2.2.2 Performance:
 - .1 Factory tested to 2.5kPa without leakage.
 - .2 Maximum relative pressure drop coefficient:
- 2.2.3 Manufactured by Flexmaster, Ductmate or approved equal.

3. EXECUTION**3.1 Examination**

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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Appendix 8.2, Division 23, Section 23 33 46, Flexible Ducts

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

- 3.2 **Duct Installation**
 - 3.2.1 Install in accordance with: CAN/ULC-S110, UL 181, NFPA 90A, NFPA 90B and SMACNA.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 53, Duct Liners**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Duct Liners as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for duct liners and include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS**2.1 Duct Liner****2.1.1 General:**

- .1 Mineral Fibre duct liner: air surface coated mat facing.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102, NFPA 90A, and NFPA 90B.
- .3 Fungi resistance: to ASTM C1338 and ASTM G21.
- .4 Manufactured by Johns Manville, Knauf or Agency approved equal.

2.1.2 Rigid:

- .1 Use on flat surfaces, or where indicated.
- .2 25mm thick, to ASTM C107, Type 2, fibrous glass rigid board duct liner.
- .3 Density: 48 kg/m³ minimum.
- .4 Thermal resistance to be minimum:
 - .1 0.76 (m².degrees C)/W for 25mm thickness
 - .2 1.15 (m².degrees C)/W for 38mm thickness
 - .3 1.53 (m².degrees C)/W for 50mm thickness
 - .4 For all options above: when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
- .5 Maximum velocity on faced air side: 20.3]m/s.
- .6 Minimum NRC of 0.70 at 25mm thickness based on Type A mounting to ASTM C423.

2.1.3 Flexible:

- .1 Use on round or oval surfaces, unless otherwise noted.
 - .2 25mm thick, to ASTM C1071 Type 1, fibrous glass blanket duct liner.
 - .3 Density: 24 kg/m³ minimum.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 33 53, Duct Liners**

- .4 Thermal resistance to be minimum:
 - .1 0.37 (m².degrees C)/W for 12mm thickness
 - .2 0.74 (m².degrees C)/W for 25mm thickness
 - .3 1.11 (m².degrees C)/W for 38mm thickness
 - .4 1.41 (m².degrees C)/W to 50mm thickness
 - .5 For all options above: when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
- .5 Maximum velocity on coated air side: 25.4m/s.
- .6 Minimum NRC of 0.65 at 25mm thickness based on Type A mounting to ASTM C423.

2.2 Adhesive

- 2.2.1 Adhesive: to NFPA 90A, NFPA 90B and ASTM C916.
- 2.2.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- 2.2.3 Water-based fire-retardant type.
- 2.2.4 Manufactured by Childers, Foster or Agency approved equal.

2.3 Fasteners

- 2.3.1 Weld pins 2.0mm diameter, length to suit thickness of insulation. Metal] retaining clips, 32mm square.
- 2.3.2 Manufactured by Brock White, Duro Dyne or Agency approved equal.

2.4 Joint Tape

- 2.4.1 Poly-Vinyl treated open weave fiberglass membrane 50mm wide.
- 2.4.2 Manufactured by Johns Manville, Avery or Agency approved equal.

2.5 Sealer

- 2.5.1 Meet requirements of NFPA 90A and NFPA 90B.
- 2.5.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.
- 2.5.3 Manufactured by Duro Dyne, Hardcast or Agency approved equal.

3. EXECUTION**3.1 Examination**

- 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for duct liner installation in accordance with manufacturer's written instructions.
 - .1 Inform the Consultant of unacceptable conditions immediately upon discovery.

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- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.
- 3.2 **General**
- 3.2.1 Do work in accordance with SMACNA HVAC Duct Construction Standard, except as specified otherwise.
 - 3.2.2 Line inside of ducts where indicated.
 - 3.2.3 Duct dimensions, as indicated, are clear inside duct lining.
- 3.3 **Duct Liner**
- 3.3.1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 90% coverage of adhesive ASTM C916.
 - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.
 - .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425mm on centres, impact driven mechanical fasteners to compress duct liner sufficiently to hold it firmly in place.
 - .1 Spacing of mechanical fasteners in accordance with SMACNA HVAC Duct Construction Standard.
 - 3.3.2 In systems, where air velocities exceed 20.3m/s, install galvanized sheet metal nosing to leading edges of duct liner.
- 3.4 **Joints**
- 3.4.1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply 2 coats of sealer over tape.
 - 3.4.2 Replace damaged areas of liner at discretion of the Consultant.
 - 3.4.3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15mm overlap and fastened to duct.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 34 00, HVAC Fans**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of HVAC Fans as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
 - .2 Provide:
 - .1 Fan performance curves showing point of operation, bhp/kW, and efficiency.
 - .2 Sound rating data at point of operation.
 - .3 Provide:
 - .1 Motors, sheaves, bearings, shaft details.
 - .2 Minimum performance achievable.

2. PRODUCTS**2.1 Manufacturer: Carnes or approved equal.****2.2 System Description**

- 2.2.1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
 - 2.2.2 Capacity: flow rate, static pressure, bhp/W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
 - 2.2.3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
 - 2.2.4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
-

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 34 00, HVAC Fans**

2.2.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300mm diameter.

2.3 Fans General**2.3.1 Motors:**

- .1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment.
- .2 For use with variable speed controllers.
- .3 Sizes as indicated.

2.3.2 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards fan inlet and outlet safety screens as indicated and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment, inlet and outlet dampers and vanes and as indicated.

2.3.3 Factory primed before assembly in colour standard to manufacturer.

2.3.4 Scroll casing drains: as indicated.

2.3.5 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

2.3.6 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.4 Cabinet Fans - General Purpose

2.4.1 Fan characteristics and construction: as centrifugal fans.

2.4.2 Cabinet hung single or multiple wheel with DWDI centrifugal fans in factory fabricated casing complete with vibration isolators and seismic control measures, motor, direct drive with variable speed controls where indicated.

2.4.3 Fabricate casing of corrosion resistant galvanized steel fan housing.

2.4.4 Manufactured by Greenheck, Carnes or approved equal.

3. EXECUTION**3.1 Examination**

3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for HVAC fan installation in accordance with manufacturer's written instructions.

.1 Inform the Consultant of unacceptable conditions.

.2 Proceed with installation only after unacceptable conditions have been remedied and approval to proceed from the Consultant.

3.2 Fan Installation

3.2.1 Install fans as indicated, complete with resilient mountings and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

3.2.2 Provide sheaves and belts required for final air balance.

3.2.3 Bearings and extension tubes to be easily accessible.

3.2.4 Access doors and access panels to be easily accessible.

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Appendix 8.2, Division 23, Section 23 34 00, HVAC Fans

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 37 13, Diffusers, Registers and Grilles**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply and installation of Diffusers, Registers and Grilles as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.3 Maintenance Material Submittals

- 1.3.1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 23 05 00 - Common Work Results for HVAC.
 - .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

2. PRODUCTS**2.1 System Description**

- 2.1.1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 General

- 2.2.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- 2.2.2 Frames:
 - .1 Full perimeter gaskets.

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 37 13, Diffusers, Registers and Grilles**

- .2 Plaster frames where set into plaster or gypsum board and as specified.
 - .3 Concealed fasteners.
 - 2.2.3 Concealed manual volume control damper operators.
 - 2.2.4 Colour: confirm with the Consultant/Agency.
 - 2.3 **Manufactured Units**
 - 2.3.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.
 - 2.3.2 Manufactured by EH Price. No substitution.
 - 2.4 **Supply Grilles and Registers**
 - 2.4.1 General: as indicated on Diffuser Schedule on Contract Drawings.
 - 2.5 **Return and Exhaust Grilles and Registers**
 - 2.5.1 General: as indicated on Diffuser Schedule on Contract Drawings.
 - 2.6 **Diffusers**
 - 2.6.1 General: as indicated on Diffuser Schedule on the Contract Drawings.
3. **EXECUTION**
- 3.1 **Examination**
 - 3.1.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.
 - .1 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.
 - 3.2 **Installation**
 - 3.2.1 Install in accordance with manufacturer's instructions.
 - 3.2.2 Install with flat head screws in countersunk holes where fastenings are visible.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 81 43, Air Source Unitary Heat Pumps**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply installation, testing and commissioning of Air Source Unitary Heat Pumps as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for heat pumps and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.

1.3 Maintenance of the Unit/System

- 1.3.1 The Contractor will provide maintenance of the unit/system during the period of two (2) years warranty from the date of Ready-for-Takeover of the project. Four (4) site visits will be required for the maintenance work during warranty period of 2 years and cost be included in the Stipulated Contract Price.

2. PRODUCTS**2.1 Description**

- 2.1.1 Heat pumps: to EPS 1/RA/2, CSA, and Ontario Hydro Inspection approved and with ARI/CSA certification seal.
- 2.1.2 Manufactured by Mitsubishi. No substitution permitted.

2.2 Refrigerants

- 2.2.1 Type of Refrigerant: R410a.

2.3 Drain Pans

- 2.3.1 Design and construct condensate drain pans under indoor coils so that no water can accumulate and install to allow for easy cleaning.

2.4 Air-Source Heat Pump

- 2.4.1 General:
 - .1 Three component unit consisting of refrigerant compressor section, outdoor unit and indoor coil for use with R410A.

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PROJECT 22701****Appendix 8.2, Division 23, Section 23 81 43, Air Source Unitary Heat Pumps**

- 2.4.2 Performance data:
 - .1 Make, model no., accessories, etc., as indicated on mechanical contract drawings.
 - .2 Electrical, cooling, heating as indicated on mechanical contract drawings.
- 2.4.3 Refrigeration piping:
 - .1 Between outdoor unit, compressor section and indoor coil, complete with refrigerant metering devices and valves.
 - .2 Refer to Section 23 23 00 – Refrigerant Piping.

3. EXECUTION**3.1 Examination**

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

3.2 Installation

- 3.2.1 Install where indicated and in accordance with manufacturer's instructions.
- 3.2.2 Install outdoor units at ground level on RC housekeeping pad.
- 3.2.3 Install outdoor units on roof with vibration isolation providing 95% isolation efficiency.
 - .1 Co-ordinate installation with architectural contract drawings for flashing, roofing, weatherproofing, etc.
- 3.2.4 Secure with hold-down bolts in accordance with manufacturer's recommendations.
- 3.2.5 Make duct connections through flexible connections.
- 3.2.6 Level unit with fans running. Align duct work. flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.
- 3.2.7 Make piping connections.
- 3.2.8 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

3.3 Drain Pans

- 3.3.1 Install so that no water can accumulate. Arrange easy access for cleaning.
- 3.3.2 Include Internal Or External Trap For Proper Draining.

3.4 Start-Up and Commissioning

- 3.4.1 Have manufacturer certify installation.

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Appendix 8.2, Division 23, Section 23 81 43, Air Source Unitary Heat Pumps

- 3.4.2 Have manufacturer present during equipment startup and certify performance.
- 3.4.3 Submit written start-up and commissioning reports to the Consultant for review.

- 3.5 **Training**
 - 3.5.1 Provide one (1) on-site training session which will cover system operation and management, troubleshooting and tour of the system. The training will be of two (2) hours duration. Coordinate with the Agency to determine the date and time of the training session.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 23, Section 23 83 00, Radiant Heating Units**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
- 1.1.2 Provide all labour, materials, products, equipment and services for supply installation, testing and commissioning Radiant Heating Units as indicated on the Contract Drawings and specified in this section of Specification.

1.2 Action and Informational Submittals

- 1.2.1 Submit in accordance with Section 23 05 00 - Common Work Results for HVAC.
- 1.2.2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for radiant panels and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.2.3 Shop Drawings:
 - .1 Submit drawings stamped and signed by the contractor including initials, date and status.
- 1.2.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

2. PRODUCTS**2.1 Manufacturer: Engineered Air.****2.2 Radiant Heating Panels**

- 2.2.1 The radiant panel extrusions shall consist of extruded aluminum with copper tubing of 12.8mm (0.504in) I.D. mechanically attached to an aluminum face plate. The copper tube shall be held in place by an aluminum saddle which extends more than half way around the diameter of the tube. A non-hardening heat conductive paste shall be placed between the copper tubing and the aluminum face plate. Panels shall weigh no more than 10.5kg/m² (2.15lb/ft²) when operating. The use of adhesive and/or clips to attach the copper tube to the extrusion will not be acceptable.
- 2.2.2 Panels shall be finished in the manufacturer's standard white color. Panel lengths and widths to be obtained from drawings. Bullnose radiant ceiling panels shall be listed on drawings. Provide 600mm (24in) access blank panel for servicing control valves.
- 2.2.3 All interconnecting of radiant panels by the mechanical contractor shall consist of 12.8mm (0.500in) O.D. soft copper tubing or accessories as recommended by the manufacturer, i.e. factory supplied 360 degrees interconnecting loops and 180 degrees return U-bends. Supply shall be

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connected to tubing closest to perimeter wall. Multiple panels shall be circuited to ensure serpentine flow over complete length of zone. Individual serpentine panel coils connected in series is unacceptable for multiple panel zones.

- 2.2.4 All radiant panels shall run continuous from wall-to wall unless otherwise noted and shall be field trimmed to length ensuring adequate expansion allowance while maintaining panel end coverage by architectural moldings. Inactive filler panels will be permitted only where indicated on Contract Drawings..
- 2.2.5 Ceiling support moldings and channels for Radiant Panels to be supplied and installed by Division 9. Ensure ceiling openings and wall moldings are installed as per radiant panel shop drawings. Hanger wires for safety and seismic restraint shall be installed at 1200mm (4ft) o.c.
- 2.2.6 All radiant panels shall be installed by personnel wearing clean white gloves to avoid soiling of panel face.
- 2.2.7 All active panels shall be covered with minimum of 25mm (1in) thick batt insulation, provided by installing contractor.

3. EXECUTION**3.1 Examination**

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

3.2 Installation

- 3.2.1 Follow manufacturer's detailed installation, testing, operation and maintenance instructions.
- 3.2.2 Test radiant system as recommended by manufacturer and required by authorities having jurisdiction. Air test piping for leaks and submit report to Consultant.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 05 01, EMCS: General Requirements**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 System Description

1.2.1 Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:

- .1 Building Controllers.
- .2 Control devices as listed in I/O point summary tables.
- .3 OWS(s).
- .4 Data communications equipment necessary to effect EMCS data transmission system.
- .5 Field control devices.
- .6 Software/Hardware complete with full documentation.
- .7 Complete operating and maintenance manuals.
- .8 Training of personnel.
- .9 Acceptance tests, technical support during commissioning, full documentation.
- .10 Wiring interface co-ordination of equipment supplied by others.
- .11 Miscellaneous work as specified in these sections and as indicated.

1.2.2 Design Requirements:

- .1 Design and provide conduit and wiring linking elements of system.
- .2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed by the Consultant prior to installation.
- .3 Location of controllers as reviewed by the Consultant prior to installation.
- .4 Provide utility power to EMCS [and emergency power to EMCS] as indicated.
- .5 Metric references: in accordance with CAN/CSA Z234.1.

1.2.3 Language Operating Requirements:

- .1 Provide English operator selectable access codes.
- .2 Use non-linguistic symbols for displays on graphic terminals [wherever possible]. Other information to be in English.
- .3 Operating system executive: provide primary hardware-to-software interface [specified as part of hardware purchase] with associated documentation to be in English.
- .4 System manager software: include in English system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.
- .5 Include, in English:

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- .1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definitions).
 - .2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in [and] English at specified OWS and to be able to operate one terminal in English and second in French. Point name expansions in both languages.
 - .3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.
- 1.3 **Action and Informational Submittals**
- 1.3.1. Make submittals in accordance with 25 05 02 – EMCS: Submittals and Review.
 - 1.3.2 Submit for review:
 - .1 Equipment list and systems manufacturers at time of tender within 48 hours and 10 days after award of contract.
 - .2 List existing field control devices to be re-used included in tender, along with unit price.
 - 1.3.3 Quality Control:
 - .1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
 - .2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.
 - .3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 - EMCS: Submittals and Review. Label or listing of specified organization is acceptable evidence.
 - .4 In lieu of such evidence, submit certificate from testing organization, approved by the Consultant, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.
 - .5 For materials whose compliance with organizational standards/codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.
 - .6 Permits and fees: in accordance with general conditions of contract.
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- .7 Submit certificate of acceptance from authority having jurisdiction to the Consultant.
 - .8 Existing devices intended for re-use: submit test report.
- 1.4 **Quality Assurance**
- 1.4.1 Have local office within 50 km of project staffed by trained personnel capable of providing instruction, routine maintenance and emergency service on systems,
 - 1.4.2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.
 - 1.4.3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.
 - 1.4.4 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings as required.
- 1.5 **Existing- Control Components**
- 1.5.1 Utilize existing control wiring and piping where applicable.
 - 1.5.2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards specifications.
 - .1 Do not modify original design of existing devices without written permission from the Consultant.
 - .2 Provide for new, properly designed device where re-usability of components is uncertain.
 - 1.5.3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.
 - .1 Furnish test report within 40 days of award of contract listing each component to be re-used and indicating whether it is in good order or requires repair by the Consultant.
 - .2 Failure to produce test report will constitute acceptance of existing devices by contractor.
 - 1.5.4 Non-functioning items:
 - .1 Provide with report specification sheets or written functional requirements to support findings.
 - .2 The Contractor will repair or replace existing items judged defective yet deemed necessary for EMCS.
 - 1.5.5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.
 - 1.5.6 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval from the Consultant.
 - .1 Be responsible for items repaired or replaced by the Contractor.
 - .2 Be responsible for repair costs due to negligence or abuse of equipment.
 - .3 Responsibility for existing devices terminates upon final acceptance of EMCS.
-

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1.5.7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.

1.6 Acronyms and Abbreviations**1.6.1 Acronyms used in EMCS.**

- .1 AEL - Average Effectiveness Level
- .2 AI - Analog Input
- .3 AO - Analog Output
- .4 BACnet - Building Automation and Control Network
- .5 BC(s) - Building Controller(s)
- .6 BECC - Building Environmental Control Centre
- .7 CAB - Canadian Automated Building (CAB) Protocol
- .8 CAD - Computer Aided Design
- .9 CDL - Control Description Logic
- .10 CDS - Control Design Schematic
- .11 COSV - Change of State or Value
- .12 CPU - Central Processing Unit
- .13 DI - Digital Input
- .14 DO - Digital Output
- .15 DP - Differential Pressure
- .16 ECU - Equipment Control Unit
- .17 EMCS - Energy Monitoring and Control System
- .18 HVAC - Heating, Ventilation, Air Conditioning
- .19 IDE - Interface Device Equipment
- .20 I/O - Input/Output
- .21 ISA - Industry Standard Architecture
- .22 LAN - Local Area Network
- .23 LCU - Local Control Unit
- .24 MCU - Master Control Unit
- .25 NC - Normally Closed
- .26 NO - Normally Open
- .27 OS - Operating System
- .28 O&M - Operation and Maintenance
- .29 OWS - Operator Work Station
- .30 PC - Personal Computer
- .31 PCI - Peripheral Control Interface
- .32 PCMCIA - Personal Computer Micro-Card Interface Adapter
- .33 PID - Proportional, Integral and Derivative.
- .34 RAM - Random Access Memory
- .35 ROM - Read Only Memory
- .36 SP - Static Pressure
- .37 TCU - Terminal Control Unit
- .38 USB - Universal Serial Bus
- .39 UPS - Uninterruptible Power Supply
- .40 WAN- Wide Area Network

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2. PRODUCTS**2.1 Equipment**

2.1.1 Control Network Protocol and Data Communication Protocol: to CEA 709.1 and ASHRAE STD 135.

2.1.2 Complete list of equipment and materials to be used on project and documents by adding manufacturer's name, model number and details of materials, and submit for approval.

2.2 Adaptors

2.2.1 Provide adaptors between metric and imperial components.

3. EXECUTION**3.1 Manufacturer's Recommendations**

3.1.1 Installation: to manufacturer's recommendations.

3.2 Painting

3.2.1 Painting: in accordance with Section 09 91 23 - Interior Painting, supplemented as follows:

- .1 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.
- .2 Restore to new condition, finished surfaces too extensively damaged to be primed and touched up to make good.
- .3 Clean and prime exposed hangers, racks, fastenings, and other support components.
- .4 Paint unfinished equipment installed indoors to EEMAC 2Y-1.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 05 02, EMCS: Submittals and Review**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 Design Requirements

1.2.1 Preliminary Design Review: to contain following contractor and systems information.

- .1 Location of local office
- .2 Description and location of installing and servicing technical staff.
- .3 Location and qualifications of programming design and programming support staff.
- .4 List of spare parts.
- .5 Location of spare parts stock.
- .6 Names of sub-contractors and site-specific key personnel.
- .7 Sketch of site-specific system architecture.
- .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
- .9 Descriptive brochures.
- .10 Sample CDL and graphics (systems schematics).
- .11 Response time for each type of command and report.
- .12 Item-by-item statement of compliance.
- .13 Proof of demonstrated ability of system to communicate utilizing BACnet.

1.3 Action And Informational Submittals

- 1.3.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.
- 1.3.2 Submit preliminary design document 5 working after contract award, for review by the Consultant.
- 1.3.3 Shop Drawings to consist of 3 hard copies and 1 soft copy of design documents, shop drawings, product data and software.
- 1.3.4 Hard copy to be completely indexed and coordinated package to assure compliance with contract requirements and arranged in same sequence as specification and cross-referenced to specification section and paragraph number.
- 1.3.5 Soft copy to be in AutoCAD - latest version and Microsoft Word latest version format, structured using menu format for easy loading and retrieval on OWS.

1.4 Preliminary Shop Drawing Review

1.4.1 Submit preliminary shop drawings within 20 working days of award of contract and include following:

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- .1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.
 - .2 Detailed system architecture showing all points associated with each controller including signal levels, pressures where new EMCS ties into existing control equipment.
 - .3 Spare point capacity of each controller by number and type.
 - .4 Controller locations.
 - .5 Auxiliary control cabinet locations.
 - .6 Single line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.
 - .7 Valves: complete schedule listing including following information: designation, service, manufacturer, model, point ID, design flow rate, design pressure drop, required Cv, Valve size, actual Cv, spring range, pilot range, required torque, actual torque and close off pressure (required and actual).
 - .8 Dampers: sketches showing module assembly, interconnecting hardware, operator locations, operator spring range, pilot range, required torque, actual torque.
 - .9 Flow measuring stations: complete schedule listing designation, service, point ID, manufacturer, model, size, velocity at design flow rate, manufacturer, model and range of velocity transmitter.
 - .10 Compressor schematic and sizing data.
- 1.5 **Detailed Shop Drawing Review**
- 1.5.1 Submit detailed shop drawings within 20 working days after award of contract and before start of installation and include following:
 - .1 Corrected and updated versions (hard copy only) of submissions made during preliminary review.
 - .2 Wiring diagrams.
 - .3 Piping diagrams and hook-ups.
 - .4 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.
 - .5 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:
 - .1 Sensing element type and location.
 - .2 Transmitter type and range.
 - .3 Associated field wiring schematics, schedules and terminations.
 - .4 Complete Point Name Lists.

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- .5 Setpoints, curves or graphs and alarm limits (high and low, 3 types critical, cautionary and maintenance), signal range.
 - .6 Software and programming details associated with each point.
 - .7 Manufacturer's recommended installation instructions and procedures.
 - .8 Input and output signal levels or pressures where new system ties into existing control equipment.
 - .6 Control schematics, narrative description, CDL's fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.
 - .7 Graphic system schematic displays of air and water systems with point identifiers and textual description of system, and typical floor plans as specified.
 - .8 Complete system CDL's including companion English language explanations on same sheet but with different font and italics. CDL's to contain specified energy optimization programs.
 - .9 Listing and example of specified reports.
 - .10 Listing of time of day schedules.
 - .11 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.
 - .12 Type and size of memory with statement of spare memory capacity.
 - .13 Full description of software programs provided.
 - .14 Sample of "Operating Instructions Manual" to be used for training purposes.
- 1.6 **Quality Assurance**
- 1.6.1 Preliminary Design Review Meeting: Convene meeting within 45 working days of award of contract to:
 - .1 Undertake functional review of preliminary design documents, resolve inconsistencies.
 - .2 Resolve conflicts between Contract Document requirements and actual items (e.g.: points list inconsistencies).
 - .3 Review interface requirements of materials supplied by others.
 - .4 Review "Sequence of Operations".
 - 1.6.2 Contractor's programmer to attend meeting.
 - 1.6.3 The Consultant retains right to revise sequence or subsequent CDL prior to software finalization without cost to the Agency.

2. **PRODUCTS**: NOT APPLICABLE

3. **EXECUTION**: NOT APPLICABLE

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END OF SECTION

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1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
 - 1.2 **Design Requirements**
 - 1.1.1 Confirm with the Consultant that Design Criteria and Design Intents are still applicable.
 - 1.1.2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.
 - 1.3 **Action and Informational Submittals**
 - 1.3.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - 1.3.2 Final Report: submit report to the Consultant.
 - .1 Include measurements, final settings and certified test results.
 - .2 Bear signature of commissioning technician and supervisor
 - .3 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to The Agency.
 - .4 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.
 - 1.4 **Closeout Submittals**
 - 1.4.1 Provide documentation, O&M Manuals, and training of O&M personnel for review of the Consultant before interim acceptance.
 - 1.5 **Commissioning**
 - 1.5.1 Carry out commissioning as described in this section.
 - 1.5.2 Inform and obtain approval from the Consultant in writing at least 14 days prior to commissioning or each test. Indicate:
 - .1 Location and part of system to be tested or commissioned.
 - .2 Testing/commissioning procedures, anticipated results.
 - .3 Names of testing/commissioning personnel.
 - 1.5.3 Correct deficiencies, re-test until satisfactory performance is obtained in the opinion of the Consultant.
 - 1.5.4 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
 - 1.5.5 Load system with project software.
 - 1.5.6 Perform tests as required.
 - 1.6 **Completion of Commissioning**
 - 1.6.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by the Consultant.
-

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1.7 Issuance of Final Certificate of Completion

- 1.7.1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

2. PRODUCTS**2.1 Equipment**

- 2.1.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.
- 2.1.2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- 2.1.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than [2] months prior to tests.
- 2.1.4 Locations to be approved, readily accessible and readable.
- 2.1.5 Application: to conform to normal industry standards.

3. EXECUTION**3.1 Procedures**

- 3.1.1 Test each system independently and then in unison with other related systems.
- 3.1.2 Commission each system using procedures prescribed by best practices.
- 3.1.3 Debug system software.
- 3.1.4 Optimize operation and performance of systems by fine-tuning PID (PROPORTIONAL-INTEGRAL_DERIVATIVE) values and modifying CDL (Control Description Language) as required.
- 3.1.5 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

3.2 Field Quality Control**3.2.1 Pre-Installation Testing.**

- .1 General : consists of field tests of equipment just prior to installation.
- .2 Testing shall be conducted on site.
- .3 Configure major components to be tested in same architecture as designed system. Include BECC (Building Environmental Control) equipment and 2 sets of Building Controller's including MCU's, LCU 's, and TCU 's.
- .4 Equip each Building Controller with sensor and controlled device of each type (AI, AO, DI, DO).
- .5 Additional instruments to include:
- .1 DP transmitters.
- .2 VAV supply duct SP transmitters.
- .3 DP switches used for dirty filter indication and fan status.

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- .6 In addition to test equipment, provide inclined manometer, digital micro-manometer, milli-amp meter, source of air pressure infinitely adjustable between 0 and 500 Pa, to hold steady at any setting and with direct output to milli-amp metre at source.
 - .7 After setting, test zero and span in 10 % increments through entire range while both increasing and decreasing pressure.
 - .8 Transmitters above 0.5 % error will be rejected.
 - .9 DP switches to open and close within 2% of setpoint.
- 3.2.2 Completion Testing.
- .1 General : test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
 - .2 Include following activities:
 - .1 Test and calibrate field hardware including stand-alone capability of each controller.
 - .2 Verify each A-to-D convertor.
 - .3 Test and calibrate each AI using calibrated digital instruments.
 - .4 Test each DI to ensure proper settings and switching contacts.
 - .5 Test each DO to ensure proper operation and lag time.
 - .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
 - .7 Test operating software.
 - .8 Test application software and provide samples of logs and commands.
 - .9 Verify each CDL including energy optimization programs.
 - .10 Debug software.
 - .11 Blow out flow measuring and static pressure stations with high pressure air at 700kPa.
 - .12 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. This document will be used in final startup testing.
- 3.2.3 Final Startup Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system. Provide the following:
- .1 2 technical personnel capable of re-calibrating field hardware and modifying software.
 - .2 Detailed daily schedule showing items to be tested and personnel available.
 - .3 Commissioning to commence during final startup testing.
 - .4 O&M personnel to assist in commissioning procedures as part of training.
 - .5 Commission systems considered as life safety systems before affected parts of the facility are occupied.
-

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- .6 Operate systems as long as necessary to commission entire project.
- .7 Monitor progress and keep detailed records of activities and results.
- 3.2.4 Final Operational Testing: to demonstrate that Energy Management Control Systems (EMCS) functions in accordance with contract requirements.
 - .1 Prior to beginning of 30 day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL 's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.
 - .2 Test to last at least 30 consecutive 24 hour days.
 - .3 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.
 - .4 Correct defects when they occur and before resuming tests.
- 3.2.5 Report results to the Consultant.
- 3.3 **Adjusting**
 - 3.3.1 Final adjusting: upon completion of commissioning as reviewed by the Consultant, set and lock devices in final position and permanently mark settings.
- 3.4 **Demonstration**
 - 3.4.1 Demonstrate to the Agency operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 05 12, EMCS: Training**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 Action and Informational Submittals

1.2.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures, supplemented and modified by requirements of this Section.

1.2.2 Submit training proposal complete with hour-by-hour schedule including brief overview of content of each segment to the Agency 30 days prior to anticipated date of beginning of training.

.1 List name of trainer, and type of visual and audio aids to be used.

.2 Show co-ordinated interface with other EMCS mechanical and electrical training programs.

1.2.3 Submit reports within one week after completion of Phase 1 and Phase 2 training program that training has been satisfactorily completed.

1.3 Quality Assurance

1.3.1 Provide bilingual, competent instructors thoroughly familiar with aspects of EMCS installed in facility.

1.4 Instructions

1.4.1 Provide instruction to designated personnel in adjustment, operation, maintenance and pertinent safety requirements of EMCS installed.

1.4.2 Training to be project specific.

1.5 Time For Training

1.5.1 Number of days of instruction to be as specified in this section (1 day = 8 hours including two 15 minute breaks and excluding lunch time).

1.6 Training Materials

1.6.1 Provide equipment, visual and audio aids, and materials for classroom training.

1.6.2 Supply manual for each trainee, describing in detail data included in each training program.

.1 Review contents of manual in detail to explain aspects of operation and maintenance (O&M).

1.7 Training Program

1.7.1 To be in 2 phases over 6 month period.

1.7.2 Phase 1: One (1) day program to begin before 30 day test period at time mutually agreeable to Contractor and the Consultant/ Agency.

.1 Train O&M personnel in functional operations and procedures to be employed for system operation.

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- .2 Supplement with on-the-job training during 30 day test period.
- .3 Include overview of system architecture, communications, operation of computer and peripherals, report generation.
- .4 Include detailed training on operator interface functions for control of mechanical systems, CDL's for each system, and elementary preventive maintenance.
- 1.8.3 Phase 2: Two (2) day program to begin 10 weeks after acceptance for operators, equipment maintenance personnel and programmers.
 - .1 Provide multiple instructors on pre-arranged schedule. Include at least following:
 - .1 Operator training: provide operating personnel, maintenance personnel and programmers with condensed version of Phase 1 training.
 - .2 Equipment maintenance training: provide personnel with 2 days training within 5 day period in maintenance of EMCS equipment, including general equipment layout, trouble shooting and preventive maintenance of EMCS components, maintenance and calibration of sensors and controls.
 - .3 Programmers: provide personnel with 2 days training within 5-day period in following subjects in approximate percentages of total course shown:

| |
|--------------------------------------|
| Software and architecture: [10]% |
| Application programs: [15]% |
| Controller programming: [50]% |
| Trouble shooting and debugging:[10]% |
| Colour graphic generation: [15]% |

1.9 **Monitoring of Training**

- 1.9.1 The Consultant will review and monitor the training program and may modify schedule and content.

2. **PRODUCTS** : NOT APPLICABLE

3. **EXECUTION** :_NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 05 60, EMCS: Field Installation**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 System Description**1.2.1 Electrical:**

- .1 Provide power wiring from existing power panels to EMCS field panels. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.
- .2 Hard wiring between field control devices and EMCS field panels.
- .3 Communication wiring between EMCS field panels and OWS's including main control centre BECC.
- .4 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
- .5 Trace existing control wiring installation and provide updated wiring schematics including additions and/or deletions to control circuits for approval by the Consultant before commencing work.

1.2.2 Pneumatic:

- .1 Pneumatic tubing, valves and fittings for field control devices.

1.2.3 Mechanical:

- .1 Pipe Taps Required For EMCS equipment will be supplied and installed by EMCS Contractor.
- .2 Wells and Control Valves Shall Be Supplied by EMCS Contractor and Installed by EMCS Contractor.
- .3 Installation of air flow stations, dampers, and other devices requiring sheet metal trades to be mounted by EMCS Contractor. Costs to be carried by designated trade.

1.2.4 VAV Terminal Units.

- .1 Air flow probe for vav boxes to be supplied and installed under Section 23 36 00. Air flow dp sensor, actuator and associated vav controls to be supplied and installed by EMCS contractor. Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators to be the responsibility of EMCS contractor. Coordinate air flow adjustments with balancing trade.

1.2.5 Structural:

- .1 Special steelwork as required for installation of work.

1.3 Personnel Qualifications**1.3.1 Qualified supervisory personnel to:**

- .1 Continuously direct and monitor all work.
- .2 Attend site meetings.

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1.4 Existing Conditions

- 1.4.1 Cutting and Patching: to base building standards.
- 1.4.2 Repair all surfaces damaged during execution of work.
- 1.4.3 Turn over to the Agency existing materials removed from work not identified for re-use.

2. PRODUCTS**2.1 Special Supports**

- 2.1.1 Structural grade steel, primed and painted after construction and before installation.

2.2 Piping For Pneumatic Control Systems**2.2.1 Copper:****.1 Tubing:**

- .1 Fittings: wrought copper solder type to ANSI/ASME B16.22, and 95.5 antimonial tin solder. At instruments use compression fittings
- .2 At panels and junction boxes where there is a transition from plastic to copper use bulkhead fittings.

2.2.2 Plastic:

- .1 Flame retardant, black PVC with minimum burst strength 1.3MPa at 23 degrees Celsius installed in conduit unless FT-6 rated.
- .2 Fittings: compression or barbed type as required.

2.3 Wiring

2.3.1 As per requirements of Division 26.

2.3.2 For 70V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1.

2.3.3 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.

2.3.4 Sizes:

- .1 120V Power supply: to match or exceed breaker, size #12 minimum.
- .2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.
- .3 Field wiring to digital device: #18 AWG or 20 AWG stranded twisted pair.
- .4 Analog input and output: shielded #18 minimum solid copper or #20 minimum stranded twisted pair. Wiring must be continuous without joints.
- .5 More than 4 conductors: #22 minimum solid copper.

2.3.5 Terminations:

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- .1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
- 2.4 **Conduit**
- 2.4.1 As per requirements of Division 26.
 - 2.4.2 Electrical metallic tubing to CAN/CSA C22.2 No. 83. Flexible and liquid tight flexible metal conduit to CAN/CSA C22.2 No. 56. Rigid steel threaded conduit to CAN/CSA C22.2 No. 45.1.
 - 2.4.3 Junction and pull boxes: welded steel.
 - .1 Surface mounting cast FS: screw-on flat covers.
 - .2 Flush mounting: covers with 25mm minimum extension all round.
 - 2.4.4 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.
 - 2.4.5 Outlet boxes: 100mm minimum, square.
 - 2.4.6 Conduit boxes, fittings:
 - .1 Bushings and connectors: with nylon insulated throats.
 - .2 With push pennies to prevent entry of foreign materials.
 - 2.4.7 Fittings for rigid conduit:
 - .1 Couplings and fittings: threaded type steel.
 - .2 Double locknuts and insulated bushings: use on sheet metal boxes.
 - .3 Use factory "ells" where 90 degree bends required for 25mm and larger conduits.
 - 2.4.8 Fittings for thin wall conduit:
 - .1 Connectors and couplings: steel, set screw type.
- 2.5 **Wiring Devices, Cover Plates**
- 2.5.1 Conform to CSA.
 - 2.5.2 Receptacles:
 - .1 Duplex: CSA type 5-15R
 - .2 Single: CSA type 5-15R
 - .3 Cover plates and blank plates: finish to match other plates in area.
- 2.6 **Starters, Control Devices**
- 2.6.1 Across-the-line magnetic starters:
 - .1 Enclosures: CSA Type 1, except where otherwise specified.
 - .2 Size, type and rating: to suit motors.
 - 2.6.2 Starter diagrams:
 - .1 Provide copy of wiring and schematic diagrams - mount one copy in each starter with additional copies for operation and maintenance manual.
 - 2.6.3 Auxiliary Control Devices:
 - .1 Control transformers: 60 Hz, primary voltage to suit supply, 120V single phase secondary, VA rating to suit load plus 20% margin.
-

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- .2 Auxiliary contacts: one "Normally Open" and one "Normally Closed" spare auxiliary contact in addition to maintained auxiliary contacts as indicated.
- .3 Hand-Off-Automatic switch: heavy duty type, knob lever operator.
- .4 Double voltage relays: with barrier to separate relay contacts from operating magnet. Operating coil voltage and contact rating as indicated.
- 2.6.4 Finish for starters:
 - .1 Exterior: in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .2 Interior: white.
- 2.7 **Supports For Conduit, Fastenings, Equipment**
 - 2.7.1 Solid masonry, tile and plastic surfaces: lead anchors or nylon shields.
 - .1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.
 - 2.7.2 Exposed conduits or cables:
 - .1 50mm diameter and smaller: one-hole steel straps.
 - .2 Larger than 50mm diameter: two-hole steel straps.
 - 2.7.3 Suspended support systems:
 - .1 Individual cable or conduit runs: support with 6mm diameter threaded rods and support clips.
 - .2 Two or more suspended cables or conduits: support channels supported by 6mm diameter threaded rod hangers.
- 3. **EXECUTION**
 - 3.1 **Installation**
 - 3.1.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
 - 3.2 **Mechanical Piping**
 - 3.2.1 Install piping straight, parallel and close to building structure with required grades for drainage and venting.
 - 3.2.2 Ream ends of pipes before assembly.
 - 3.2.3 Copper tubing not to come into contact with dissimilar metal.
 - 3.2.4 Use non-corrosive lubricant or Teflon tape on male screwed threads.
 - 3.2.5 Clean ends of pipes, tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.
 - 3.2.6 Install di-electric couplings where dissimilar metals joined.
 - 3.2.7 Sleeves:
 - .1 Installation:
 - .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
 - .2 Other floors: terminate 25mm above finished floor.

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- .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint.
- .2 Caulking:
 - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere: provide space for fire stopping by Section 07 84 00 - Fire Stopping. Maintain the fire-resistance rating integrity of the fire separation.
 - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.
- 3.2.8 Pressure tests:
 - .1 Pressure test all piping systems modified under this contract to 1 1/2 times maximum working pressure or 860kPa (whichever is greater) for 4 hours without loss of pressure.
 - .2 Isolate equipment, components, not designed to withstand test pressure.
- 3.2.9 Introduce system pressure carefully into new piping.
- 3.3 **Supports**
 - 3.3.1 Install special supports as required and as indicated.
- 3.4 **Pneumatic Control Systems**
 - 3.4.1 General:
 - .1 Install tubing in accessible concealed locations, straight, parallel and close to building structure with required grades for drainage and venting.
 - .2 Install drip legs and drains at low points.
 - .3 Tubing to be free from surface damage.
 - .4 Tubing NOT to pass through or touch unheated ducts or enclosures.
 - .5 Do not cover pneumatic tubing with insulation.
 - .6 Test tubing, check joints after connection to system.
 - 3.4.2 Copper tubing:
 - .1 Not to come into contact with dissimilar metal. Use non-metallic stand-offs on air handling systems.
 - .2 Install dielectric couplings where dissimilar metals are connected.
 - .3 Plastic tubing:
 - .1 Inaccessible locations: install plastic tubing in conduit.
 - .2 Inside panels: install in tube trays or racks, or clip individually to back of panel.
 - .3 Multiple tube bundles: install in tube trays, conduit or armoured flexible cable.

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3.5 Electrical General

- 3.5.1 Do complete installation in accordance with requirements of:
 - .1 Division 26, this specification.
 - .2 CSA 22.1 Canadian Electrical Code
 - .3 ANSI/NFPA 70
 - .4 ANSI C2
- 3.5.2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage [above 70 V] contacts and mark to prevent accidental injury.
- 3.5.3 Do underground installation to CAN/CSA-C22.3 No.7, except where otherwise specified.
- 3.5.4 Conform to manufacturer's recommendations for storage, handling, and installation.
- 3.5.5 Check factory connections and joints. Tighten where necessary to ensure continuity.
- 3.5.6 Install electrical equipment between 1000 and 2000mm above finished floor wherever possible and adjacent to related equipment.
- 3.5.7 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.
- 3.5.8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.
- 3.5.9 Install conduits, and sleeves prior to pouring of concrete.
- 3.5.10 Holes through exterior wall and roofs: flash and make weatherproof.
- 3.5.11 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.
- 3.5.12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.6 Conduit System

- 3.6.1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduits fill not to exceed 40%. Design contract drawings do not show conduit layout.
 - 3.6.2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.
 - 3.6.3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Project Manager. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified.
 - 3.6.4 Locate conduits at least 150mm from parallel steam or hot water pipes and at least 50mm at crossovers.
 - 3.6.5 Bend conduit so that diameter is reduced by less than 1/10th original diameter.
-

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- 3.6.6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.
 - 3.6.7 Limit conduit length between pull boxes to less than 30m.
 - 3.6.8 Use conduit outlet boxes for conduit up to 32mm diameter and pull boxes for larger sizes.
 - 3.6.9 Fastenings and supports for conduits, cables, and equipment:
 - .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.
 - .2 Provide adequate support for raceways and cables, sloped vertically to equipment.
 - .3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from The Agency.
 - 3.6.10 Install polypropylene fish cord in empty conduits for future use.
 - 3.6.11 Where conduits become blocked, remove and replace blocked sections.
 - 3.6.12 Pass conduits through structural members only after receipt of The Consultant's written approval.
 - 3.6.13 Conduits may be run in flanged portion of structural steel.
 - 3.6.14 Group conduits wherever possible on suspended or surface channels.
 - 3.6.15 Pull boxes:
 - .1 Install in inconspicuous but accessible locations.
 - .2 Support boxes independently of connecting conduits.
 - .3 Fill boxes with paper or foam to prevent entry of construction material.
 - .4 Provide correct size of openings. Reducing washers not permitted.
 - .5 Mark location of pull boxes on record contract drawings.
 - .6 Identify AC power junction boxes, by panel and circuit breaker.
 - 3.6.16 Install terminal blocks or strips indicated in cabinets.
 - 3.6.17 Install bonding conductor for 120 volt and above in conduit.
- 3.7 **Wiring**
- 3.7.1 Install multiple wiring in ducts simultaneously.
 - 3.7.2 Do not pull spliced wiring inside conduits or ducts.
 - 3.7.3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.
 - 3.7.4 Tests: use only qualified personnel. Demonstrate that:
 - .1 Circuits are continuous, free from shorts, unspecified grounds.
 - .2 Resistance to ground of all circuits is greater than 50 Megohms.
 - 3.7.5 Provide Consultant with test results showing locations, circuits, results of tests.
-

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- 3.7.6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.
 - 3.7.7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.
 - 3.7.8 Do not allow wiring to come into direct physical contact with compression screw.
 - 3.7.9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.
- 3.8 **Wiring Devices, Cover Plates**
- 3.8.1 Receptacles:
 - .1 Install vertically in gang type outlet box when more than one receptacle is required in one location.
 - .2 Cover plates:
 - .1 Install suitable common cover plate where wiring devices are grouped.
 - .2 Use flush type cover plates only on flush type outlet boxes.
- 3.9 **Starters, Control Devices**
- 3.9.1 Install and make power and control connections as indicated.
 - 3.9.2 Install correct over-current devices.
 - 3.9.3 Identify each wire, terminal for external connections with permanent number marking identical to diagram.
 - 3.9.4 Performance Verification:
 - .1 Operate switches and controls to verify functioning.
 - .2 Perform start and stop sequences of contactors and relays.
 - .3 Check that interlock sequences, with other separate related starters, equipment and auxiliary control devices, operate as specified.
- 3.10 **Grounding**
- 3.10.1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors and accessories.
 - 3.10.2 Install separate grounding conductors in conduit within building.
 - 3.10.3 Install ground wire in all PVC ducts and in tunnel conduit systems.
 - 3.10.4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.
- 3.11 **Tests**
- 3.11.1 General:
-

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- .1 Perform following tests in addition to tests specified Section 25 08 20 - EMCS: Warranty and Maintenance.
- .2 Give 14 days written notice of intention to test.
- .3 Conceal work only after tests satisfactorily completed.
- .4 Report results of tests to the Consultant in writing.
- .5 Preliminary tests:
 - .1 Conduct as directed to verify compliance with specified requirements.
 - .2 Make needed changes, adjustments, replacements.
 - .3 Insulation resistance tests:

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 08 20, EMCS: Warranty and Maintenance**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 Action and Informational Submittals

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

1.2.2 Submit detailed preventative maintenance schedule for system components to the Consultant.

1.2.3 Submit detailed inspection reports to the Consultant.

1.2.4 Submit dated, maintenance task lists to the Consultant and include the following sensor and output point detail, as proof of system verification:

.1 Point name and location.

.2 Device type and range.

.3 Measured value.

.4 System displayed value.

.5 Calibration detail

.6 Indication if adjustment required,

.7 Other action taken or recommended.

1.2.5 Submit network analysis report showing results with detailed recommendations to correct problems found.

1.2.6 Records and logs:

.1 Maintain records and logs of each maintenance task on site.

.2 Organize cumulative records for each major component and for entire EMCS chronologically.

.3 Submit records to The Agency, after inspection indicating that planned and systematic maintenance have been accomplished.

1.2.7 Revise and submit to the Consultant, "As-built drawings" documentation and commissioning reports to reflect changes, adjustments and modifications to EMCS made during warranty period.

1.3 Maintenance Service During Warranty Period

1.3.1 Provide services, materials, and equipment to maintain EMCS for specified warranty period (2 Year from the date of Ready-for-Takeover). Provide detailed preventative maintenance schedule for system components as described in Submittal article.

1.3.2 Emergency Service Calls:

.1 Initiate service calls when EMCS is not functioning correctly.

.2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.

.3 Furnish AMD with telephone number where service personnel may be reached at any time.

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- .4 Service personnel to be on site ready to service EMCS within 2 hours after receiving request for service.
 - .5 Perform Work continuously until EMCS restored to reliable operating condition.
 - 1.3.3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.
 - 1.3.4 Work requests: record each service call request, when received separately on approved form and include:
 - .1 Serial number identifying component involved.
 - .2 Location, date and time call received.
 - .3 Nature of trouble.
 - .4 Names of personnel assigned.
 - .5 Instructions of work to be done.
 - .6 Amount and nature of materials used.
 - .7 Time and date work started.
 - .8 Time and date of completion.
 - 1.3.5 Provide system modifications in writing.
 - .1 No system modification, including operating parameters and control settings, to be made without prior written approval of The Agency.
 - 1.4 **Maintenance during Warranty Period**
 - 1.4.1 Include maintenance during the two (2) year warranty period and include the cost into Lump-Sum Stipulated Contract price.
 - 1.4.2 Maintenance service to include:
 - .1 Annual verification of field points for operation and calibration.
 - .2 Two (2) visits per year.
 - .3 Four (4) responses to emergency calls per year
 - .4 Complete inventory of installed system.
 - 2. **PRODUCTS: NOT APPLICABLE**
 - 3. **EXECUTION**
 - 3.1 **Field Quality Control**
 - 3.1.1 Perform as minimum (3) three minor inspections and one major inspection (more often if required by manufacturer) per year. Provide detailed written report to the Agency as described in Submittal article.
 - 3.1.2 Perform inspections during regular working hours, 0800 to 1600 h, Monday through Friday, excluding statutory holidays.
 - 3.1.3 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:
 - .1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.
-

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- .2 Check and Calibrate each field input/output device in accordance with Canada Labour Code - Part I and CSA Z204.
- .3 Provide dated, maintenance task lists, as described in Submittal article, as proof of execution of complete system verification.
- 3.1.4 Minor inspections to include, but not limited to:
 - .1 Perform visual, operational checks to BC's, peripheral equipment, interface equipment and other panels.
 - .2 Check equipment cooling fans as required.
 - .3 Visually check for mechanical faults, air leaks and proper pressure settings on pneumatic components.
 - .4 Review system performance with the Agency to discuss suggested or required changes.
- 3.1.5 Major inspections to include, but not limited to:
 - .1 Minor inspection.
 - .2 Clean OWS(s) peripheral equipment, BC(s), interface and other panels, micro-processor interior and exterior surfaces.
 - .3 Check signal, voltage and system isolation of BC(s), peripherals, interface and other panels.
 - .4 Verify calibration/accuracy of each input and output device and recalibrate or replace as required.
 - .5 Provide mechanical adjustments, and necessary maintenance on printers.
 - .6 Run system software diagnostics as required.
 - .7 Install software and firmware enhancements to ensure components are operating at most current revision for maximum capability and reliability.
 - .1 Perform network analysis and provide report as described in Submittal article.
- 3.1.6 Rectify deficiencies revealed by maintenance inspections and environmental checks.
- 3.1.7 Continue system debugging and optimization.
- 3.1.8 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons, after Consultant/Agency has accepted, taken over and fully occupied.
 - .1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 10 01, EMCS: Local Area Network (LAN)**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 System Description

1.2.1 Data communication network to link Operator Workstations and Master Control Units (MCU) in accordance with CSA T529, TIA/EIA-568, CSA T530, TIA/EIA-569-A and TBITS 6.9.

.1 Provide reliable and secure connectivity of adequate performance between different sections (segments) of network.

.2 Allow for future expansion of network, with selection of networking technology and communication protocols.

1.2.2 Data communication network to include, but not limited to:

.1 EMCS-LAN.

.2 Modems.

.3 Network interface cards.

.4 Network management hardware and software.

.5 Network components necessary for complete network.

1.3 Design Requirements

1.3.1 EMCS Local Area Network (EMCS-LAN).

.1 High speed, high performance, local area network over which MCUs and OWSs communicate with each other directly on peer to peer basis in accordance with IEEE 802.3/Ethernet Standard.

.2 EMCS-LAN to: BACnet.

.3 Each EMCS-LAN to be capable of supporting at least 50 devices.

.4 Support of combination of MCUs and OWSs directly connected to EMCS-LAN.

.5 High speed data transfer rates for alarm reporting, quick report generation from multiple controllers, upload/download information between network devices. Bit rate to be 10 Megabits per second minimum.

.6 Detection and accommodation of single or multiple failures of either OWSs, MCUs or network media. Operational equipment to continue to perform designated functions effectively in event of single or multiple failures.

.7 Commonly available, multiple sourced, networking components and protocols to allow system to co-exist with other networking applications including office automation.

1.3.2 Dynamic Data Access.

.1 LAN to provide capabilities for OWSs, either network resident or connected remotely to access point status and application report data or execute control functions for other devices via LAN.

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Appendix 8.2, Division 25, Section 25 10 01, EMCS: Local Area Network (LAN)

- .2 Access to data to be based upon logical identification of building equipment.
- 1.3.3 Network Medium.
 - .1 Network medium: twisted cable, shielded twisted cable, or fibre optic cable compatible with network protocol to be used within buildings. Fibre optic cable to be used between buildings.
- 2. **PRODUCTS** : NOT APPLICABLE
- 3. **EXECUTION**: NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 25, Section 25 10 02, EMCS: Operator Workstation (OWS)**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.
 - 1.2 **OWS System Description**
 - 1.2.1 Existing Operator Workstation (OWS) to remain.
 - 1.3 **Action and Informational Submittals**
 - 1.3.1 Make submittals in accordance with Section 25 05 02 - EMCS: Submittals and Review.
 2. **PRODUCTS**
 - 2.1 **OWS Control Software**
 - 2.1.1 OWS is not to form part of real-time control functions either directly or indirectly or as part of communication link. Real-time control functions to reside in MCUs, LCUs, and TCUs with peer-to-peer communication occurring at MCU to MCU device level.
 - 2.1.2 Time Synchronization Module.
 - .1 System to provide Time Synchronization of real-time clocks in controllers.
 - .2 System to perform this feature on regular scheduled basis and on operator request.
 - 2.1.3 User Display Interface Module.
 - .1 OWS software to support "Point Names" as defined in Section 25 05 01 - EMCS: General Requirements.
 - .2 Upon operator's request in either text, graphic or table mode, system to present condition of single point, system, area, or connected points on system to OWS. Display analog values digitally to 1 place of decimal with negative sign as required. Update displayed analog values and status when new values received. Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm. For systems supporting COSV, refresh rate of screen data not to exceed 5 seconds from time of field change and system is to execute supervisory background scan every[20 seconds to verify point data value. For other systems refresh rate not to exceed 5 seconds for points displayed. Initial display of new system graphic display (with up to 30 active points), including presentation of associated dynamic data not to exceed 8 seconds.
 - 2.1.4 General Event Log Module: to record system activities occurring at OWS or elsewhere in system including:
 - .1 Operator Log-in from user interface device.
 - .2 Communication messages: errors, failures and recovery.
-

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PROJECT 22701****Appendix 8.2, Division 25, Section 25 10 02, EMCS: Operator Workstation (OWS)**

- .3 Event notifications and alarms by category.
- .4 Record of operator initiated commands.
- 2.1.5 General Event Log:
 - .1 Hold minimum of 4 months information and be readily accessible to operator.
 - .2 Able to be archived as necessary to prevent loss of information.
- 2.1.6 Operator Control Software Module: to support entry of information into system from keyboard and mouse, disk, or from another network device. Display of information to user; dynamic displays, textual displays, and graphic displays to display logging and trending of system information and following tasks:
 - .1 Automatic logging of digital alarms and change of status messages.
 - .2 Automatic logging of analog alarms.
 - .3 System changes: alarm limits, set-points, alarm lockouts.
 - .4 Display specific point values, states as selected.
 - .5 Provide reports as requested and on scheduled basis when required.
 - .6 Display graphics as requested, and on alarm receptions (user's option).
 - .7 Display list of points within system.
 - .8 Display list of systems within building.
 - .9 Direct output of information to selected peripheral device.
 - .10 On-line changes:
 - .1 Alarm limits.
 - .2 Setpoints.
 - .3 Deadbands.
 - .4 Control and change of state changes.
 - .5 Time, day, month, year.
 - .6 Control loop configuration changes for controller-based CDLs.
 - .7 Control loop tuning changes.
 - .8 Schedule changes.
 - .9 Changes, additions, or deletions, of points, graphics, for installed and future systems.
 - .11 According to assigned user privileges (password definition) following functions are to be supported:
 - .1 Permit operator to terminate automatic (logic based) control and set value of field point to operator selected value. These values or settings to remain in effect until returned to automatic (logic based) control by operator.
 - .2 Requests for status, analog values, graphic displays, logs and controls to be through user interface screens.
 - .12 Software and tools utilized to generate, modify and configure building controllers to be installed and operational on the OWS.

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- 2.1.7 Dial-up host Module for off site OWSs.
 - .1 Operators at dial-up OWS to be able to perform control functions, report functions, data base generation and modification functions as described for OWS's connected via LAN. Provide routines to automatically answer calls and either file or display information sent from remote panels.
 - .2 Operator to be able to access remote buildings by selection of facility by its logical name. Dial-up module to maintain user-definable cross-reference of buildings and associated telephone numbers without manual dialing.
 - .3 Local OWS may serve as dial-up host for remotely connecting OWSs, remote controllers or networks. Alarms and data file transfers handled via dial-up transactions must not interfere with local LAN activity. LAN activity not to prevent work-station from handling incoming calls.
- 2.1.8 Message Handling Module - and Error Messages: to provide message handling for following conditions:
 - .1 Message and alarm buffering to prevent loss of information.
 - .2 Error detection correction and retransmission to guarantee data integrity.
 - .3 Informative messages to operator for data error occurrences, errors in keyboard entry, failure of equipment to respond to requests or commands and failure of communications between EMCS devices.
 - .4 Default device definition to be implemented to ensure alarms are reported as quickly as possible in event of faulty designated OWS.
- 2.1.9 Access Control Module.
 - .1 Minimum [5] levels of password access protection to limit control, display, or data base manipulation capabilities. Following is preferred format of progression of password levels:
 - .1 Guest: no password data access and display only.
 - .2 Operator Level: full operational commands including automatic override.
 - .3 Technician: data base modifications.
 - .4 Programmer: data base generation.
 - .5 Highest Level: system administration - password assignment addition, modification.
 - .2 User-definable, automatic log-off timers from 1 to 60 min. to prevent operators leaving devices on-line inadvertently. Default setting = [3] minutes.
- 2.1.10 Trend Data Module: includes historical data collection utility, trend data utility, control loop plot utility. Each utility to permit operator to add trend point, delete trend point, set scan rate.

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- .1 Historical data collection utility: collect concurrently operator selected real or calculated point values at operator selectable rate [30-480] minutes. Samples to include for each time interval (time-stamped), minimum present value, maximum present value, and average present value for point selected. Rate to be individually selectable for each point. Data collection to be continuous operation, stored in temporary storage until removed from historical data list by operator. Temporary storage to have at least [6] month capacity.
- .2 Trend data utility: continuously collect point object data variables for variables from building controllers as selected by operator, including at minimum; present value of following point object types - DI, DO, AI, AO set points value, calculated values. Trend data utility to have capacity to trend concurrently points at operator-selectable rate of [05]seconds to [3600] seconds, individually selectable for selected value, or use of COSV detection. Collected trend data to be stored on minimum [96] hours basis in temporary storage until removed from trend data list by operator. Option to archive data before overwriting to be available.
- .3 Control loop plot utility: for AO Points provide for concurrent plotting of Measured value input - present value, present value of output, and AO setpoint. Operator selectable sampling interval to be selectable between 1 second to 20 seconds. Plotting utility to scroll to left as plot reaches right side of display window. Systems not supporting control loop plot as separate function must provide predefined groups of values. Each group to include values for one control loop display.
- .4 Trend data Module to include display of historical or trend data to OWS screen in X Y plot presentation. Plot utility to display minimum of [6] historical points or [6]trend points concurrently or 1 Control Loop Plot. For display output of real time trend data, display to automatically index to left when window becomes full. Provide plotting capabilities to display collected data based on range of selected value for (Y) component against time/date stamp of collected data for (X) component.
- .5 Provide separate reports for each trend utility. Provide operator feature to specify report type, by point name and for output device. Reports to include time, day, month, year, report title, and operator's initials. Implement reports using report module. Ensure trend data is exportable to third party spreadsheet or database applications for PCs.

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- 2.1.11 Report Module: reports for energy management programs, function totalization, analog/pulse totalization and event totalization features available at MCU level. Refer also to Section 25 30 01 - EMCS: Building Controllers Family of Controllers.
- .1 Reports to include time, day, month, year, report title, operator's initials.
 - .2 Software to provide capability to:
 - .1 Generate and format reports for graphical and numerical display from real time and stored data.
 - .2 Print and store reports as selected by operator.
 - .3 Select and assign points used in such reports.
 - .4 Sort output by area, system, as minimum.
 - .3 Periodic/automatic report:
 - .1 Generate specified report(s) automatically including options of start time and date, interval between reports (hourly, daily, weekly, monthly), output device. Software to permit modifying periodic/automatic reporting profile at any time.
 - .2 Reports to include:
 - .4 Report types:
 - .1 Dynamic reports: system to printout or display of point object data value requested by operator. System to indicate status at time of request, when displayed, updated at operator selected time interval. Provide option for operator selection of report type, by point name, and/or output device. Ensure reports are available for following point value combinations:
 - .2 Points in accessible from this OWS (total connected for this location), multiple "areas".
 - .3 Area (points and systems in Area).
 - .4 Area, system (points in system).
 - .5 System (points by system type).
 - .6 System point (points by system and point object type).
 - .7 Area point (points by system and point object type).
 - .8 Point (points by point object type).
 - .5 Summary report: printout or display of point object data value selected by operator. Report header to indicate status at time of request. Ensure reports are available on same basis as dynamic reports. Provide option as to report type, point name, output device.
 - .6 Include preformatted reports as listed in Event/Alarm Module.
- 2.1.12 Graphics Display Module: graphics software utility to permit user to create, modify, delete, file, and recall graphics required.

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- .1 Provide capacity for 100% expansion of system graphics. Graphic interface to provide user with multiple layered diagrams for site, building in plan view, floor furniture plan view and building systems, overlaid with dynamic data appropriately placed and permitting direct operator interaction. Graphic interface to permit operator to start and stop equipment, change set points, modify alarm limits, override system functions and points from graphic system displays by use of mouse or similar pointing device.
 - .2 Display specific system graphics: provide for manual and/or automatic activation (on occurrence of an alarm). Include capability to call up and cancel display of graphic picture.
 - .3 Library of pre-engineered screens and symbols depicting standard air handling components (fans, coils, filters, dampers, VAV), complete mechanical system components (chillers, boilers, pumps), electrical symbols.
 - .4 Graphic development, creation, modification package to use mouse and drawing utility to permit user to:
 - .1 Modify portion of graphic picture/schematic background.
 - .2 Delete graphic picture.
 - .3 Call up and cancel display of graphic picture.
 - .4 Define symbols.
 - .5 Position and size symbols.
 - .6 Define background screens.
 - .7 Define connecting lines, curves.
 - .8 Locate, orient, size descriptive text.
 - .9 Define, display colours of elements.
 - .10 Establish co-relation between symbols or text and associated system points or other graphic displays.
 - .5 User to be able to build graphic displays showing on-line point data from multiple MCU panels. Graphic displays to represent logical grouping of system points or calculated data based upon building function, mechanical system, building layout, other logical grouping of points which aids operator in analysis of facility operation. Data to be refreshed on screen as "changed data" without redrawing of entire screen or row on screen.
 - .6 Dynamic data (temperature, humidity, flow, status) to be shown in actual schematic locations, to be automatically updated to show current values without operator intervention.
 - .7 Windowing environment to allow user to view several graphics simultaneously to permit analysis of building operation, system performance, display of graphic associated with alarm to be viewed without interrupting work in progress. If interface is unable to display several different types of display at same time, provide at minimum [2]OWS's.
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- .8 Utilize graphics package to generate system schematic diagrams as. In addition, provide graphics for schematic depicted on mechanical plan flow diagrams, point lists and system graphics. Provide graphic for floor depicting room sensors and control devices located in their actual location. For floor graphic include secondary diagram to show TCU-VAV box actuator and, flow sensor. Diagram to be single line schematic of ductwork as well as associated heating coil or radiation valve. The Agency to provide CAD floor layouts. Provide display of TCU -VAV's in table form, include following values as minimum; space temp, setpoint, mode, actual flow, min flow setpoint, max flow setpoint, cooling signal value, and heating signal value. Organize table by rooms and floor groupings.
 - .9 Provide complete directory of system graphics, including other pertinent system information. Utilize mouse or pointing device to "point and click" to activate selected graphic.
 - .10 Provide unique sequence of operation graphic or pop-up window for each graphic that is depicted on OWS. Provide access to sequence of operation graphic by link button on each system graphic. Provide translation of sequence of operation, a concise explanation of systems operation, from control descriptive logic into plain [English] [and/or] [French] language.
- 2.1.13 Event/Alarm Module: displays in window alarms as received and stored in General Event Log.
- .1 Classify alarms as "critical", "cautionary", "maintenance". Alarms and alarm classifications to be designated by personnel requiring password level.
 - .2 Presentation of alarms to include features identified under applicable report definitions of Report Module paragraph.
 - .3 Alarm reports.
 - .1 Summary of points in critical, cautionary or maintenance alarm. Include at least point name, alarm type, current value, limit exceeded.
 - .2 Analog alarm limit summary: include point name, alarm limits, deviation limits.
 - .3 Summary of alarm messages: include associated point name, alarm description.
 - .4 Software to notify operator of each occurrence of alarm conditions. Each point to have its own secondary alarm message.
 - .5 EMCS to notify operator of occurrence of alarms originating at field device within following time periods of detection:
 - .1 Critical - [5]seconds.
 - .2 Cautionary - [10]seconds.
 - .3 Maintenance - [10]seconds.
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- .6 Display alarm messages in [English] [and] [French].
 - .7 Primary alarm message to include as minimum: point identifier, alarm classification, time of occurrence, type of alarm. Provide for initial message to be automatically presented to operator whenever associated alarm is reported. Assignment of secondary messages to point to be operator-editable function. Provide secondary messages giving further information (telephone lists, maintenance functions) on per point basis.
 - .8 System reaction to alarms: provide alarm annunciation by dedicated window (activated to foreground on receipt of new alarm or event) of OWS with visual and audible hardware indication. Acknowledgement of alarm to change visual indicator from flashing to steady state and to silence audible device. Acknowledgment of alarm to be time, date and operator stamped and stored in General Event Log. Steady state visual indicator to remain until alarm condition is corrected but must not impede reporting of new alarm conditions. Notification of alarm not to impede notification of subsequent alarms or function of Controller's/CDL. Do not allow random occurrence of alarms to cause loss of alarm or over-burden system. Do not allow acknowledgement of one alarm as acknowledgement of other alarms.
 - .9 Controller network alarms: system supervision of controllers and communications lines to provide following alarms as minimum:
 - .1 Controller not responding - where possible delineate between controller and communication line failure.
 - .2 Controller responding - return to normal.
 - .3 Controller communications bad - high error rate or loss of communication.
 - .4 Controller communications normal - return to normal.
 - .10 Digital alarm status to be interrogated every [2] seconds as minimum or be direct interrupting non-polling type (COV). Annunciate each non-expected status with alarm message.
- 2.1.14 Archiving and Restoration Module.
- .1 Primary OWS to include services to store back-up copies of controller databases. Perform complete backup of OWS software and data files at time of system installation and at time of final acceptance. Provide backup copies before and after Controller's revisions or major modifications.
 - .2 Provide continuous integrity supervision of controller data bases. When controller encounters database integrity problems with its data base, system to notify operator of need to download copy data base to restore proper operation.
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- .3 Ensure data base back-up and downloading occurs over LAN without specialized operator technical knowledge. Provide operator with ability to manually download entire controller data base, or parts thereof as required.
- 2.1.15 CDL Generator and Modifier Module.
 - .1 CDL Generator module to permit generation and modification of CDLs.
 - .2 Provide standard reference modules for text based systems module that will permit modification to suit site specific applications. Module to include cut, paste, search and compare utilities to permit easy CDL modification and verification.
 - .3 Provide full library of symbols used by manufacturer for system product installed accessible to operators for systems using graphical environment for creation of CDLs Module to include graphic tools required to generate and create new object code for downloading to building controllers.
 - .4 Module to permit testing of code before downloading to building controllers.
- 2.2 **Additional Utility Software**
 - 2.2.1 Supply and install on primary OWS, following CAD software products by [Autodesk Inc.] and include:
 - .1 AutoCAD LT latest version.
 - .2 Include special drivers, fonts, to ensure complete and proper functioning of software packages specified. Deliver system complete with full set of User Manuals.
 - .3 Enter soft copy submissions, including "Record" contract drawings.
 - .4 Enter soft copy of Architectural, Electrical, Mechanical systems plans and "Record" contract drawings in OWS. Plans and contract drawings to be provided by the Consultant.
- 3. **EXECUTION**
 - 3.1 **Installation Requirements**
 - 3.1.1 Provide necessary power as required from local 120V emergency power branch circuit panels for OWS's and peripheral equipment.
 - .1 Install tamper locks on breakers of circuit panels.
 - .2 Refer to UPS requirements stated under OWS Hardware in PART 2 of this Section of Specification.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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Controllers**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01- General Requirements and all documents referred to therein.

1.2 Description

1.2.1 General: Network of controllers comprising of MCU('s), LCU('s), ECU('s) or TCU('s) to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications.

.1 Provide sufficient controllers to meet intents and requirements of this section.

1.2.2 Controllers: stand-alone intelligent Control Units.

.1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.

.2 Incorporate communication interface ports for communication to LANs to exchange information with other Controllers.

.3 Capable of interfacing with operator interface device.

.4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need to interact with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

.1 Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

1.2.3 Interface to include provisions for use of dial-up modem for interconnection with remote modem.

.1 Dial-up communications to use 56 Kbit modems and voice grade telephone lines.

.2 Each stand-alone panel may have its own modem or group of stand-alone panels may share modem.

1.3 Design Requirements

1.3.1 To include:

.1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.

.2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.

.3 Perform Analog control using programmable logic, (including PID (PROPORTIONAL-INTEGRAL_DERIVATIVE)) with adjustable dead bands and deviation alarms.

.4 Control of systems as described in sequence of operations.

.5 Execution of optimization routines as listed in this section.

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- 1.3.2 Total spare capacity for MCUs and LCUs: at least 25 % of each point type distributed throughout the MCUs and LCUs.
- 1.3.3 Field Termination and Interface Devices:
 - .1 To: CSA C22.2 No.205.
 - .2 Electronically interface sensors and control devices to processor unit.
 - .3 Include, but not be limited to, following:
 - .1 Programmed firmware or logic circuits to meet functional and technical requirements.
 - .2 Power supplies for operation of logics devices and associated field equipment.
 - .3 Lockable wall cabinet.
 - .4 Required communications equipment and wiring (if remote units).
 - .5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.
 - .6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.
 - .7 Wiring terminations: use conveniently located screw type or spade lug terminals.
 - .4 AI interface equipment to:
 - .1 Convert analog signals to digital format with [10] bit analog-to-digital resolution.
 - .2 Provide for following input signal types and ranges:
 - .3 Meet IEEE C37.90.1 surge withstand capability.
 - .4 Have common mode signal rejection greater than 60 dB to 60 Hz.
 - .5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.
 - .5 AO interface equipment:
 - .1 Convert digital data from controller processor to acceptable analog output signals using 8 bit digital-to-analog resolution.
 - .2 Provide for following output signal types and ranges:
 - .3 Meet IEEE C37.90.1 surge withstand capability.
 - .6 DI interface equipment:
 - .1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.
 - .2 Meet IEEE C37.90.1 surge withstand capability.
 - .3 Accept pulsed inputs up to 2 kHz.
 - .7 DO interface equipment:
 - .1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24V AC.

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- .2 Switch up to 5 amps at 220V AC using optional interface relay.
 - 1.3.4 Controllers and associated hardware and software: operate in conditions of 0 degrees C to 44 degrees C and 20 % to 90 % non-condensing RH.
 - 1.3.5 Controllers (MCU, LCU): mount in wall mounted cabinet with hinged, keyed-alike locked door.
 - .1 Provide for conduit entrance from top, bottom or sides of panel.
 - .2 ECUs and TCUs to be mounted in equipment enclosures or separate enclosures.
 - 1.3.6 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.
 - 1.3.7 Provide surge and low voltage protection for interconnecting wiring connections.
- 1.4 **Action and Informational Submittals**
- 1.4.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.
 - .1 Submit product data sheets for each product item proposed for this project.
- 1.5 **Maintenance**
- 1.5.1 Provide manufacturers recommended maintenance procedures.
2. **PRODUCTS**
- 2.1 **Master Control Unit (MCU)**
 - 2.1.1 General: primary function of MCU is to provide co-ordination and supervision of subordinate devices in execution of optimization routines such as demand limiting or enthalpy control.
 - 2.1.2 Include high speed communication LAN Port for Peer to Peer communications with OWS(s) and other MCU level devices.
 - .1 MCU must support BACnet.
 - 2.1.3 MCU local I/O capacity as follows:
 - .1 MCUI/O points as allocated in I/O Summary Table referenced in MD13800.
 - .2 LCUs may be added to support system functions.
 - 2.1.4 Central Processing Unit (CPU).
 - .1 Processor to consist of minimum 16 bit microprocessor capable of supporting software to meet specified requirements.
 - .2 CPU idle time to be more than 30 % when system configured to maximum input and output with worst case program use.
 - .3 Minimum addressable memory to be at manufacturer's discretion but to support at least performance and technical specifications to include but not limited to:
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- .1 Non-volatile EEPROM to contain operating system, executive, application, sub-routine, other configurations definition software. Tape media not acceptable.
 - .2 Battery backed (72 hour minimum capacity) RAM (to reduce the need to reload operating data in event of power failure) to contain CDLs, application parameters, operating data or software that is required to be modifiable from operational standpoint such as schedules, setpoints, alarm limits, PID (PROPORTIONAL-INTEGRAL_DERIVATIVE) constants and CDL and hence modifiable on-line through operator panel or remote operator's interface. RAM to be downline loadable from OWS.
 - .4 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving year/month/day/hour/minute/second, with rechargeable batteries for minimum 72 hour operation in event of power failure.
- 2.1.5 Local Operator Terminal (OT): Provide OT for each MCU.
- .1 Mount access/display panel in MCU or in suitable enclosure beside MCU.
 - .2 Support operator's terminal for local command entry, instantaneous and historical data display, programs, additions and modifications.
 - .3 Display simultaneously minimum of 16 point identifiers to allow operator to view single screen dynamic displays depicting entire mechanical systems. Point identifiers to be in English and French.
 - .4 Functions to include, but not be limited to, following:
 - .1 Start and stop points.
 - .2 Modify setpoints.
 - .3 Modify PID (PROPORTIONAL-INTEGRAL_DERIVATIVE) loop parameters.
 - .4 Override PID (PROPORTIONAL-INTEGRAL_DERIVATIVE) control.
 - .5 Change time/date.
 - .6 Add/modify/start/stop weekly scheduling.
 - .7 Add/modify setpoint weekly scheduling.
 - .8 Enter temporary override schedules.
 - .9 Define holiday schedules.
 - .10 View analog limits.
 - .11 Enter/modify analog warning limits.
 - .12 Enter/modify analog alarm limits.
 - .13 Enter/modify analog differentials.
 - .5 Provide access to real and calculated points in controller to which it is connected or to other controller in network. This capability not to be restricted to subset of predefined "global points" but to provide totally open exchange of data between OT and other controller in network.
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- .6 Operator access to OTs: same as OWS user password and password changes to automatically be downloaded to controllers on network.
 - .7 Provide prompting to eliminate need for user to remember command format or point names. Prompting to be consistent with user's password clearance and types of points displayed to eliminate possibility of operator error.
 - .8 Identity of real or calculated points to be consistent with network devices. Use same point identifier as at OWS's for access of points at OT to eliminate cross-reference or look-up tables.
- 2.2 **Local Control Unit (LCU)**
- 2.2.1 Provide multiple control functions for typical built-up and package HVAC systems, hydronic systems and electrical systems.
 - 2.2.2 Minimum of 16 I/O points of which minimum be 4 AOs, 4 AIs, 4 DIs, 4 DOs.
 - 2.2.3 Points integral to one Building System to be resident on only one controller.
 - 2.2.4 Microprocessor capable of supporting necessary software and hardware to meet specified requirements as listed in previous MCU article with following additions:
 - .1 Include minimum 2 interface ports for connection of local computer terminal.
 - .2 Design so that shorts, opens or grounds on input or output will not interfere with other input or output signals.
 - .3 Physically separate line voltage (70V and over) circuits from DC logic circuits to permit maintenance on either circuit with minimum hazards to technician and equipment.
 - .4 Include power supplies for operation of LCU and associated field equipment.
 - .5 In event of loss of communications with, or failure of, MCU, LCU to continue to perform control. Controllers that use defaults or fail to open or close positions not acceptable.
 - .6 Provide conveniently located screw type or spade lug terminals for field wiring.
- 2.3 **Terminal/Equipment Control Unit (TCU/ECU)**
- 2.3.1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications.
 - .1 TCU/ECU definition to be consistent with those defined in HVAC Applications Handbook section 45.
 - 2.3.2 Controller to communicate directly with EMCS through EMCSLAN and provide access from EMCSOWS for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCSOWS.
 - 2.3.3 VAV Terminal Controller.
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- .1 Microprocessor based controller with integral flow transducer, including software routines to execute PID (PROPORTIONAL-INTEGRAL_DERIVATIVE) algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs. Sequence of operation to ASHRAE HVAC Applications Handbook.
 - .2 Controller to support point definition; in accordance with Section 25 05 01 - EMCS: General Requirements.
 - .3 Controller to operate independent of network in case of communication failure.
 - .4 Controller to include damper actuator and terminations for input and output sensors and devices.
- 2.4 **Software**
- 2.4.1 General.
 - .1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.
 - .2 Include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.
 - .3 Include initial programming of Controllers, for entire system.
 - 2.4.2 Program and data storage.
 - .1 Store executive programs and site configuration data in ROM, EEPROM or other non-volatile memory.
 - .2 Maintain CDL and operating data including setpoints, operating constants, alarm limits in battery-backed RAM or EEPROM for display and modification by operator.
 - 2.4.3 Programming languages.
 - .1 Program Control Description Logic software (CDL) using English like or graphical, high level, general control language.
 - .2 Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required.
 - 2.4.4 Operator Terminal interface.
 - .1 Operating and control functions include:
 - .1 Multi-level password access protection to allow user/manager to limit workstation control.
 - .2 Alarm management: processing and messages.
 - .3 Operator commands.
 - .4 Reports.
 - .5 Displays.
 - .6 Point identification.
 - 2.4.5 Pseudo or calculated points.
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- .1 Software to provide access to value or status in controller or other networked controller in order to define and calculate pseudo point. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.
 - .2 Inputs and outputs for process: include data from controllers to permit development of network-wide control strategies. Processes also to permit operator to use results of one process as input to number of other processes (e.g. cascading).
- 2.4.6 Control Description Logic (CDL):
- .1 Capable of generating on-line project-specific CDLs which are software based, programmed into RAM or EEPROM and backed up to OWS. The Agency must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) from OWS.
 - .2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (e.g. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from OWS and BC(s) to tune control loops.
 - .3 Perform changes to CDL on-line.
 - .4 Control logic to have access to values or status of points available to controller including global or common values, allowing cascading or inter-locking control.
 - .5 Energy optimization routines including enthalpy control, supply temperature reset, to be LCU or MCU resident functions and form part of CDL.
 - .6 MCU to be able to perform following pre-tested control algorithms:
 - .1 Two position control.
 - .2 Proportional Integral and Derivative (PID (PROPORTIONAL-INTEGRAL_DERIVATIVE)) control.
 - .7 Control software to provide ability to define time between successive starts for each piece of equipment to reduce cycling of motors.
 - .8 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
 - .9 Power Fail Restart: upon detection of power failure system to verify availability of Emergency Power as determined by emergency power transfer switches and analyse controlled equipment to determine its appropriate status under Emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyse status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.
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- 2.4.7 Event and Alarm management: use management by exception concept for Alarm Reporting. This is system wide requirement. This approach will ensure that only principal alarms are reported to OWS. Events which occur as direct result of primary event to be suppressed by system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Examples of above are, operational temperature alarms limits which are exceeded when main air handler is stopped, or General Fire condition shuts air handlers down, only Fire alarm status shall be reported. Exception is, when air handler which is supposed to stop or start fails to do so under event condition.
 - 2.4.8 Energy management programs: include specific summarizing reports, with date stamp indicating sensor details which activated and or terminated feature.
 - .1 MCU in coordination with subordinate LCU, TCU, ECU to provide for the following energy management routines:
 - .1 Time of day scheduling.
 - .2 Calendar based scheduling.
 - .3 Holiday scheduling.
 - .4 Temporary schedule overrides.
 - .5 Optimal start stop.
 - .6 Night setback control.
 - .7 Enthalpy (economizer) switchover.
 - .8 Peak demand limiting.
 - .9 Temperature compensated load rolling.
 - .10 Fan speed/flow rate control.
 - .11 Cold deck reset.
 - .12 Hot deck reset.
 - .13 Hot water reset.
 - .14 Chilled water reset.
 - .15 Condenser water reset.
 - .16 Chiller sequencing.
 - .17 Night purge.
 - .2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.
 - 2.4.9 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month.
 - .1 MCUs to accumulate and store automatically run-time for binary input and output points.
 - .2 MCU to automatically sample, calculate and store consumption totals on daily, weekly or monthly basis for user-selected analog or binary pulse input-type points.
 - .3 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly or monthly basis.
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- .4 Totalization routine to have sampling resolution of [1] min or less for analog inputs.
 - .5 Totalization to provide calculations and storage of accumulations up to [99,999.9] units (e.g. KWh, litres, tonnes, etc.).
 - .6 Store event totalization records with minimum of [9,999,999] events before reset.
 - .7 User to be able to define warning limit and generate user-specified messages when limit reached.

2.5 Levels of Address

- 2.5.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.
 - .1 Display analog values digitally to 1 place of decimals with negative sign as required.
 - .2 Update displayed analog values and status when new values received.
 - .3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.
 - .4 Updates to be change-of-value (COV)-driven or if polled not exceeding 2 second intervals.

2.6 Point Name Support

- 2.6.1 Controllers (MCU, LCU) to support PWGSC point naming convention as defined in Section 25 05 01 - EMCS: General Requirements.

3. EXECUTION

3.1 Location

- 3.1.1 Location of Controllers to be approved by the Consultant.

3.2 Installation

- 3.2.1 Install Controllers in secure locking enclosures.
- 3.2.2 Provide necessary power from local 120V branch circuit panel for equipment.
- 3.2.3 Install tamper locks on breakers of circuit breaker panel.
- 3.2.4 Use uninterruptible Power Supply (UPS) and emergency power when equipment must operate in emergency and co-ordinating mode.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
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1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 High Level Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services for selective demolition, supply, installation, testing and commissioning of the following work as indicated on the Contract Drawings and specified in various section of the Specifications.

.1 Provide new 120/208 Volt and 347/600 Volt utility power service.

.2 Provide new 120/208 Volt and 347/600 Volt EPS power service.

.3 Provide electrical distribution systems, communications conduit systems, grounding systems, lighting, lighting control system, fire alarm system, security and access control and CCTV requirements, lightning protection, etc., as specified and shown on the Contract Drawings.

.4 Power up the input points for system & ancillary furniture.

1.2.2 The Contractor shall provide a comprehensive Methods of Procedures (MOPs) four weeks prior to each and every power shutdown. MOPs must include a detailed sequence of operations to be completed during the respective shutdown as well as a back out plan. MOPs must be approved by the Consultant/Agency prior to any work taking place.

1.2.3 All electrical cables to be used on this project shall be copper only and within the conduit- No exceptions. Lugs, terminals, screws used for termination of wiring should be suitable for copper conductors.

1.2.4 Arrange and pay for permits and inspection of all electrical work by the Electrical Safety Authority Inspection Department. On completion of the Work, present to the Consultant the final unconditional certificate of approval.

1.3 Terms And Conditions**1.3.1 Definitions**

.1 The term Agency shall be understood to refer to Regional Municipality of Peel.

.2 The term Project Manager shall be understood to refer to Regional Municipality of Peel/Agency Project Manager.

.3 The term electrical contractor shall be understood to refer to the successful bidder to this Contract for the electrical systems.

.4 The term Contract shall be understood to refer to all items and conditions of this specification, Contract Drawings, the complete tender package, the Contractor's tender submission and any other future

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- contractual arrangements. All such items and conditions shall be binding unless agreed otherwise by the Contractor and Consultant/Agency.
- .5 The term Project shall be understood to refer to the complete supply and installation of the electrical system and components, as defined in this Specification and Contract Drawings.
 - .6 Wherever the words “equal”, “equivalent”, “approved”, or “approved equal” are used, it shall be understood to mean, “equal”, “equivalent”, “approved”, or “approved equal” in the opinion of the Consultant/Agency.
 - .7 Wherever the words “install”, “provide”, or “supply and install”, are used it shall be understood to mean “provide and install, inclusive of all labour, materials, installation, testing, and connections” for the item to which referred.
 - .8 “Concealed” is defined as “out of sight” in “normal” viewing conditions, and includes buried in concrete, above acoustic tile or gypsum board ceilings, within masonry or gypsum board constructed walls, within cable trays of below raised access floors.
- 1.3.2 These Specifications or the Contract Drawings shall not be used alone. Any item or subject omitted from one, but mentioned or reasonably implied in the other, shall be provided. Misinterpretation of any requirements of either the specification or Contract Drawings shall not result in any additional charge after submission of Tender. This Contractor shall, by careful study of the total requirements, include all necessary components to make each system workable. The Agency shall be contacted for written clarification on any point before the submission of Tenders.
- 1.3.3 All terms and conditions of the specifications, tender documents and accompanying Contract Drawings shall be strictly adhered to by the Contractor, unless otherwise noted. Any inability to comply with these requirements must be stated in writing, in detail, before the tender submission, otherwise, it shall be understood that the Contractor is bound to compliance with the stated terms and conditions.
- 1.3.4 The Contractor shall co-operate fully with the Agency and other persons working on the site.
- 1.3.5 The Contractor shall do the complete installation in accordance with the latest editions of the Ontario Building Code, Electrical Safety Code, CSA, NFPA, or other Codes or governing authorities of competent jurisdiction. In case of discrepancies with this or the manufacturer’s specifications, the Contractor shall notify the Consultant immediately.
- 1.3.6 Obtain and pay for permits (note: Building Permit obtained by Agency) and inspections required for work performed. Provide Certificate(s) of Acceptance from the Authorities Inspection Department, upon completion of work.
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- 1.3.7 Submit required Documents and shop drawings to authorities having jurisdiction in order to obtain approval for the Work. Copies of Contract Drawings and Specifications may be used for this purpose. Prepare any additional information, details and Contract Drawings which these authorities may require.
 - 1.3.8 The Contractor must comply with all requirements of the Occupational Health & Safety Act.
 - 1.3.9 In order to meet the requirements of Substantial Completion, the Contractor must complete the following:
 - .1 Installation and successful testing of all electrical system devices as per mutually agreed to tests and commissioning plan.
 - .2 Submission of all coordination and permit documentation for the Consultant's review.
 - .3 Submission of all record and As-built documentation.
 - .4 Correction of any deficiencies in the electrical system.
 - 1.4 **Contract Drawings**
 - 1.4.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.4.2 The Contract Drawings for the electrical system work are diagrammatic performance drawings, intended to convey the scope of work and indicate the approximate sizes and locations of equipment and outlets. The Drawings do not intend to show Designer's Architectural, Mechanical or Structural details.
 - 1.4.3 Do not scale or measure Contract Drawings, but obtain information regarding accurate dimensions, from the dimensions shown or by site measurements. Follow the Contract Drawings for laying out the work.
 - 1.4.4 Make, at no additional cost, any changes or additions to materials and equipment necessary to accommodate Structural conditions (offsets around beams, columns, etc.).
 - 1.4.5 Alter at no additional cost, the location of materials and/or equipment as directed, provided that the changes are made before installation, and do not necessitate additional materials.
 - 1.4.6 Change location of termination panels and devices at no extra cost providing cable length increase resulting from relocation does not exceed 3m (10') and information is given before installation.
 - 1.4.7 Confirm at the site the exact location of equipment.
 - 1.4.8 Any miscellaneous materials, hardware, devices, wiring, etc., not specifically described, but required for the installation and operation of the electrical system, shall be provided and included as part of the Bid.
 - 1.5 **Materials and Equipment**
 - 1.5.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
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- 1.5.2 All materials and equipment shall be completely new and unused products of only the most recent manufacturer model or version number, CSA or UL certified, and manufactured to the Standards specified.
 - 1.5.3 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the local Inspection Department.
 - 1.5.4 No damaged, chipped or marked equipment or materials will be accepted and must not be installed.
- 1.6 **Shop Drawings**
- 1.6.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.6.2 Submitted Shop Drawings must indicate details of construction, dimensions, capacities, weights and electrical performance and flame spread characteristics of equipment or materials, as well as specification reference Section number and project name.
 - 1.6.3 Shop Drawings shall be provided with sufficient space on the front for all Agency’s and Contractor’s “review” stamps.
 - 1.6.4 Work affected by submittal shall not proceed until review is complete.
 - 1.6.5 Review submittal prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the work and Contract Documents and bears the Stamp of Contractor.
 - 1.6.6 Changes made to the Shop Drawings by the Consultant will not affect the Contract Price.
 - 1.6.7 Submit Shop Drawings for all material and equipment referred to in Contract Document.
 - 1.6.8 All dimensions on the shop drawings shall be metric.
- 1.7 **Field Supervision**
- 1.7.1 Throughout the duration of the Project, a properly qualified electrical field Supervisor must be available at all times. The Supervisor who starts the work must not be changed unless requested by the Consultant/Agency, and written permission is obtained.
 - 1.7.2 In addition, provide proper office supervision of the work. The person responsible for office supervision must visit the site as often as necessary, to ensure work is properly performed, and attend weekly site meetings when so requested.
- 1.8 **Site Responsibilities**
- 1.8.1 Maintain work areas to be free of construction debris and waste. The disposal of all materials shall be the responsibility of the Contractor.
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- 1.8.2 Make all necessary arrangements to transport materials and equipment to and within the site. The Contractor shall be responsible for arranging for the use of any hoists, lifts, pulleys, winches, cranes or service elevators.
 - 1.8.3 The Contractor is responsible for complete storage, handling, delivery, and installation of all materials used in the performance of the work. Agency will not provide any storage space to the Contractor.
- 1.9 **Testing and Commissioning**
- 1.9.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.9.2 Provide testing and commissioning as per Testing and Commissioning Plan to be reviewed and approved by the Consultant/Commissioning Consultant for all items and their related components.
 - 1.9.3 Supply all required equipment maintenance and operations manuals, for Agency's staff use.
 - 1.9.4 Provide all required software for monitoring, annunciation and control/dispatch applications.
 - 1.9.5 CFMS Consulting Inc. is the Commissioning Consultant on this project.
- 1.10 **Other**
- 1.10.1 It is the responsibility of the Contractor to perform all cutting, patching and repair related to the electrical system work.
 - 1.10.2 Existing and adjacent finishes, work and structures shall be protected from damage resulting from work of this project.
- 1.11 **Record and As-Built Drawings**
- 1.11.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.11.2 The Contractor shall maintain one set of Contract Drawings on site. Clearly mark on these Contract Drawings all changes and deviations from the Contract Drawings and in particular mark the actual location of all feeder conduit locations.
 - 1.11.3 All deviations from the Contract Drawings shall be recorded on the "as-built" drawings, including those changes through Site Instructions or Change Orders.
 - 1.11.4 After the date of Substantial Performance, a set of the most recent Electrical System Drawings in AutoCAD Version 2021 format shall be obtained from the Consultant. These Contract Drawings shall be marked up to record clearly, neatly, accurately and promptly all locations of Electrical System deviations as a result of Change Orders, Agency's or Agency's Instruction, site conditions, etc. Utilize normal recognized CAD procedures that match the original drafting methodology. Submit the revised As-Built AutoCAD files and full-sized drawings (one sets) with
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changes clearly indicated for review and final presentation to the Consultant.

- 1.11.5 For the disk drawing submission described above, the contractor must include as part of the base bid price \$750.00 to have HCC Engineering supply the AutoCAD Version 2021 floor plans denoted as 'Issued for Construction' through file transfer site.

1.12 **Contract Documents**

- 1.12.1 For exact details and quantities, refer to the Specification and Contract Drawings.

1.13 **Selective Demolition**

- 1.13.1 Visit the site during non-mandatory vendors meeting, examine the existing conditions and become familiar with the extent of the necessary removal, relocation, reconnecting and re-routing of electrical equipment and wiring as necessary for the completion of the project.
- 1.13.2 Disconnect and remove existing conduit and wiring in partitions to be demolished and existing 'BX' cables, conduit and wire in ceiling where existing outlets, lighting fixtures, devices and mechanical equipment are to be removed and disposed of, off site.
- 1.13.3 Remove all branch circuit wiring and raceways originating from the existing receptacle panels. Wiring and raceways shall be removed back to the source panel. Circuits utilized to feed existing to remain mechanical equipment and other 120/208 volt sources to remain must be maintained.
- 1.13.4 Remove all existing electrical outlets and light switches as well as the associated wiring and raceways not being reused and/or not required for new layout (note: existing outlets and switches to be removed are not shown on the Contract Drawings). Provide blank cover plates at all locations where electrical and/or communications devices were removed in which partitions are not being demolished.
- 1.13.5 Be responsible and pay for any damage to the base building incurred by work of this Division, or repair to the satisfaction of the Consultant/Agency.

1.14 **Work to be performed by Base Building Contractor**

- 1.14.1 Refer to the Section 01 00 00 – General Requirements and other Sections of this Specification.

2. **PRODUCTS** – NOT APPLICABLE

3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 01, Common Work Results- Electrical**

1. GENERAL**1.1 General Requirements**

- 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
- 1.1.2 This section forms part of every section of Division 26.
- 1.1.3 Provide labour, materials, products, equipment and services to complete common work results- electrical work specified herein.
- 1.1.4 The work of this Division to be carried out by a Contractor who holds a valid Master Electrical Contractor license as issued by the Province that the work is being constructed.

1.2 Intent

- 1.2.1 It is the intent of the Contract Drawings and Specifications that the Contractor provide complete and operational systems as required.
- 1.2.2 Where differences occur, the maximum condition shall govern.
- 1.2.3 Any miscellaneous items, hardware, devices, wiring, etc., not specifically described, but required for the operation of the system, must be provided and included as part of the Bid.

1.3 Codes and Standards

- 1.3.1 Complete the installation of the work in accordance with latest editions of the Ontario Building Code, Electrical Safety Code, CSA, ULC, NFPA or other codes, as required.
- 1.3.2 Comply with Electrical Bulletins in force at time of Bid submission. While not identified and specified by number in this Division, they are to be considered as forming part of related Standards.
- 1.3.3 Abbreviations for electrical terms are as per CSA Z85.

1.4 Finishes

- 1.4.1 All shop finished metal equipment and enclosure surfaces, must be prepared by removal of rust and scale from the raw metal, degreasing, cleaning, application of rust resistance primer inside and outside, and at least two coats of finish enamel paint. Use factory standard colours unless otherwise specified. Colour reference numbers are Sico.
- 1.4.2 Paint exterior surfaces of indoor electrical equipment to manufacturer's standard.
- 1.4.3 Clean and touch-up (to the Consultant/Agency's acceptance) surfaces of shop-finished equipment that is scratched or marred during shipment or installation, so as to match original paint.
- 1.4.4 Clean and prime exposed non-galvanized hangers, racks and fastening to prevent rusting. Colour to be selected by the Consultant/Agency.
- 1.4.5 Leave with the Agency, 0.22 gal. of paint of each colour used, in the form of liquid or spray, to allow for future touch-up of damaged areas.

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- 1.5 **Inserts, Hangers and Sleeves**
- 1.5.1 Provide hangers, inserts, sleeves and supports as required.
 - 1.5.2 Inserts are to be of lead shield type.
 - 1.5.3 Hangers must not be welded to structural steel members and burning of holes in structural steel is prohibited.
 - 1.5.4 Sleeves are to be of a type suitable for the application and be sealed and made watertight. Sleeves through concrete shall be sized for free passage of conduit and installed flush with underside of concrete slab and extend 100mm (4") above finished floor unless otherwise shown.
- 1.6 **Mounting Heights**
- 1.6.1 Mounting height of equipment is from finished floor to center line of equipment unless specified or indicated otherwise.
 - 1.6.2 If mounting height of equipment is not indicated, verify with Agency before proceeding with installation or match mounting heights of devices of the existing building.
- 1.7 **Agency's Instruction and Trial Usage**
- 1.7.1 Instruct the Agency's operating personnel in the startup, operation, care and maintenance of all the equipment. All equipment to be tested, operational and commissioned before instruction. Provide sheets for signatures of Agency's representative and operating personnel present at each instruction period.
 - 1.7.2 Arrange and pay for the service of the manufacturer's factory service Engineer/Technician to supervise the start-up of his equipment installation, and to check, adjust, balance and calibrate components.
 - 1.7.3 Provide these services for such period, and for as many visits as necessary to ensure that the Agency's operating personnel are conversant with all aspects of its care and operation.
 - 1.7.4 When commissioning is included in the contract:
 - .1 Prior to any instruction sessions, commissioning coordinator shall submit check lists of each system or equipment indicating their operation status for acceptance by the Agency.
 - .2 Coordinate all instruction sessions to suit Agency's operation personnel schedule. Submit proposed instruction session schedule c/w training agenda three weeks prior to session start date to Agency for review.
 - 1.7.5 The Agency's operating personnel must be permitted to operate the systems under the contractor's supervision for a reasonable period of time prior to Substantial Completion of Contract. This use shall not be misconstrued as acceptance of the equipment.
- 1.8 **Plywood Backboard**
- 1.8.1 Supply and install all plywood backboards required for the work of this Division. Plywood to be highest quality fire retardant fir. 1200mm wide x 2400mm high (4'-0" wide x 8'-0" high), 19mm (3/4") thick unless otherwise
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- specified. Prime and paint backboards on both sides with fire retardant paint, equal to CGSB spec. #1-GP-151M, of a colour to match the equipment and services mounted thereon as defined in "Finishes" above. Do not paint over fire rated stamps.
- 1.8.2 Plywood backboards are to be provided for mounting the following surface wall mounted equipment:
- .1 Cabinets.
 - .2 Contactors.
 - .3 Control Panels
 - .4 Disconnect Switches.
 - .5 Junction Boxes 600mm (2'-0") square and larger.
 - .6 Pull Boxes.
 - .7 Panel Boards.
 - .8 Splitters
 - .9 Transient Voltage Surge Suppression Units.
 - .10 External Breakers
- 1.8.3 Where practical, group devices on a common backboard.
- 1.9 **Protection**
- 1.9.1 Protect exposed live equipment during construction for personnel safety.
- 1.9.2 Shield and mark live parts "LIVE 600 VOLTS", or with appropriate voltage in English.
- 1.10 **Protection**
- 1.10.1 Clean devices and other surfaces that have been exposed to construction dust and dirt. Clean the insides and outsides of panels and other electrical equipment and completely remove all debris and tools from the project.
- 1.11 **Sealing**
- 1.11.1 Where cables or conduits pass through non fire-rated floors, walls or roof, provide internal and external sealing thereto.
- 1.11.2 Retain the service of a specialty sealant contractor for the work required.
- 1.11.3 Comply with manufacturer's installation instructions for all sealant applications.
- 1.11.4 For non-fire rated locations, Sealant shall be silicone, that meets requirements of CGSB 19-GP-23, for the size of the joint required, and the types of materials being bonded.
- 1.11.5 For fire rated locations, the fire stop shall meet the requirements of UL with regards to the type of assembly and the fire separation.
- 1.11.6 Provide architecturally approved air barrier seals and vapor barrier seals to electrical items passing through or terminating within walls, roofs and decks, humidity controlled areas and pressurized areas.
- 1.11.7 All materials used for fire stopping of penetrations must be Hilti Limited manufactured product only.
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- 1.12 **Sprinkler Proofing**
 - 1.12.1 All areas of this building are protected by a wet sprinkler system. All electrical equipment to be configured for installation in such an environment.

- 1.13 **Warning Signs**
 - 1.13.1 Provide warning signs, as specified to meet requirements of Department of Labor Safety Inspection, Inspection Department, Authorities having jurisdiction and the Consultant/Agency.
 - 1.13.2 Use decal signs, in English minimum as required by Authorities/ Consultant/Agency.

- 1.14 **Wire Pulling Lubricant**
 - 1.14.1 Lubricant to be non-corrosive and NFPA 70 approved for the type of cable used.
 - 1.14.2 Lubricants to be soap or wax based, depending upon application. Use soap based for short runs and for semi-conducting insulated wires, and wax based for long runs.

- 2. **PRODUCTS** – NOT APPLICABLE

- 3. **EXECUTION** – NOT APPLICABLE

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 20, Wire and Box Connectors (0-1000V)-
Electrical**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
 - 1.2 **Scope of Work**
 - 1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of wire and box connectors as indicated on the Contract Drawings and specified in this section of the Specification.
2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Pressure type wire connectors are to be manufactured to CSA C22.2 No.65. Clamps and connectors are to be manufactured to CSA C22.2 No. 18.
 - 2.1.2 Building Wire Connectors shall be:
 - .1 For wire sizes up to #6 AWG - Ideal “Wing Nut” or Gardner - Bender “Wing Gard”.
 - .2 For Wire Sizes #4 AWG and larger:
 - .1 End to end splices - Burndy YS.
 - .2 Parallel splices - Burndy YC & YH (CU) or YHO & YHD (CU / AL).
 - .3 At studs and bus bars - Burndy YA (CU) or YA-A (CU / AL).
 - .4 Two or three conductors in parallel - Burndy KA-U (CU / AL).
 - 2.1.3 Cable connectors shall be:
 - .1 For armored TECK cables, watertight type, with open compounded head - T&B series “Spin-on 2” with corrosion resistant boot.
 - .2 For armored cables steel type with nylon insulated throat - T&B “TITE-Bite”.
 - .3 Clamps or connectors for armored cable, flexible conduit non-metallic sheathed cable shall be as required.
3. **EXECUTION**
 - 3.1 **Installation**
 - 3.1.1 Remove insulation carefully from ends of conductors and:
 - .1 Install connectors and tighten as recommended by manufacturer.
 - .2 Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - 3.1.2 Install bushing stud connectors in accordance with NEMA 1Y-2.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 21, Wire and Cables (0-1000V)- Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of building wire as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Materials****2.1.1 Wire in Conduit:**

.1 Conductor material to be annealed commercial grade, copper, 98 percent conductivity, up to #10 AWG solid, with RW90 insulation, #8 and larger, stranded, with RW90 insulation, unless noted otherwise, 300V rating for fire alarm, security and other low voltage circuits, 600V rating for 120 / 208V circuits, 1000V rating for 230 / 400V circuits, 1000V rating for 277 / 480V circuits, 1000V rating for 347 / 600V circuits.

2.1.2 Colour Coding (must be approved by ESA Field Inspector):

.1 Two conductor, 1 phase: 1 black, 1 white.
Three conductor, 1 phase: 1 red, 1 black, 1 white.
Three conductor, 3 phase: 1 red, 1 black, 1 blue.
Four conductor, 3 phase: 1 red, 1 black, 1 blue, 1 white.

.2 Ground wires: green.

2.1.3 Low voltage Armored Cables Type AC-90:

.1 Type to be AC-90, Multi-conductor, with solid, annealed commercial grade 98 percent conductivity tinned copper conductors and cross-linked polyethylene with R90 insulation, 600 volt rating, on #10 and #12 size only.

.2 Colour Coding:
Two conductor, 1 phase: 1 black, 1 white.
Three conductor, 1 phase: 1 black, 1 red, 1 white.

.3 Grounding to be uninsulated, solid copper, with impregnated paper separator.

2.1.4 Low voltage Armored Cables - TECK:

.1 Type to be TECK, single conductor with annealed. Class B, stranded copper conductors and cross linked polyethylene, RW90 insulation, 1000 volt rating for #8 AWG and larger.

.2 The inner and outer jackets to be PVC "Flamenol" suitable for – 40°C, with mylar tape separator and aluminum strip, armour helically wound and interlocked.

2.1.5 Two Hour Fire Rated Cable - Mineral Insulated

.1 Mineral Insulated Cables:

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PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 21, Wire and Cables (0-1000V)- Electrical**

- .1 Mineral insulated cables shall be manufactured to CSA C22.2 No. 124.
- .2 Conductors are to be solid, bare, soft annealed copper, sized as required.
- .3 Insulation to be compressed powdered magnesium oxide, to form compact homogeneous mass throughout entire length of cable.
- .4 Overall covering to be annealed seamless copper sheath, type LW MI, rated 600 volt, 250°C.

3. EXECUTION**3.1 Installation****3.1.1 General:**

- .1 Wire shall be installed in conduit and sized for the connected load(s) and protection as required, unless otherwise specified.
- .2 Provide a dedicated #12AWG neutral from panel board to wiring devices ran with each of Phase 'A,' B,' C' conductors (i.e: dedicated neutral per phase). Minimum power conductor wire size shall be #12 AWG.
- .3 Minimum power conductor wire size shall be #12 AWG, unless otherwise stated. Home runs in excess of 30 m (90') for circuits protected by a 15A over current device, shall be #10 AWG.
- .4 The current carrying capacity of the feeders, sub feeders and branch circuit conductors shall be sized to equal or better than shown on the drawings. If wire or cable sizes with equivalent current carrying capacity other than that specified is used, ensure that the voltage drop shall not be more than 2%.
- .5 The number of wires indicated for various systems is intended to show the general scheme only. The required number and type of wires shall be installed in accordance with the manufacturer's diagrams and with the requirements of the installation.

3.1.2 Wire in Conduit:

- .1 Provide pigtails at all outlets for wiring devices. All neutrals and branch circuits shall be connected in each outlet box to avoid a break in the neutral or the circuit wire when fixture or wiring device is disconnected.
- .2 At each junction, pull and outlet box make a 360 degree loop of the stripped uncut ground conductor under the ground screws.

3.1.3 Low Voltage Armored Cables - (Feeders):

- .1 Do not directly bury in or below concrete slabs or walls.
- .2 Do not encircle single conductor cable with ferrous metal.
- .3 No splices will be permitted.
- .4 Single conductors of the three or four wire circuit shall be run with uniform spacing of not less than one cable diameter throughout the feeder length.

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- .5 Use wood throated cable clamps to ensure proper and uniform cable spacing.
 - .6 Where cables are installed on walls, provide mechanical protection over them up to 2.4m (8'-0") above finished floor, using a 12 gauge U section aluminum cover.
 - .7 Cable connections to all enclosures, boxes and panels shall be by means of a watertight malleable aluminum connector.
- 3.1.4 Mineral Insulated Cable:
- .1 Run cable exposed as required, securely supported by straps.
 - .2 Make cable terminations by using factory made kits.
 - .3 Use thermoplastic sleeving over bare conductors at cable terminations.
 - .4 Do not splice cable.
 - .5 MI cables must be rigidly supported at maximum spacing of 1m (39"). Do not use aluminum products for support.
 - .6 MI cables shall be used for emergency system feeders and branch circuits requiring a one (1) hour fire rating.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 27, Grounding – Primary – Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of grounding as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Materials**

2.1.1 All grounding conductors stranded copper, bare or insulated as indicated on Contract Drawings and in Specifications.

2.1.2 All ground wires are to be FT-4 rated factory green. Green tape, spray paint or any other means to alter the colour of the conductor is not permitted.

2.1.3 Use Cadweld or Burndy Thermoweld process for all weld connections. AMP of Canada Ltd. Wrench-Lok grounding connectors are an acceptable equivalent to welded connections.

2.1.4 All ground connectors to be designed and approved for grounding purposes.

3. EXECUTION**3.1 Installation**

3.1.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories in accordance with CSA C22.2No 0.4 and requirements of local authority having jurisdiction.

3.1.2 Ground all conduit, and all non-current carrying metal parts, equipment cases, frames, bases, brackets, etc.

3.1.3 Grounding of all trays, AFRCRs, racks, cabinets, etc. provided by the electrical contractor.

3.1.4 Ground each piece of fixed equipment back to the panel feeding that equipment, by one of the following methods:

.1 Conduit shall **not** be utilized for the ground return conductor.

.2 Where the conduit is flexible, install a separate bare soft drawn copper ground inside the conduit. At the switchboard or distribution panel, provide a grounding bushing, loop the ground conductor through the bushing, and connect to the switchboard ground bus. At the fixed equipment, connect to an internal ground bus, or connect to the inside of the metal enclosure utilizing approved screws and connectors (remove all paint).

.3 Run a separate (dedicated) insulated ground wire in all conduits to all devices and fixtures.

.4 Where equipment is fed by a multi-conductor power cable, provide a ground conductor in the cable. At the switchboard or panel,

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PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 27, Grounding – Primary – Electrical**

- connect to the ground bus. Use a grounding connector on the cable for positive grounding of the metallic sheath. Loop the ground wire to the grounding connector.
- .5 Run a separate ground wire in all flexible conduits. Connect each end to ground bus or lug or connector.
 - .6 Where mechanical protection is required for insulated grounding conductors install in rigid conduit.
- 3.1.4 Provide weld connection or wrench type grounding connectors for:
- .1 All connections between grounding conductors.
 - .2 All connections to building steel.
 - .3 All connections between grounding conductors and cable lugs.
- 3.1.5 Arrange grounding to provide the minimum impedance paths for ground fault currents. Provide any additional grounding required for approval by the inspecting authorities.
- 3.2 **Equipment Grounding**
- 3.2.1 Install grounding connections to typical equipment including non-current carrying metal parts of transformers, generators, motors, circuit breakers, cable sheaths, raceways, pipe work, screen guards, switchboards, meter and relay cases, any exposed building metal and building structural steel.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 29, Hangers and Supports for Electrical Systems**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
 - 1.2 **Scope of Work**
 - 1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of Hangers and Supports for Electrical Systems as indicated on the Contract Drawings and specified in this section of the Specification.
2. **PRODUCTS**
 - 2.1 **Support Channels**
 - 2.1.1 U shape pre-galvanized steel, size 41mm x 41mm x 22mm (1-5/8" x 1-5/8" x 7/8"), for surface mounting, suspending, or inserting into poured concrete walls and ceilings as required.
 - 2.1.2 All channel fittings to suit channel type.
 - 2.1.3 All other fittings to suit equipment weight, location and surface as required.
3. **EXECUTION**
 - 3.1 **Installation**
 - 3.1.1 Secure plywood backboards, channels, luminaires, equipment and fittings to wood with wood screws, to solid masonry, tile and plaster surfaces with lead anchors, to poured concrete with self-drilling expandable inserts, and to hollow masonry walls with toggle bolts.
 - 3.1.2 All ceiling mounted equipment shall be independently supported from the structure. Do not support equipment from ceiling support system.
 - 3.1.3 Support equipment, conduit or cable using clips, spring loaded bolts, or cable clamps designed as accessories to basic channel members.
 - 3.1.4 Fasten exposed conduit or cables to building using:
 - .1 Two-hole steel straps to secure surface conduits and cables 50mm (2") and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50mm (2").
 - .3 Beam clamps to secure conduit to exposed steel work.
 - 3.1.5 For suspended support system:
 - .1 Support individual cable or conduit runs with 6mm (1/4") diameter threaded rods and spring clips.
 - .2 Support two or more cables or conduits on channels support by 6mm (1/4") diameter threaded rod hangers where direct fastening to building construction is impractical.
 - .3 Support suspended luminaire using two or more lengths of Weldless "Single Jack", bright zinc plated steel chain, American Standard #10 gauge, 13 links per foot.

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Appendix 8.2, Division 26, Section 26 05 29, Hangers and Supports for Electrical Systems

- 3.1.6 Provide metal brackets, frames, hangers, clamps and related type of support structure where indicated or as required to support conduit and cable runs.
- 3.1.7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- 3.1.8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- 3.1.9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission and approval of Consultant.
- 3.1.10 Install Hangers and Supports for Electrical Systems as required for each type of equipment, cable and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 31, Splitters, Junction Boxes, Pull Boxes and Cabinets**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Furnish all labour, materials and equipment necessary to supply and install splitters, junction boxes, pull boxes and cabinets as indicated on the Contract Drawings and specified herein.

2. PRODUCTS**2.1 Splitter Troughs**

2.1.1 Splitter trough construction is to be based on CSA C22.2 No. 76.

2.1.2 They shall have sheet steel enclosure, with welded corners and formed hinged cover suitable for locking in closed position.

2.1.3 Connection bars are to match required size and number of incoming and outgoing conductors as indicated.

2.1.4 Provide at least three spare terminals on each set of lugs in splitter troughs less than 400A and feed through lugs where required.

2.1.5 Provide double lugs for neutrals where required.

2.1.6 Enclosures shall be CSA/EEMAC Type 1 modified to sprinkler proof enclosure.

2.2 Junction and Pull boxes

2.2.1 Junction and pull boxes construction is to be based on CSA C22.2 No. 40.

2.2.2 They shall be suitable for surface mounting and be of welded steel construction with screw-on flat covers.

2.2.3 For flush-mounted pull and junction boxes, provide covers with 25mm (1") minimum extension all around.

2.3 General Cabinets

2.3.1 Type D or E to be sheet steel, for surface mounting, complete with screw on cover (D) or hinged door (E), and return flange overlapping sides, handle and catch.

3. EXECUTION**3.1 Splitter Installation**

3.1.1 Install splitter troughs where required. Mount plumb, true and square to the building lines.

3.1.2 Extend splitters for full length of equipment arrangement except where indicated otherwise.

3.1.3 Provide watertight connections for all services entering the top of the splitter trough.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 26, Section 26 05 31, Splitters, Junction Boxes, Pull Boxes and Cabinets

- 3.2 **Junction, Pull Boxes and Cabinet installation**
 - 3.2.1 Install junction, pull boxes and cabinets in inconspicuous but accessible locations.
 - 3.2.2 Only certain junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30m (100') of conduit run between boxes, and after every two (2) 90 degree bends.

- 3.3 **Identification**
 - 3.3.1 Install nameplates.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 32, Outlet and Conduit Boxes and Fittings**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of Outlet and Conduit Boxes, and Fittings as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Outlet and Conduit boxes - General**

2.1.1 The construction of outlet boxes, conduit boxes and fittings is to be based on:

- .1 Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- .2 Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, [ferrous alloy] [aluminum], Type FD, with gasketed cover.
- .3 Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C

2.1.2 Boxes shall be suitable for the utilization voltage.

2.1.3 Combination boxes shall have barriers where outlets for more than one system are grouped.

2.1.4 Recessed 100mm (4") square or larger outlet boxes shall be complete with single or ganged plaster rings to suit application.

2.2 Sheet Steel Outlet boxes

2.2.1 Electro-galvanized steel single and multi-gang device boxes for flush installation, shall be minimum size 75mm x 50mm x 37mm (3" x 2" x 1-1/2") unless otherwise specified or required. 100mm (4") square outlet boxes shall be used when more than one conduit enters one side, with extension and plaster rings as required.

2.2.2 Boxes for door switches and push buttons shall be sized as required.

2.2.3 Utility boxes for connection to surface mounted EMT conduit, shall be minimum 100 x 54 x 48mm (4" x 2-1/8" x 1-7/8") size.

2.2.4 Square or octagonal outlet boxes for lighting fixture outlets, shall be minimum 100mm (4") size.

2.2.5 Square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls, shall be minimum 100mm (4") size.

2.3 Masonry Boxes

2.3.1 Electro-galvanized steel masonry single and multi-gang MBD boxes shall be used for flush mounted devices in exposed block walls.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 32, Outlet and Conduit Boxes and Fittings**

- 2.4 **Concrete boxes**
 - 2.4.1 Electro-galvanized sheet steel concrete boxes shall be used for flush mounting in concrete, with matching extension and plaster rings as required.

- 2.5 **Conduit Boxes**
 - 2.5.1 Cast FS or FD ferrous boxes with factory-threaded hubs and mounting feet shall be used for outlets connected to surface mounted rigid conduit.

- 2.6 **PVC Boxes**
 - 2.6.1 F series and octagon boxes shall be moulded type, with fastening ears and screwed secured covers as required.

- 2.7 **Fittings - General**
 - 2.7.1 Bushing and connectors shall be with nylon insulated throats.
 - 2.7.2 Provide knock-out fillers to prevent entry of foreign materials.
 - 2.7.3 Use conduit outlet bodies for conduit up to and including 32mm (1-1/4") and pull boxes for larger conduits.
 - 2.7.4 Provide double locknuts and insulated bushings on sheet metal boxes.

- 2.8 **Fish Cord**
 - 2.8.1 Polypropylene of a strength suitable for tension to be pulled.

- 3. **EXECUTION**
 - 3.1 **Installation**
 - 3.1.1 Support boxes independently of connecting conduits.
 - 3.1.2 Fill boxes with paper, foam sponges or similar approved material to prevent entry of construction material.
 - 3.1.3 Size box wiring chambers in accordance with Electrical Safety Code.
 - 3.1.4 Gang boxes together where wiring devices are grouped.
 - 3.1.5 Provide matching blank cover plates for boxes without wiring devices.
 - 3.1.6 Use combination boxes where outlets for more than one system or voltage are grouped.
 - 3.1.7 For flush installations, mount outlets flush with finished wall using plaster rings to permit wall finish to come within 5mm (1/4") of opening.
 - 3.1.8 Provide correct size of openings in boxes for conduit and armored cable connections. Reducing washers are not allowed.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 34, Conduits, Conduit Fastening and Conduit Fittings**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
 - 1.2 **Scope of Work**
 - 1.2.1 Furnish all labour, materials and equipment necessary to supply and install conduits, conduit fastening, and conduit fittings as indicated on the Contract Drawings and specified herein.
2. **PRODUCTS**
 - 2.1 **Conduits**
 - 2.1.1 Rigid and epoxy coated conduit shall be threaded, galvanized steel and shall be manufactured to CSA C22.2 No. 45.
 - 2.1.2 Electrical metallic tube (EMT) conduit and couplings shall be manufactured to CSA C22.2 No. 83.
 - 2.1.3 Flexible metal conduit and liquid tight – flexible metal conduit shall be manufactured to CSA C22.2 No. 56.
 - 2.2 **Conduit Fastenings**
 - 2.2.1 Conduit straps shall be steel, double hole for rigid or EMT conduit. Single hole straps are not acceptable.
 - 2.3 **Conduit Fittings**
 - 2.3.1 Fittings for conduits shall be manufactured to CSA C22.2 No.18. Provide coatings as per conduit.
 - 2.3.2 Fittings for rigid conduit shall be steel threaded type.
 - 2.3.3 Fittings for EMT conduit to be steel set screw type fittings.
 - 2.3.4 Fittings for flexible conduit and exposed conduit outdoors to be liquid-tight type, straight or angled threaded for rigid and compression for EMT conduit.
 - 2.3.5 Expansion fittings for rigid or EMT conduits shall be of the watertight type, with an integral bonding assembly, suitable for deflection in all directions.
 - 2.4 **Pulling Cables**
 - 2.4.1 Pulling cables shall be 1/4" diameter polypropylene and of a strength suitable for tension to be pulled.
 - 2.5 **Waterproof Membrane**
 - 2.5.1 Conduits penetrating waterproof membranes shall be PEM #6372.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 34, Conduits, Conduit Fastening and Conduit Fittings**

3. EXECUTION**3.1 Installation (General)**

- 3.1.1 The conduits for the following circuits and systems shall be run separately:
- .1 120/208 volt utility power distribution.
 - .2 347/600 volt utility power distribution.
 - .3 120/208 volt emergency power distribution.
 - .4 347/600 volt emergency power distribution.
 - .5 Normal power to luminaries.
 - .6 Emergency power to luminaries and exit signs.
 - .7 Fire alarm system multiplex loop devices.
 - .8 Fire alarm system signaling devices.
 - .9 Access Control and CCTV System devices.
 - .10 Telephone and data systems.
 - .11 Control wiring.
- 3.1.2 All conduits to be surface mounted (exposed, EMT) in mechanical and electrical service spaces and rooms and concealed elsewhere unless otherwise shown.
- 3.1.3 Wiring in ceiling spaces and in all partitions shall be EMT.
- 3.1.4 Exposed conduits shall be installed to conserve headroom and cause minimum interference in spaces through which they pass.
- 3.1.5 Use rigid conduit up to 2.4m (8' -0") above finished floor where exposed indoors
- 3.1.6 Use RGS conduit PVC coated galvanized rigid steel Robroy Permacote in all outdoor locations and in areas that are not environmentally controlled.
- 3.1.7 Use electrical metallic tubing (EMT) above grade, and above 2.4m (8'-0") above finished floor where exposed indoors.
- 3.1.8 Use flexible liquid tight metal conduit for connection to motors, and transformers.
- 3.1.9 Bend conduit without heating. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- 3.1.10 Mechanically bend conduit over 20mm (3/4") diameter.
- 3.1.11 Field threads on rigid conduit must be of sufficient length to draw conduits tight.
- 3.1.12 Install pulling cables in all conduits that are to remain "empty".
- 3.1.13 A maximum of two (2), 90 degree bends, or equivalent up to 180 degrees, will be permitted without installation of a pull box. Radius of bends must be no less than ten (10) times the conduit diameter.
- 3.1.14 Conduits must be dry, before installing wires.
- 3.1.15 Support all branch conduits from building structure. Do not clip conduits to ceiling hangers, sprinkler pipes, plumbing or BAS wiring hangers.

3.2 Surface Conduits

- 3.2.1 Surface conduits shall be run parallel or perpendicular to building lines.
- 3.2.2 Conduits located near any heat producing equipment shall have 1500mm (5'-0") clearance.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 05 34, Conduits, Conduit Fastening and Conduit Fittings**

- 3.2.3 Conduits adjacent to structural steel, beams or columns shall be run within the flanged portion, unless otherwise shown.
 - 3.2.4 Group exposed conduits on surface or suspended channels.
 - 3.2.5 Do not pass conduits through structural members except where indicated and approved by landlord.
 - 3.2.6 Do not locate conduits less than 75mm (3") parallel to steam or hot water lines. Provide a minimum clearance of 25mm (1") at crossovers.
- 3.3 **Conduit Size**
- 3.3.1 The minimum conduit size shall be 21mm (3/4").
 - 3.3.2 All un-dimensioned conduits in the Contract Drawings are 21mm (3/4").
- 3.4 **Expansion Fittings**
- 3.4.1 Conduit expansion fittings shall be provided on all conduits crossing expansion joints, and at maximum of 60m (200') spacing.
 - 3.4.2 Install expansion fittings perpendicular to expansion joint.
 - 3.4.3 Refer to Contract Drawings for location of expansion joints.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 27 26, Wiring Devices Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of wiring devices as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Standards**

2.1.1 Construction of manually operated general purpose AC switches is to be based on CSA C22.2 No. 111, snap switches on CSA C22.2 No.55, and receptacles, plugs and similar wiring devices on CSA C22.2 No. 42.

2.1.2 Devices shall be Specification Grade and of one manufacturer throughout

2.2 Switches

2.2.1 Switches shall be suitable for the voltage and load controlled and shall be single pole or three way as indicated.

2.2.2 They shall have terminal holes approved for #10 AWG wire, silver alloy contacts, and urea or melamine moldings for parts subject to carbon tracking.

2.2.3 They shall be suitable for back and side wiring, and rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

2.2.4 White decorator style switches shall be used for 120V circuits, in all finished areas.

2.2.5 White decorator style switches shall be used for 347V circuits in all areas.

2.3 Receptacles

2.3.1 Duplex receptacles shall be NEMA Type 5-15R, 125 volt, 15 Amp, U ground and NEMA Type 5-20R (T Slot), 125 volt, 15/20 Amp, U Ground.

2.3.2 They shall be decorator style.

2.3.3 They shall be suitable for #10 AWG, back and side wiring, have break-off links for use as split receptacles and shall have eight (8) back wired entrances, four (4) side wiring screws and double wipe contacts with riveted grounding contacts.

2.4 Coverplates

2.4.1 Cover plates for wiring devices to: CSA-C22.2 No 42.1

2.4.2 Cover plates from one manufacturer throughout the project.

2.4.3 Cover plates shall be white in finished areas and stainless steel in unfinished areas.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 27 26, Wiring Devices Electrical**

- 2.4.4 Use die cast aluminum cover plates for wiring devices mounted for surface mounted FS or FD boxes, and pressed steel coverplates for utility surface boxes.
- 2.4.5 Use weatherproof spring-loaded, cast aluminum coverplates complete with gaskets for exterior mounted single receptacles and switches, or where indicated.

3. EXECUTION**3.1 Installation****3.1.1. Switches:**

- .1 Install single throw switches with lever in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.

3.1.2. Receptacles:

- .1 Install receptacles in gang type outlet box when more than one device is required in one location.

3.1.3 Cover plates:

- .1 Protect cover plate finish until painting and other work is finished or install after painting is complete.
- .2 Do not use flush type coverplates on surface mounted boxes.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 28 14, Fuses – Low Voltage Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of low voltage fuses as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Fuses - General**

2.1.1 Plug and cartridge fuses shall be manufactured to CSA C22.2 No. 59.

2.1.2 HRC fuses shall be manufactured to CSA C22.2 No. 106 and to have interrupting capability of 200,000A symmetrical.

2.1.3 Fuses shall be the product of one manufacturer.

2.1.4 Fuse type reference L1, L2, J1, R1, etc. have been adopted for use in this specification.

2.2 Fuse Types

2.2.1 HRCI - J fuses.

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.

.2 Type J2, fast acting.

2.2.2 HRC - L.

.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.

.2 Type L2, fast acting.

2.2.3 HRC - R fuses (For UL Class RK1 fuses, peak let-through current and I²t values not to exceed limits of UL 198E table 10.2.)

.1 Type R1, (UL Class RK1), time delay capable of carrying 500% of its rate current for 10 seconds minimum, to meet UL Class RK1 maximum let-through limits.

.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.

.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

2.2.4 HRCII - C fuses.

3. EXECUTION**3.1 Installation**

3.1.1 Install fuses in mounting devices immediately before energizing circuit.

3.1.2 Ensure circuit fuses fitted to physically matched mounting devices. Install Class R rejection clips for HRCI-R fuses.

3.1.3 Ensure correct fuses fitted to assigned electrical circuit.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 26, Section 26 28 14, Fuses – Low Voltage Electrical

- 3.1.4 Fuses protecting motor loads and transformers to be type J1 for up to and including 600A and L1 for ratings above 600A.
- 3.1.5 Fuses protecting feeder circuits to be type J2 for up to and including 600A and type L2 ratings above 600A.
- 3.1.6 Fuses protecting other services or equipment shall be of the type required for that purpose.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 28 23, Disconnect Switches – Fused and Non-Fused**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
 - 1.2 **Scope of Work**
 - 1.2.1 Provide all labour, materials, materials, products, equipment and services for supply and installation of fused and non-fused disconnect switches as indicated on the Contract Drawings and specified in this section of the Specification.
2. **PRODUCTS**
 - 2.1 **Equipment**
 - 2.1.1 Fuseholder assemblies to CSA C22.2 No. 39
 - 2.1.2 Fusible and non-fusible disconnect switches shall be installed in CSA enclosures.
 - 2.1.3 Provide for padlocking in “OFF” switch position by one lock.
 - 2.1.4 Provide a mechanically interlocked door to prevent opening when handle in “ON” position.
 - 2.1.5 Provide fuses sized as required.
 - 2.1.6 Fuseholders in each switch shall be suitable without adapters, for type of fuse as specified.
 - 2.1.7 Provide quick make, quick break action.
 - 2.1.8 Provide ON-OFF switch position indication on switch enclosure cover.
 - 2.1.9 Enclosures shall be CSA/NEMA Type 1 modified to sprinkler proof enclosure.
3. **EXECUTION**
 - 3.1 **Installation**
 - 3.1.1 Install disconnect switches with or without fuses as required.
 - 3.1.2 Provide watertight connections for all services entering the top of the disconnect switches.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 41 13, Lightning Protection Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, materials, products, equipment and services for selective demolition, supply and installation of lightning rod protection system as indicated on the Contract Drawings and specified in this section of the Specification.

.1 System

.1 Lightning rod protection system consisting of lightning rod points, interconnecting braid cable, ground drops and ground grid.

.2 Description of Work

.1 Confirm materials and details of related construction, such as type of flashing, etc.

.3 Standard Specifications

.1 Installation to be in accordance with NFPA 780 and CSA B72-M87 for “Installation of Lightning Rods”. Provide UL master label.

1.3 System Description

1.3.1 System: lightning rod protection system consisting of lightning rod points, interconnecting braid cable, ground drops and ground grid. The system is subject to approval by the authority having jurisdiction.

1.3.2 Description of work: selective demolition and installation in new areas, as shown on the Contract Drawings

1.3.3 Standard Specifications: Installation to be in accordance with NFPA 780 and CSA B72-M87 for “Installation of Lightning Rods”. Provide UL master label.

1.4 Performance of Work

1.4.1 The Contractor will engage and pay to the following Vendor to perform the work under this Section:

Burchell Lighting Protection Limited, Perth, Ontario, Tel: 613-264-0456

1.4.2 The Contractor will include the cost in the Stipulated Contract Price.

2. PRODUCTS**2.1 Components**

2.1.1 Lightning points: 460mm pin type, narrow base.

2.1.2 Lightning cable: approved braid copper.

2.1.3 Ground grid: 20mm x 3m copper weld ground rods with #2/0 stranded copper interconnecting conductor.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 41 13, Lightning Protection Electrical**

3. EXECUTION**3.1 Installation of System**

- 3.1.1 The lightning protection system shall be installed by a Contractor licensed to carry out such installations by the Provincial Fire Marshall.
- 3.1.2 Include air terminals, copper conductors, connection above roof, downleads, connection below grade all as required to meet the requirements of the Code.
- 3.1.3 The roof cables shall form a closed loop around the periphery of the roof as shown on Contract Drawings. The roof cables shall be laid in and covered by gravel and secured with manufactured bronze flat roof cables anchors.
- 3.1.4 Install solid copper aerial terminals (lightning points) and connect to perimeter loop system.
- 3.1.5 Bond all metal masses on the roof to the perimeter loop system using #3/0 copper braid cables
- 3.1.6 At downlead cable locations, provide a suitable copper tube soldered to a copper plate. Fasten copper plate to roof with pitch. Provide suitable pitch pocket pot and solder roof cable to copper tube to ensure waterproof joints.
- 3.1.7 Extend downlead copper from the roof, within columns and connect to ground loop.
- 3.1.8 Provide a closed loop of #2/0 bare copper grounding cable in the excavated portion of the building prior to pouring of floor slab. Bond the grounding cable to copper weld driven ground rods and to the water mains.
- 3.1.9 All connection between cable to ground rods, cable to cable, cable to air terminals and cable to steel connection shall be made using welded copper connection, "Cadweld" as supplied by Erico Products or Thermoweld as supplied by Burndy of Canada Ltd.
- 3.1.10 Modify existing to suit building extensions or grounding of new equipment on roof.
- 3.1.11 Ensure all terminals are securely fastened and any spring mounts are free to operate.
- 3.1.12 Test electrical conductivity across all connections and submit report to the Consultant.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 50 00, Interior Lighting Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services for supply and installation of interior lighting as indicated on the Contract Drawings and specified in this section of the Specification.

2. PRODUCTS**2.1 Lamp Standards**

2.1.1 Fluorescent lamps shall be manufactured to ANSI C78.

2.1.2 Incandescent, fluorescent and HID lamps shall be of one (1) manufacturer, either in total, or in groups defined by lamp type.

2.1.3 Ballast and lamps provided under this contract must be an approved combination by both respective manufacturers.

3. EXECUTION**3.1 Installation**

3.1.1 Lighting fixtures:

.1 Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

3.1.2 Lamp and Driver / Ballast Installation:

.1 Refer to luminaire schedule and Contract Drawings, for lamp and driver / ballast requirements.

.2 Install lamps only when the luminaires are clean.

.3 Ensure that lamps are suitable for luminaires before energization and lamp length and colours are that as specified. Report any discrepancies to the Consultant.

3.1.3 Luminaire Installation:

.1 Install luminaires accurately and carefully aligned complete with all mounting hardware. Ensure any suspension rods are vertical.

.2 All luminaires shall be supplied with accessory items such as yokes, plaster rings, frame adjusters, etc., where required for proper installation.

.3 At the time of date of “Substantial Completion” all luminaires, lenses, louvers and lamps must be clean, and the lamps illuminated.

3.1.4 Luminaire Support:

.1 All fixtures in finished ceilings must be chained by 2 points directly to main structure such that they are supported independently of the ceiling system.

.2 All fixtures in exposed ceiling areas (no T-bar or Drywall) shall be mounted on 1-5/8” unistrut, running the full length of the run of

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- fixtures. The unistrut is to be suspended from the ceiling deck by 9.5mm (3/8") threaded rod from unistrut between the joists. Do not puncture ceiling deck.
- .3 All lighting feeds for suspended fixtures shall be dropped from the deck or slab straight down into the fixture or raceway. Fixture to fixture conduits will not be permitted. Conduit must go to the deck then to the next fixture.
- 3.1.5 **Cleaning:**
- .1 All luminaires must be cleaned before lamping and installing lenses or louvres.
- .2 Use dry, clean, soft cloths if luminaires are dusty. Use mild solvents to clean soiled luminaires.
- 3.2 **Field Quality Control**
- 3.2.1 Verify correct lamp, position and operation of all luminaries.
- 3.2.2 **Test for Emergency Lighting:** Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- 3.2.3 Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 60 01, Electrical Identification Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services for supply and installation of electrical identification as indicated on the Contract Drawings and specified in this section of the Specification.

1.3 Manufacturer's Nameplates

1.3.1 Have the manufacturer's nameplates affixed to each item of all equipment showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase, horsepower, etc., and the name of the manufacturer and his address. Ensure that all stamped, etched or engraved lettering on plates is perfectly legible. Ensure that nameplates are not painted over. Where apparatus is to be concealed, attach the nameplate in an approved location on the equipment support or frame.

1.3.2 Ensure that panels and other apparatus which have exposed faces in finished areas do not have any visible trademarks or other identifying symbols. Mount nameplates behind doors.

2. PRODUCTS**2.1 Lamacoid Plates**

2.1.1 Green background with black engraved letters 10mm (0.4") high or 25mm (1") high as noted for normal power distribution.

2.1.2 Red background with black engraved letters 10mm (0.4") high or 25mm (1") high as noted for EPS power distribution.

2.2 Conductor Markers

2.2.1 Cable diameter less than 13mm (1/2") - Electrovert type Z.

2.2.2 Cable diameter 13mm (1/2") and larger - Electrovert #510 strap-on.

2.2.3 Colour - white with black markings except fire alarm and life safety system which shall be white with red markings.

3. EXECUTION**3.1 Conduit Services - Power**

3.1.1 Locate identification:

.1 Behind each access door.

.2 At each change of direction and at junction boxes.

.3 At not more than 10m (40') apart in straight runs of conduit behind removable enclosures such as lay-in type ceiling, but on both sides of sleeves through walls or floors.

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- .4 Above each floor or platform for vertical exposed conduits, preferably 1500mm (60") above floor or platform.
- .5 Use stencils and stencil paint or lamacoid plates on all conduits.
- .6 Use minimum 25mm (1") high letters.
- .7 The identification shall describe system voltage and service, i.e., "120 / 208 volt lighting to panel AA".

3.2 **Conduits And Outlet Boxes:**

- 3.2.1 Identify conduits and outlet boxes for the various systems by the use of the following distinctive colour paints. Apply a small area of paint to the inside of each outlet box, pull box and panel as it is being installed. Identify junction boxes in suspended ceiling areas with colour on both inside and outside.
 - .1 120 / 208 volt system. -Black
 - .2 Fire Alarm systems. -Red
 - .3 347/600 volt system. -Blue
 - .4 Security Alarm system -Orange
- 3.2.2 Use the colour coding as defined in NEC Section 210.
- 3.2.3 Where the existing colour coding differs from these Specifications, notify the Agency of colours used and maintain existing colour coding.

3.3 **Equipment Nameplates**

- 3.3.1 Identify all equipment listed below with lamacoid plates, letters 10mm (0.4") high, unless otherwise noted.
 - .1 Lighting and Power Panels - Plates to be on outsides of door. Typical identification: "Lighting Panel C 120/208V, 3PH, 4 W MAINS 225 AMP 18KA RMS. Supplied from Panel BB".
 - .2 Disconnect switches and starters - Plates to be mounted externally on switch cover. Typical identification: "Fan S4, 208V, 3PH".
 - .3 Transformers - Plates to be mounted externally on case. Typical identification: "Transformer TR-UPSA 225 KVA/416/120/208V, 3PH / 4W fed from Panel UPS A".
- 3.3.2 Secure with mechanical fastening devices except on the inside of panel doors where gluing will be acceptable.

3.4 **Wiring Colour Code**

- 3.4.1 Power and Lighting Conductors:
 - .1 Phase A - Red
 - .2 Phase B - Black
 - .3 Phase C - Blue
 - .4 Neutral - White
 - .5 Ground - Green
- 3.4.2 For sizes available in black only, use coloured tape markers at junction boxes and terminal points to match phase coding described above.
- 3.4.3 Band green isolated ground conductors with yellow tape.
- 3.4.4 Control conductors - Orange

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- 3.4.5 Fire Alarm System Conductors:
 - .1 Alarm initiating devices and manual pull stations - red and blue.
 - .2 Alarm signaling devices - black and white.

3.5 Conductor Markers

- 3.5.1 For power feeders, install markers at either end of the conductors where terminated inside of equipment to match wiring diagram conductor identification or panelboard circuit numbers. Typical identification Panel AA circuits - 21; use "AA-21". For a three phase circuit provide identification on phase A conductor only. For a single phase circuit provide identification on the phase conductor.
- 3.5.2 For Branch circuits supplying single phase and three phase devices such as receptacles and connections to equipment identify conductors at panel and in device outlet box. Install marker on phase conductor inside outlet box. Typical identification if device is connected to Panel B - circuit 14, marker identification "B-14".

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 26, Section 26 60 02, Testing and Commissioning of Electrical
Systems**

1. **GENERAL**
 - 1.1 **General Requirements**
 - 1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.
 - 1.2 **Scope of Work**
 - 1.2.1 Provide all labour, materials, products, equipment and services for testing and commissioning of all new equipment and component systems as indicated on the Contract Drawings and specified in this section of the Specification.
 - 1.2.2 Testing and commissioning on site will be witnessed by the Consultant and the Agency. Provide seven (7) days' notice in advance.
 - 1.2.3 Include the factory testing and approved certification, where required.
 - 1.3 **Completion of Work**
 - 1.3.1 All electrical systems and equipment shall be totally commissioned and operating before date of "Substantial Completion".
 - 1.3.2 Coordinate with other trades and the building operations staff for work which affects the operation of the electrical systems, before submitting request for testing and commissioning. Failing to comply, bear all costs including Agency's time cost, incurred for re-testing and re-commissioning.
 2. **PRODUCTS**
 - 2.1 **Materials**
 - 2.1.1 Provide all tools, equipment, labour and materials required to perform electrical testing and commissioning on site, as specified. Provide the test results report(s).
 3. **EXECUTION**
 - 3.1 **General**
 - 3.1.1 Perform site testing and commissioning only after all equipment is installed and operational.
 - 3.1.2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - 3.1.3 Provide two (2) copies of certificates of all factory and site testing in complete detail bearing in each case, the seal of the engineer responsible for the tests.
 - 3.1.4 Submit all test results for Consultant's review.
 - 3.1.5 All equipment or system deficiencies identified by factory or site testing procedures, to be corrected by the Contractor prior to obtaining a "Certificate of Substantial Completion".
 - 3.1.6 Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres,
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- operating under normal load. Include hour and date on which load was measured, and voltage at time of test.
- 3.1.7 General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.
- 3.1.8 Test systems and obtain written confirmation from manufacturers that components have been installed correctly and system functioning as intended. Submit certification for power distribution, communications systems and emergency power to the Consultant.
- 3.1.9 Provide labour, instruments, apparatus and pay expenses required for testing. Agency reserves right to demand proof of accuracy of instruments used.
- 3.1.10 Perform the following tests on completed power systems:
- .1 Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to Consultant. Perform test with majority of electrical equipment in use.
Motor loading: measure line current of each phase of motors with motor operating under load, and report results in writing to Agency.
 - .1 Upon indications of imbalances or overloads, thoroughly examine electrical connections and rectify defective parts or wiring.
 - .2 If electrical connections are correct, report overloads due to defects in driven machines in writing to Agency.
 - .3 Insulation resistance tests:
 - .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument for at least one (1) minute.
 - .2 Megger 350-600V circuits, feeders and equipment with a 1000V instrument for at least one (1) minute.
 - .3 Check resistance to ground before energizing.
 - .4 Coordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.
- 3.1.11 Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:
- .1 Low voltage service equipment and metering
 - .2 Exit and emergency lighting
-

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- .3 Restabilization of systems after power return. Attach report printouts as evidence of expected operation on systems.
- .4 User equipment shut-down and auto-restart.

3.2 Field Tests

- 3.2.1 Provide advance notice to Agency of proposed testing schedule.
- 3.2.2 Perform tests at time of acceptance of work.
- 3.2.3 Conduct and pay for field tests:
 - .1 Power distribution, including phase voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and lighting control. Motors, heaters and associated control equipment, including sequenced operation.
 - .4 Emergency Power Systems
- 3.2.4 Perform tests in presence of Agency's Representative.
 - .1 Provide instruments, meters, equipment and personnel required to conduct required tests.
 - .2 Test systems to verify operation as specified.
- 3.2.5 Conduct di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment

3.3 General Testing

- 3.3.1 With the system completely connected, perform the following tests:
 - .1 Control and Switching - all circuits shall be tested for the correct operation of devices, switches and controls.
 - 3.3.2 Polarity Tests - all sockets shall be tested for correct polarity.
 - 3.3.3 Voltage Test - a voltage test shall be made at the last outlet of each circuit. The maximum drop in potential permitted will be 2% on 120 and 208 volt branch circuits and on 208 volt feeder circuits. Any deficiency in this respect shall be corrected.
 - 3.3.4 Phase Balance - measure the load on each phase at each splitter, and lighting and power panelboard and report the results in writing to the Agency. Rearrange phase connections as necessary to balance the load on each phase as instructed by the Agency, with the re-arrangement being restricted to the exchanging of connections at the distribution points mentioned in this paragraph. After making any such changes, make available to the Agency Contract Drawings or marked prints showing the modified connections.
 - 3.3.5 General Operations - energize and put into operation each and every electrical circuit and item. Necessary repairs, alterations, replacements, tests and adjustments required shall be made for complete and satisfactory operating systems.
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- 3.4 **Sealing**
- 3.4.1 Ensure and verify that all penetrations of electrical equipment have been properly sealed with appropriate material and to the manufacturer's requirements.
- 3.5 **Noise and vibration**
- 3.5.1 Ensure and verify that all isolation equipment has been installed where required and to the manufacturers' recommendations. Include the locations of and measurements of static deflection of spring isolators.
- 3.6 **Coordination Study**
- 3.6.1 For the entire electrical distribution system provided as part of this contract and for the existing high voltage base building switchgear and low voltage base building switchgear, supply a report from an independent test agency of the short circuit, protection, co-ordination study of the electrical distribution system. An existing coordination study is not available for contractor's use.
- 3.6.2 Procure (coordinate and pay for) the services of Enkompass Power & Energy Corp Rene Seipt rene@enkompass.ca to prepare the coordination study and arc flash analysis.
- 3.6.3 Co-ordination of Protective Devices:
- .1 Ensure circuit protective devices such as overcurrent trips, relays, circuit breakers and fuses are installed to values and settings so as to provide protection by means of opening the closest device to the fault.
- .2 Submit a short circuit, protection and co-ordination study as follows:
- .1 Obtain and organize all electrical protection data for all the equipment. This will consist of obtaining the relay types and settings, transformer impedances, cable sizes, fuse sizes and types, motor data, etc., required to carry out the short circuit.
- .2 Perform a short circuit analysis to determine short circuit current levels at all critical points in the distribution system, having obtained the available short circuit current available from the Hydro Supply Authority.
- .3 Generate appropriate settings for all relays and protective devices from the level of the Hydro Supply Authority feeder protective devices to the largest downstream device on all the feeder secondary distribution levels.
- .3 Provide a complete, comprehensive report at the conclusion of the short circuit, protection and co-ordination study consisting of the following:
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- .1 A set of time current curve characteristics of all protective devices in the system plotted on log/log graph paper with corresponding short circuit current levels.
- .2 Time current damage curves for all transformers, large motors and cables are also to be plotted.
- .3 Provide a complete schedule of all main protective relays, fuses and other protective device listing device locations, function number, manufacturer, model number, size, range, setting, etc.
- .4 The complete study will illustrate and ensure that the settings and sizes of all protective devices for each voltage level have been chosen to ensure maximum or optional protection and co-ordination during electrical fault or overload conditions.
- .5 These generated settings will then be applied by “in-field” testing methods to the respective devices.

3.7 Ground Fault Protection System

- 3.7.1 Inspect relays visually for condition and clean where necessary.
- 3.7.2 Check all connections for tightness.
- 3.7.3 Apply settings to each relay as specified in the short circuit, protection and co-ordination study and test operation by means of a relay test set.
- 3.7.4 Verify each protective system by means of a primary current injection through the zero phase sequence transformer. This will provide correct operation of both the transformer and relay as well as proper functioning of the circuitry through to the breaker tripping elements.

3.8 Grounding Study

- 3.8.1 As part of this scope of work electrical contractor shall supply a report from an independent test agency for a grounding system study (Contractor to arrange and pay) of the complete primary and secondary grounding systems for the entire installation. The study shall include resistance testing for each and all grounding circuits to ensure that the entire grounding system satisfies a one (1) ohm resistance requirement.
- 3.8.2 Contractor shall provide a preliminary grounding study prior to installation of remote station ground grid.

3.9 Arc Flash Analyses

- 3.9.1 For the entire electrical distribution system provided as part of this contract and the existing electrical distribution system shown on the Contract Drawings, conduct an electrical arc flash hazard analysis as prescribed under NFPA 70E (CSA Z462-18) and provide a written report summarizing the findings and recommended control measures to be taken. The arc flashing analysis results must be deemed acceptable prior to the equipment purchase.

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- 3.9.2 The power systems software utilized to perform the study must be SKM Powertools.
 - 3.9.3 Provide appropriate labels for all equipment (including all pre-purchased equipment and equipment supplied by Agency). The labels shall warn a qualified worker who intends to open the equipment for analysis or work that a serious hazard exists and that the workers should follow appropriate work practices and wear appropriate Personal Protection Equipment (PPE) for the specific hazard.
 - 3.9.4 An existing coordination study is not available for the electrical contractor's use.
 - 3.9.5 Procure (coordinate and pay for) the services of Enkompass Power & Energy Corp Rene Seipt rene@enkompass.ca to prepare the coordination study and arc flash analysis.
- 3.10 **Emergency Light Level Measurements**
- 3.10.1 As part of this scope of work procure the services and pay for a third party professional engineer to measure and record emergency lighting levels in foot candles throughout the scope of work areas with a calibrated light meter. Readings shall be taken based on a minimum of one reading for every 20' center in open office areas, equipment rooms and corridors / hallways and one reading in each closed and open office, meeting room and stairwell.
 - 3.10.2 All light level readings are to be taken during non-daylight hours.
 - 3.10.3 Provide a letter identifying light level readings and stating that the emergency lighting levels meet the requirements of the Ontario Building Code (OBC). Notify Consultant and Agency at least ten (10) days prior to proposed testing date and schedule testing at time and date acceptable to Consultant/Agency.
- 3.11 **Test Results**
- 3.11.1 Submit test results to Consultant for review.
 - 3.11.2 Testing methods and test results: to CSA, NEC 2017 and authorities having jurisdiction.
 - 3.11.3 Remove and replace conductors found damaged with new materials.
 - 3.11.4 Provide required labour and tools, if during testing Agency's Representative requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

END OF SECTION

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1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 This Contract includes the complete supply, installation, testing and commissioning of the analog and data horizontal cabling, interlink cabling, riser cabling, house cabling and backbone cabling and terminating hardware and connectivity products specified within this document and shown on the Contract Drawings.

1.2.2 A complete BELDEN product and cable based solution is required for the data copper Category 6 and Category 6A based infrastructures.

1.2.3 A complete BELDEN product and cable based solution is required for the data fiber optic based infrastructure.

1.2.4 Carry out all testing and provide documentation of the test results to the Consultant as specified herein.

1.2.5 Allow for the removal and replacement of ceiling tiles to allow the Consultant to review all installed horizontal cabling in the ceiling space at the completion of the project.

1.2.6 Contractor is responsible to perform all cutting, patching and repair related to cabling work.

1.2.7 The Contractor may not assign or sub-contract any work without the prior written consent of the Consultant/Agency or his designated representative. A list of sub-contractors must be submitted immediately upon award of the Contract.

1.2.8 This Specifications includes the technical specifications for the copper cabling and fiber optic cabling provided as part of this scope of work, termination hardware provided as part of this scope of work and accessories provided as part of this scope of work. Refer to Contract Drawings C-1.1, C-1.2, C-2.1, C-2.2 and C-3.1 for quantity of cables and accessories provided as part of the Scope of Work, cable type and for additional requirements.

1.2.9 The cabling system must be certified by the manufacturer for a period of twenty five (25) years. The Contractor will provide a letter of Certification and a plaque by BELDEN within two weeks of Substantial Completion of the project. These documents will include, but not limited to the following:

- .1 Verification of the performance of the installed system:
 - .1 Category 6 – data copper cabling system
 - .2 Category 6A – data copper cabling system
 - .3 Multi Mode OM4 10 GB – fiber optic cabling system

.2 Identification of the installation by location and Project Number

1.2.10 Certification

- .1 The successful bidder must be trained and certified by BELDEN and shall provide written confirmation of this fact.
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- .2 Personnel installing communications cabling shall be trained and conversant with communications cabling practices required for this project. Proof of certification must be provided prior to commencement of work.

1.3 Completion of Contract

- 1.3.1 All the equipment and cabling must be cleaned and tested, before acceptance of work by the Consultant.
- 1.3.2 At points of termination, all cabling and terminations must be free of any cable pulling lubricants before acceptance by the Consultant.
- 1.3.3 The Contractor shall guarantee all equipment and work furnished under this Section for a period of five (5) years or such longer periods as may be provided in the warranty of the manufacturer of individual components, whichever is longer from the date of Ready-for Takeover. The Contractor shall correct all defects developing as a whole or in part, due to defective workmanship, materials or defective arrangement of the various parts or materials damaged as a result of these defects or repairs. All defects shall be made good to the satisfaction of the Consultant at the Contractor's expense.

1.4 Terms And Conditions**1.4.1 DEFINITIONS**

- .1 The term Owner shall be understood to refer to Regional Municipality of Peel.
 - .2 The term cabling Contractor shall be understood to refer to the Contractor doing the communications cabling infrastructure.
 - .3 The term Contract shall be understood to refer to all items and conditions of the Specification, Contract Drawings, the complete tender package, the Contractor's tender submission and any other future contractual arrangements. All such items and conditions shall be binding unless agreed otherwise by the Contractor, Consultant and the Agency.
 - .4 The term Project shall be understood to refer to the complete supply and installation of the Communications Cabling System and components, as defined in this Section of Specification and Contract Drawings.
 - .5 Wherever the words "equal", "equivalent", "approved", or "approved equal" are used, it shall be understood to mean, "equal", "equivalent", "approved", or "approved equal" in the opinion of the Consultant.
 - .6 Wherever the words "install", "provide", or "supply and install", are used it shall be understood to mean "provide and install, inclusive of all labour, materials, installation, testing, and connections" for the item to which referred.
 - .7 "Concealed" is defined as "out of sight" in "normal" viewing conditions, and includes buried in concrete, above acoustic tile or
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- gypsum board ceilings, within masonry or gypsum board constructed walls, within cable trays of below raised access floors.
- 1.4.2 The Specifications or the Contract Drawings shall not be used alone. Any item or subject omitted from one, but mentioned or reasonably implied in the other, shall be provided. Misinterpretation of any requirements of either the Specification or Contract Drawings shall not result in any additional charge after submission of tender. The Contractor shall, by careful study of the total requirements, include all necessary components to make each system workable.
- 1.4.3 All terms and conditions of the specifications, tender documents and accompanying Drawings shall be strictly adhered to by the Contractor, unless otherwise noted. Any inability to comply with these requirements must be stated in writing, in detail, with the response submission. Otherwise, it shall be understood that the Contractor is bound to compliance with the stated terms and conditions.
- 1.4.4 The Contractor shall co-operate fully with the Consultant and all contractors, sub-contractors and other persons working on the site.
- 1.4.5 The Contractor shall do the complete installation in accordance with the latest editions of the Building Code, Electrical Safety Code, C.S.A., or other Codes or governing authorities of competent jurisdiction. In case of discrepancies with this or the manufacturer's specifications, the Contractor shall notify Consultant immediately.
- 1.4.6 Obtain and pay for permits and inspection required for work performed where applicable.
- 1.4.7 Submit required Documents and shop drawings to authorities having jurisdiction in order to obtain approval for the Work. Copies of Contract Drawings and Specifications may be used for this purpose. Prepare any additional information, details and drawings which these authorities may require.
- 1.4.8 In order to meet the requirements of Substantial Completion the Contractor must complete the following:
- .1 Installation and testing of all cable runs.
 - .2 Submission of all testing documentation for the Consultant's review.
 - .3 Submission of all record and As-built documentation (in hand written format until typed / AutoCAD versions are available).
 - .4 Correction of any deficiencies in the horizontal cabling systems and associated outlets.
 - .5 Correction of any deficiencies in the backbone cabling systems.
- 1.5 **Contract Documents**
- 1.5.1 The Contract Drawings for the Communications work are diagrammatic performance Drawings, intended to convey the scope of work and indicate the approximate sizes and locations of equipment and outlets. The Drawings do not intend to show Designer's Architectural, Mechanical or Structural details.
-

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- 1.5.2 Do not scale or measure Drawings, but obtain information regarding accurate dimensions, from the dimensions shown or by site measurements. Follow the Contract Drawings for laying out the work.
 - 1.5.3 Make, at no additional cost, any changes or additions to materials and equipment necessary to accommodate Structural conditions (offsets around beams, columns, etc.)
 - 1.5.4 Alter at no additional cost, the location of materials and/or equipment as directed, provided that the changes are made before installation, and do not necessitate additional materials.
 - 1.5.5 Change location of termination panels and outlets at no extra cost providing cable length increase resulting from relocation does not exceed 3m (10') and information is given before installation.
 - 1.5.6 Confirm at the site, the exact location of equipment.
 - 1.5.7 Any miscellaneous materials, hardware, devices, wiring, etc., not specifically described, but required for the installation and operation of the communications cabling system, shall be provided and included as part of the Bid.
- 1.6 **Materials and Equipment**
- 1.6.1 All materials and equipment shall be completely new and unused products of only the most recent manufacturer model or version number, C.S.A. certified, and manufactured to the Standards specified.
- 1.7 **Shop Drawings**
- 1.7.1 Submitted Shop Drawings must indicate details of construction, dimensions, capacities, weights and electrical performance and flame spread characteristics of equipment or materials, as well as specification reference Section number and project name.
 - 1.7.2 Shop Drawings shall be provided with sufficient space on the front for all Consultant's and Contractor's "review" stamps.
 - 1.7.3 Work affected by submittal shall not proceed until review is complete.
 - 1.7.4 Review submittal prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the work and Contract Documents and bears the Stamp of Contractor.
 - 1.7.5 Changes made to the Shop Drawings by the Consultant will not affect the Contract Price.
 - 1.7.6 Submit Shop Drawings for all material and equipment referred to in Contract Document and other items reasonably requested by Consultant.
- 1.8 **Field Supervision**
- 1.8.1 Throughout the duration of the Project, a properly qualified Communications Field Supervisor must be available at all times. The Supervisor who starts the work must not be changed unless requested by
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the Consultant/Agency, or written permission from the Consultant/Agency is obtained.

1.9 Site Responsibilities

- 1.9.1 Maintain work areas to be free of construction debris and waste. The disposal of all materials shall be the responsibility of the Contractor.
- 1.9.2 Make all necessary arrangements to transport materials and equipment to and within the site. The Contractor shall be responsible for arranging for the use of any hoists, lifts, pulleys, winches, cranes or service elevators.
- 1.9.3 The Contractor is responsible for complete storage, handling, delivery, and installation of all materials used in the performance of the work.

1.10 Deliveries / Access

- 1.10.1 Coordinate all deliveries to site. Book service elevators 72 hours in advance. Contractor must pre-arrange all site access and authorization for all site personnel and subcontractor personnel with General Contractor.

1.11 Testing And Commissioning

- 1.11.1 Provide testing and commissioning of all items and their related components. Include maintenance manuals and operating instructions for owner's staff use.

1.12 Other

- 1.12.1 It is the responsibility of the Contractor to perform all cutting, patching and repair related to the communications cabling work.
- 1.12.2 The Contractor will be responsible to fish walls, columns etc., wherever conduit has not been provided by others to ensure all cabling is concealed.

1.13 Record And As-Built Drawings

- 1.13.1 On the cable pull end date, the contractor must provide the client with one copy of working drawings showing all installed outlet locations and corresponding labels.
 - 1.13.2 The Contractor shall maintain two sets of drawings on site. Clearly mark on these drawings all changes and deviations from the contract drawings and in particular mark the actual location of all feeder conduit and floor monument locations.
 - 1.13.3 All deviations from the contract drawings shall be recorded on the "as-built" drawings, including those changes due to Addenda, Site Instructions or Change Orders.
 - 1.13.4 After the date of Substantial Performance, obtain from the Consultant, a set of AutoCAD Version 2021 files of the most recent Communications Drawings. These Drawings shall be marked up to record clearly, neatly, accurately and promptly all locations of Communications deviations as a result of Change Orders, Consultant's or Owner's Instruction, site conditions, etc. Utilize normal recognized CAD procedures that match the original drafting methodology. Submit the revised As-Built AutoCAD files
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as well as full-sized drawings with changes clearly indicated to the Consultant for review and final presentation to the Owner. Provide three (3) sets.

- 1.13.5 For the drawing file submission described above, the contractor must include as part of the base bid price \$400.00 to have HCC Engineering supply the AutoCAD Version 2021 floor plans denoted as 'Issued for Tender' through a file transfer site.

2. **PRODUCTS**

2.1 **General**

2.1.1 The equipment, material and installation shall conform with the latest version of the applicable Codes, Standards and regulations of authorities having jurisdiction.

- .1 CSA C22.1: Canadian Electric Code Part 1, Ontario Hydro Electrical Safety Code
 - .2 ANSI/EIA/TIA-568-A: Commercial Building Telecommunications Cabling Standard (CSA T529).
 - .3 ANSI/EIA/TIA-569 Commercial Building Standard For Telecommunications Pathways And Spaces (CSA T530).
 - .4 ANSI/EIA/TIA-606 Administration Standard For The Telecommunications Infrastructure Of Commercial Buildings (CSA T528).
 - .5 ANSI/EIA/TIA-607 Commercial Building Grounding And Bonding Requirements For Telecommunications (CSA T527).
 - .6 ANSI/EIA/TIA TSB-67 Performance Specification For Field Testing Of Unshielded Twisted-Pair Cabling Systems.
 - .7 CSA C22.2 No. 214 Communications Cables.
 - .8 CSA C22.2 No. 232-M: Optical Fibre Cables.
 - .9 ANSI/EIA/TIA-492AAAA Detailed Specification For 62.5µm Core Diameter / 125µm Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide fibres.
 - .10 ANSI/EIA/TIA-492BAAA Detail Specifications For Class 1va Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used In Communication Systems.
 - .11 ANSI/EIA/TIA-472CAAA Detailed Specifications For All Dielectric (Construction 1) Fibre Optic Communications Cable For Indoor Plenum Use, Containing Class 1a, 62.5µm Core Diameter / 125µm Cladding Diameter Optical Fibre(s).
 - .12 ANSI/EIA/TIA-472DAAA Detailed Specifications For All Dielectric Fibre Optic Communications Cable For Outdoor Plant Use, Containing Class 1, 62.5µm Core Diameter / 250µm Cladding Diameter Optical Fibre(s).
 - .13 ANSI/EIA/TIA-455 Test Procedures For Optical Fibres, Cables And Transistors.
 - .14 ANSI/EIA/TIA-598 Colour Coding Of Optical Fibre Cables.
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- .15 ANSI/EIA/TIA-604-3 FOCIS 3 Fibre Optic Connector Intermateability Standard.
 - .16 ANSI/ICEA S-83-596 Fibre Optic Premises Distribution Cable.
 - .17 ANSI/ICEA S-83-640 Fibre Optic Outside Plant Communications Cable.
 - .18 ANSI Z136.2 American Standards For The Safe Operation Of Optical Fibre Communication Systems Utilizing Laser Diode And LED Sources.
 - .19 ISO/IEC IS 11801A Generic Cabling For Customer Premises.
 - .20 CENELEC EN 50173 Performance Requirements For Generic Cabling Schemes.
 - .21 IEC 603-7, PART 7 Detailed Specification For Connectors, 8-Way, Including Fixed And Free Connectors With Common Mating Features.
 - .22 FIPS PUB 174 Commercial Building Telecommunications Wiring Standard. Federal Information Standard Publication.
 - .23 UL 444 and 13 Adopted Test And Follow-Up Service Requirements For the Optional Qualification Of 100Ω Twisted-Pair (Cables).
 - .24 IEC 807-8 Rectangular Connectors For Frequencies Below 3 MHz, Part 8: Detailed Specification For Connectors, Four-Signal Contacts And Earthing Contacts For Cable Screens, First Edition.
 - .25 NEMA WC 63 Performance Standard For Field Testing Of Unshielded Twisted-Pair Cabling System.

2.1.2 Components to meet CSA, ULC and ANSI/EIA/TIA-568A requirements.

2.2 **Data and Analog Outlets**

2.2.1 Category 6 UTP Modular Information Outlets - 8 Position

- .1 Utilize BELDEN REVConnect CAT6+ RV6MJKUXX UTP modules for data and analog designated outlets (colours to be finalized during shop drawing process).
- .2 RJ45 modules complete with insulation displacement contacts for termination of all eight cable conductors.
- .3 Minimum 50 microns of hard gold over nickel or copper on modular jack contact wires.
- .4 Modular jack to meet or exceed the requirements of ANSI/EIA/TIA-568-B for Category 6.
- .5 Pin out Termination Sequence = 568A (unless stated otherwise).

2.2.2 Category 6A UTP Modular Information Outlets - 8 Position

- .1 Utilize BELDEN REVConnect Category 6A RVAMJKUXX-S1 UTP modules for data and analog designated outlets (colours to be finalized during shop drawing process).
- .2 RJ45 modules complete with insulation displacement contacts for termination of all eight cable conductors.
- .3 Minimum 50 microns of hard gold over nickel or copper on modular jack contact wires.

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- .4 Modular jack to meet or exceed the requirements of ANSI/EIA/TIA-568-B for Category 6A.
 - .5 Pin out Termination Sequence = 568A (unless stated otherwise).
 - 2.2.3 Telecommunications Outlets - Wall Mounted Faceplates (Copper Cables)
 - .1 Utilize BELDEN flush mounted 4-port 1-gang AX102249 KeyConnect faceplate. Faceplates to be white in colour. Provide sample as part of shop drawing process prior to ordering.
 - .2 Faceplates equipped with ports to accommodate 4 modular information outlets respectively.
 - .3 Use recessed blank modular inserts for all unused communication ports. Blanks to match faceplate colour.
 - .4 Provide dustcovers and icons.
 - 2.2.4 Telecommunications Outlets - Furniture Mounted Faceplates
 - .1 Utilize BELDEN AX102292 3-port Key Connect modular furniture adaptor. Grey in colour.
 - .2 Faceplates equipped with ports to accommodate 3 modular information outlets.
 - .3 Use recessed blank modular inserts for all unused communication ports. Blanks to match faceplate colour.
 - .4 Provide dustcovers and icons.
 - .5 Confirm faceplate requirements with consultant and furniture supplier prior to procurement.
 - .6 Provide sample as part of shop drawing process prior to ordering.
 - 2.2.5 Telecommunications Outlets – Phone Mounted Faceplates
 - .1 Utilize BELDEN flush mounted 1-port 1-gang AX102902 Key Connect faceplate. Faceplates to be white in colour. Provide sample as part of shop drawing process prior to ordering.
 - .2 Faceplates equipped with ports to accommodate 1 modular information outlets respectively.
 - .3 Use recessed blank modular inserts for all unused communication ports. Blanks to match faceplate colour.
 - .4 Provide dustcovers and icons.
 - 2.3 **Punch Down Block Assemblies**
 - 2.3.1 Assemblies to consist of cable termination wiring blocks and connecting blocks.
 - 2.3.2 Connector construction to allow for termination of cables on one side and cross connect jumper wire on the other.
 - 2.3.3 Each wiring block strip to be equipped with fifty (50) double-ended Insulation Displacement Connection (IDC) clips. Each clip capable of terminating 22-,24- and 26-AWG plastic insulated solid copper conductors without stripping.
 - 2.3.4 Mounting blocks shall be wall mountable and stackable.
 - 2.3.5 Utilize Belden QCBIX1A connectors for house and riser cabling terminations, QCBIX1A4 (4-pair marking) connectors for interlinks and
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horizontal cabling terminations, QCBIX2A and QCBIX5A multiplying connectors where detailed on the drawings and QMBIX12E mounts.

2.4 Horizontal and Interlink Copper Cables**2.4.1 Category 6 Cables**

- .1 Unshielded twisted pair cordage with eight (8) - 23 AWG thermoplastic insulated, solid conductors formed into individually twisted pairs and enclosed in a CSA FT-6 (CMP) rated thermoplastic jacket and all individual conductors to be insulated with fluorinated ethylene propylene (FEP).
- .2 Diameter of insulated conductors not to exceed 1.2 mm (0.048") and diameter of completed cable not to exceed 5.70 mm (0.225").
- .3 Cable to withstand a bend radius of 25.4 mm (1") at a temperature of $-20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ without jacket or insulating cracking.
- .4 Cable to meet or exceed the requirements of ANSI/EIA/TIA-568-B for Category 6.
- .5 Cable shall be Belden 2413 series.

2.4.2 Category 6A Cables

- .1 Unshielded twisted pair cordage with eight (8) - 23 AWG thermoplastic insulated, solid conductors formed into individually twisted pairs and enclosed in a CSA FT-6 (CMP) rated thermoplastic jacket and all individual conductors to be insulated with fluorinated ethylene propylene (FEP).
- .2 Diameter of insulated conductors not to exceed 1.2 mm (0.048") and diameter of completed cable not to exceed 5.70 mm (0.225").
- .3 Cable to withstand a bend radius of 25.4 mm (1") at a temperature of $-20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ without jacket or insulating cracking.
- .4 Cable to meet or exceed the requirements of ANSI/EIA/TIA-568-B for Category 6A.
- .5 Cable shall be Belden 10GXS13 non bonded plenum series.

2.5 Patch Panels**2.5.1 Category 6 Copper Patch Panel –**

- .1 482 mm (19") rack mountable 48 port, 8-position Category 6 jack patch panel
- .2 Patch panels equipped with ports to accommodate 48 UTP modules.
- .3 RJ45 modules complete with insulation displacement contacts for termination of all eight cable conductors.
- .4 All patch panels to be fully populated with UTP modules.
- .5 Utilize BELDEN 1U 48 port KeyConnect AX104600 Angled patch panels c/w BELDEN REVConnect Category 6+ modular jacks.
- .6 Patch panel frame black in colour.

2.5.2 Category 6A Copper Patch Panel

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- .1 482 mm (19") rack mountable 48 port, 8-position Category 6 jack patch panel
 - .2 Patch panels equipped with ports to accommodate 48 UTP modules.
 - .3 RJ45 modules complete with insulation displacement contacts for termination of all eight cable conductors.
 - .4 All patch panels to be fully populated with UTP modules.
 - .5 Utilize BELDEN 1U 48 port KeyConnect AX104600 Angled patch panels c/w BELDEN REVConnect Category 6A modular jacks.
 - .6 Patch panel frame black in colour.
- 2.5.3 Fiber Optic Patch Panel
- .1 482 mm (19") rack mountable.
 - .2 Equip patch panels with LC (duplex) (quantity as shown on the drawings) multimode and single mode adapter sleeves.
 - .3 All patch panels must be equipped with high (double) density LC duplex modules, zirconia for multimode and zirconia for single mode.
 - .4 Rack mounted fiber optic patch panels provided as part of this scope of work for terminating fiber optic cables shall be Belden AX105563 1U 48 duplex port modular cassette shelf c/w front cover. Provide FF4U12LD OM4 LC adaptor panel with FT4LC900FS01 fusion splice-on connectors.
 - .5 Provide blank strips required.
- 2.6 **Backbone and Interlink Cables**
- 2.6.1 Fiber Optic Cables - Backbone Interlocking Armored Multimode
- .1 Optical fiber cable construction of 50/125 μm graded-index optical fibres to be of aqua coloured jacket.
 - .2 Cable to be formed into groups of six fibres each. Groups and individual fibres to be identified in accordance with ANSI/EIA/TIA-598.
 - .3 Groups assembled to form a single compact core and core is covered by a protective sheath.
 - .4 Sheath consisting of an overall jacket and one or more layers of dielectric material applied over the core.
 - .5 All test to be performed at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
 - .6 Fiber optic cables to be as follows:
 - .1 Belden FI4D012A9 series OM4 Plenum Rated Interlocking Armored Riser Cable, 12 strand.
 - .7 Provide cable clamp kit to ground metallic sheath of cable as required per manufacturer's direction.
- 2.7 **Patch Cords, Pigtailed and Cross Connect Jumpers**
- 2.7.1 Copper Patch Cords
- .1 Category 6A UTP patch cords to have copper stranded conductors to assure adequate flex-life.
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- .2 Patch cords to be factory assembled and not site prepared.
 - .3 Patch cords to be a snagless type using a rubber housing for the connector.
 - .4 Patch cord to have characteristics of 100Ω Category 6/6A data cables and the minimum performance characteristics at 20°C that meet or exceed the requirements of ANSI/EIA/TIA-568A for Category 6A.
 - .5 The patch cords shall be wired EIA-A to EAI-A with a one-to-one correspondence straight-through and terminated on both ends on 8-position Modular Long-Plugs (one end for pigtails).
 - .6 Colours: Blue
 - .7 Category 6 patch cords and pigtails are to be Belden C6D110XXX series.
 - .8 Category 6A patch cords and pigtails are to be Belden CAD110XXX series.
- 2.7.2 **Fibre Optic Patch Cords**
- .1 Two strand fibre optic patch cables
 - .2 Cables to meet same performance criteria as stated above for optical cables.
 - .3 Multimode LC to LC
 - .4 Patch cords positions (i.e. A & B) to be in accordance with ANSI/EIA/TIA-568A.
 - .5 **Colours: Aqua**
 - .6 Factory terminated.
 - .7 Patch cords are to be BELDEN FP4XXXXXXXXX series and FPSXXXXXXXXX series.
- 2.8 **1RMU Horizontal Cable Manager**
- 2.8.1 Provide CPI 35441-701 1RMU wire managers where shown on the Contract Drawings.
- 2.9 **2RMU Horizontal Cable Manager**
- 2.9.1 Provide CPI 35441-702 2RMU wire managers where shown on the Contract Drawings.
- 2.10 **Corrugated Tubing**
- 2.10.1 Exposed cables are to be bundled and wrapped with corrugated loom tubing, as manufactured by Panduit.
- 2.11 **Coax Cable**
- 2.11.1 TV grade 75 ohm RG6 coax cable (confirm type with base building) enclosed in a CSA FT-6 rated jacket.

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2.12 Equipment Cabinets

- 2.12.1 Equipment cabinets to be Cabletalk make, model # CTCWH-4428-DDSO-B. Each cabinet to be configured as follows. The colour to be black.

| Description | Notes |
|---|---|
| Cabletalk CTCWH-4428-DDSO-B c/w Lexan door (extended depth) | Refer to Contract Drawings for quantity of cabinets |
| Cabletalk CTCWH-4428-DDSO-08EX Wall Mount Extension Kit | One per cabinet |
| Cabletalk CTC-FA-1 Fan | One per cabinet |

2.13 RJ45 to Ceiling Connector

- 2.13.1 RJ45 to Ceiling Connector to be BELDEN RVAFFPUEW18-S1.

3. EXECUTION

3.1 Installation

- 3.1.1 The following minimum clearances from electrical and heat sources must be maintained when routing cables.

| Item | Minimum Clearance |
|--|-------------------|
| Motor | 1.2 m (4'-0") |
| Transformers | 1.2 m (4'-0") |
| Conduit and cables used for electrical distribution less than 1kV | 0.3 m (1'-0") |
| Conduit and cables used for electrical distribution greater than 1kV | 1.0 m (3'-0") |
| Pipes (gas, oil, water, etc.) | 0.3m (1'-0") |
| HVAC (equipment, ducts, etc.) | 15 cm (6") |
| Fluorescent Luminaires | 12 cm (5") |

- 3.1.2 Any deviation from the cable routing, outlet and equipment locations shown on Contract Drawings must be approved by the Consultant and documented on as-built drawings.
- 3.1.3 Avoid scraping, denting, or otherwise damaging cables, before, during or after installation. Damaged cables shall be replaced by the Contractor without any additional compensation.
- 3.1.4 Ensure that all cable lengths are sufficient to allow for slack, vertical runs, cable necessary for splicing, wastage, connectorization and future moves.
- 3.1.5 Bush, ream and remove any sharp projections on all conduits. There must be a minimum of one spare pull string in each conduit.
- 3.1.6 Supply and install non-permanent CSA approved intumescent fire stopping, to cap all empty sleeves and around cabling passing through

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sleeves. All fire stopping must meet applicable Federal, Provincial and Local building codes.

- 3.1.7 When terminating copper cables remove cable jacket only enough to perform termination and untwist pairs only 13 mm (1/2") for Category 6 cables and 25 mm (1") for Category 3 cables.
- 3.1.8 Ensure ANSI/EIA/TIA-568A installation practices are followed. Consultant will determine quality of workmanship during installation. Cables that have not been properly combed and dressed will have to be redressed at the Contractor's expense.

3.2 Termination Requirements**3.2.1 Horizontal Data Termination Fields**

- .1 At the ICC Equipment Cabinet end, terminate Horizontal Distribution Data cables on rack mounted patch panels. Terminate all four (4) cable pairs.
- .2 Contractor to patch Agency's supplied CISCO make PoE switches.

3.3 Horizontal Distribution

- 3.3.1 Pull all cables in a continuous run. No cable splices will be permitted.
- 3.3.2 When bundling Category 6/6A cables, comply with manufacturer's recommended bundling practices for Category 6/6A cables installation. Ensure that no cable bundle put excess pressure on the cable at any point which may result in the compression or deformation of the cable jacket and internal pair/conductor geometry.
- 3.3.3 Neatly comb, bundle and tie-wrap all cables every three (3) feet. Utilize Polytie style 1030 velcro nylon fasteners, as manufactured by Polygon Wire Management Ltd. Note: plastic tie wraps are unacceptable during any phase of this project. All cables bundled using plastic tie wraps will be replaced at contractor's cost.
- 3.3.4 Follow proper installation and termination practices for Category 6/6A UTP cabling. Do not kink or exceed the cable minimum bend radius or maintain a minimum of four (4) times cable diameter as a bend radii if no bend radius is specified. For fiber optic cables maintain a minimum of ten (10) times the cable diameter or 30 mm (1.2") whichever is larger for a bend radius.
- 3.3.5 Secure and support cables every 1.2 m (4'-0") when running in free space.
- 3.3.6 Utilize all indicated and available cable pathways such as conduits, cable tray, raceways and furniture system channels except where otherwise noted. Exercise caution when pulling cables in such pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii.
- 3.3.7 Inform Consultant immediately of any horizontal cable runs exceeding 90 m (295'-0").
- 3.3.8 Supply Caddy J Pro hangers, threaded rod extensions, cable supports, tie-wraps and any other miscellaneous hardware required to support horizontal cabling where conduit has not been provided. Anchors for

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Caddy hangers must not be drilled into post tensioned beams under any circumstances.

- 3.3.9 Bridal ring Caddy Fasteners and other alternates to 'J-hooks' or their equivalent may not be used to support the horizontal cabling.
- 3.3.10 Do not support cables to T-bar ceiling hangers or have any cables laying on ceiling tiles.
- 3.3.11 Wrap cables servicing systems furniture with corrugated tubing. Match colour with systems furniture manufacturer's power feed. Tubing to be butted so that no cables are exposed.
- 3.3.12 Cables shall be bundled on a per mounting frame / patch panel basis.

3.4 Backbone Distribution

- 3.4.1 Pull all cables in a continuous run. No cable splices will be permitted.
- 3.4.2 Install backbone cables in accordance with manufacturer's specifications ensuring that proper installation techniques are observed and that the cable's maximum pull-force and maximum bend radii specifications are adhered to.
- 3.4.3 Utilize vertical pipe split mesh to support the weight of the cable at the top of the riser. Use a minimum of five (5) cable ties per floor to prevent side to side movement of cable. Ensure cable ties do not deform the cable jacket.
- 3.4.4 Neatly bundle, tie-wrap and route all riser cables such that copper data cables, copper voice cables and fibre optic cables are in separate bundles. Secure cable bundles to vertical and horizontal supports and neatly fasten to plywood backboards or termination racks/cabinets when routing cables to backbone cross-connects.
- 3.4.5 Utilize Polytie style 1030 velcro nylon fasteners, as manufactured by Polygon Wire Management Ltd in the IT room.
- 3.4.6 Follow proper installation and termination practices for Category 6 UTP cabling. Do not kink or exceed the cable minimum bend radius or maintain a minimum of four (4) times cable diameter as a bend radius if no bend radius is specified. For fibre optic cables maintain a minimum of ten (10) times the cable diameter or 30 mm (1.2") whichever is larger for a bend radius.
- 3.4.7 Utilize all indicated and available cable pathways such as conduits, cable tray, ducts raceways and furniture system channels except where otherwise noted. Exercise caution when pulling cables in such pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii.
- 3.4.8 Terminate all pairs of cable and all strands of fibre optic cable at both ends, including all spares unless indicated otherwise.

3.5 Testing And Repairing

- 3.5.1 Consultant must approve the testing procedure prior to testing commencing.

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- 3.5.2 Consultant may request to be present during the initial testing period of all cables.
- 3.5.3 Upon completion of the testing by the Contractor, the Consultant will ask the Contractor to perform a random test of up to 10% of the cables.
- 3.5.4 All deficiencies must be corrected before Consultant will provide a certificate of Substantial Completion of the project.
- 3.5.5 Horizontal and backbone cables are to be completed in accordance with the following test criteria. The testing must be completed on the Link Level (testing does not include patch and equipment cords). Testing is to be completed at both ends of the installed cable.
- 3.5.6 End to end testing for UTP copper shall be conducted for 100% of all pairs supplied and must be performed at 10 MHz, 50 MHz, 100 MHz, 155 MHz, 200 MHz, 250 MHz and 300 MHz for continuity, shorts, opens, grounds, crosses, wiring resistance, near-end cross-talk, attenuation, wire map, impedance and ACR as well as for the completeness and accuracy of the cable labeling scheme. All testing to be carried out with a Microtest Omni Scanner tester or Fluke DSP4000 incorporating the most recent software version. Each cable shall be tested in both directions.
- 3.5.7 All fiber cables (each strand) are to be tested for continuity and attenuation, including the connectors and adapters. (In practice continuity and attenuation can be combined, because if attenuation can be measured continuity exists).
- 3.5.8 Tests have to be in accordance with ANSI/TIA/EIA-526-14A and ANSI/TIA/EIA-568-A Standard, for both wavelengths 850 nm and 1300 nm (multimode) and 1310 nm and 1550 nm (single-mode).
- 3.5.9 Clean all connections and adapters at the optical test points prior to taking measurements.
- 3.5.10 Test jumpers must be of the same fibre core size and connector type as the cable system and shall be 1 to 5 meters long.
- 3.5.11 Before installing the cable, test the cable on the reel for continuity.
- 3.5.12 Divide the end-to-end links into segments at each cross connect and measure the attenuation of each link segment. Note: connector pairs must be included as part of link segment including test cord connectors that mate with the link interface.
- 3.5.13 Calculate the individual attenuation values for segment in the path. The end-to-end link attenuation for multimode fibre must be less than 2.6dB @850nm and less than 6.2dB @1300nm for singlemode fibre.
- 3.5.14 The maximum accepted loss for a mated pair shall be no greater than 0.35dB. The maximum accepted loss utilizing a preconnectorized cable assembly (LC and MTP) shall be 1.3 dB or less.
- 3.5.15 Contractor to produce a test report based on the cable schedules. The report should indicate for each cable, when it was tested successfully and the signature of the technician that performed the test. A copy of the test report must be submitted to the Consultants for approval. The entire report must be signed by an authorized person and certified by a Professional

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Engineer or RCDD for the Contractor at the end of the project. Note: Test results must be verified by Belden.

- 3.5.16 Correct all cable faults. Splicing of any cables will not be permitted, for any reason, unless prior authorization is received in writing by the Consultant.
- .1 Hard-copy test results should also be provided in tabular form.
 - .2 Test results should be segregated into horizontal runs, inter-room runs, and patch cables by category and cable type.
 - .3 Test results should be presented in ascending order in order to allow easy retrieval of any particular link.

3.6 **Labeling**

- 3.6.1 Adhesive cable labels to meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition, the labels shall meet the general exposure requirements in UL 969 for indoor use.
- 3.6.2 Self-laminating vinyl construction cable labels with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times. Hubbell Data Symbols (PO702914) are to be used on each Data Jack along with the Alpha Numeric label for cable identification.
- 3.6.3 Mechanically print labels using a laser printer and follow guidelines in ANSI/EIA/TIA-606 for colour codes. Hand-written labels are not permitted.
- 3.6.4 Labels should appear at the following locations:
- .1 Each end of cable at maximum distance of 2" from the end of the sheath.
 - .2 Front of voice and data cable termination fields.
 - .3 Front of workstation faceplates.
- 3.6.5 Labels on connectors are to be mechanically printed and are to follow the guidelines in CSA-T528-93 for colour coding.
- 3.6.6 Labels used on the wall and system furniture outlets shall be White, Metallicized Plastic Stickers.
- 3.6.7 Cable numbers are to be assigned by the Contractor in accordance with these Specifications and Contract Documents.
- 3.6.8 All labels are to be as manufactured by Panduit. Provide Soft copy results to the Consultant/Agency in Microsoft EXCEL format on USB drive.

3.7 **Naming standards**

- 3.7.1 All cables will be labeled according to the client's naming standard. Naming standard will be provided at the time of installation.

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701****Appendix 8.2, Division 28, Section 28 13 00, Access Control Electrical**

1. GENERAL**1.1 General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 Scope of Work

1.2.1 Provide all labour, materials, products, equipment and services for supply installation, testing, commissioning and integration of the access control with the existing building access control system (AMAG) as indicated on the Contract Drawings and specified in this section of the Specification.

1.2.2 The Contractor shall be responsible for supply, install, configure, program, test, commission all the required hardware, licenses, programming and configuration required to integrate into the existing access control system. The work will also to include concealed conduit, wiring, communication cabling, power supplies and other components to produce a fully functional system.

1.2.3 The Contractor will prep the door frame and install all the access control component such as power supplies, electric strike, card reader, door contact and request to exit. Security Data Gathering Panels (DGP) are installed in the existing IT room-126 on the ground floor and have sufficient ports available to secure five (5) new doors through access cards. No new DGP is required. In addition, the existing double door leading to patio has two (2) existing card readers from both sides with Automatic Door Operators (ADO). The Security Contractor will remove the card readers and ADO's from both the sides before the start of construction and re-install one card reader and ADO on the lobby side of the new door. The extra card reader, accessories and ADO will be returned to the Agency.

1.2.4 Mounting heights of the devices to match the existing building devices unless otherwise mentioned in the Contract Document.

1.2.5 The cost of all licenses shall be included in the Contract Price for new doors.

1.3 Conductors and Cables

1.3.1 Supply and install conductors and cables as required and as recommended by the manufacturer.

1.3.2 Ensure that all cable lengths are sufficient to allow for slack, vertical runs, wastage, connectors and future maintenance.

1.3.3 All cables shall be concealed and in conduit. No surface conduit is permitted. Minimum size of the conduit is 21mm.

1.3.4 Conductors and cables for security systems shall be FT-6 rated for indoor applications and shall conform to the recommendations of the manufacturer of the security system.

1.3.5 Multi-conductor cables shall have the conductors colour coded.

1.3.6 All cables shall be CAS approved and shall be stamped accordingly.

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PROJECT 22701****Appendix 8.2, Division 28, Section 28 13 00, Access Control Electrical**

2. PRODUCTS**2.1 Card Readers**

2.2.1 Access Control Card Reader for the new doors will be HID Singo R40. The mounting height of the new Readers to match the existing card reader in the building.

2.2 Door Contacts

2.2.1 Flush mounted and shall be maximum 25mm (1") in diameter and shall be from Sentrol.

2.2.2 Compatible with the access control system

2.2.3 No surface mount door contacts are permitted.

2.3 Electric Strike

2.3.1 Electric strikes shall be provided and installed by Access Control Contractor complete with wiring.

2.4 Request to Exit

2.4.1 Request to Exit to be installed and shall be from T-Rex.

2.5 Base building Security Contractor

2.5.1 The Contractor will engage and pay to the security contractor and include the cost in Lump-Sum Contract Price. The contact information of security contractor is as below:

OHM Security Ltd.

6535 Millcreek Drive Unit-4

Mississauga, ON L5N 2M2

Tel: 905-812-9636

2.4 Warranty

2.4.1 Provide on-site warranty for two (2) years for parts and labour from the date of Ready-for-Takeover of the project.

2.4.2 The Contractor qualified technician capable of performing necessary security diagnostics and repairs within a maximum of six (6) hours from the time of receipt from the Agency during the entire warranty period.

3. EXECUTION

3.1 All devices shall be installed and configured in accordance with manufacturer's installation instructions and recommendations, and as per Contract Drawings and Specifications.

3.2 Provide all auxiliary hangers, fittings, connectors, supports and miscellaneous materials necessary to install the system.

3.3 A certificate of verification, naming the Agency, confirming that the inspection has been completed and showing the conditions upon which, such inspections and certification has been rendered.

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 28, Section 28 13 00, Access Control Electrical

END OF SECTION

**SECOND FLOOR EXPANSION, 3190 MAVIS ROAD, CITY OF MISSISSAUGA,
PROJECT 22701**

Appendix 8.2, Division 28, Section 28 31 02, Multiplex Fire Alarm System Electrical

1. **GENERAL**

1.1 **General Requirements**

1.1.1 Conform to Division 01 – General Requirements and all documents referred to therein.

1.2 **Scope of Work**

1.2.1 Provide all labour, materials, products, equipment, services, testing, commissioning and verification of multiplex fire alarm system as indicated on the Contract Drawings and specified in this section of the Specification.

1.2.2 All work required and /or shown on Contract Drawings related to life safety systems (i.e.: fire alarm, EVAC speakers, etc.) shall be performed by the Agency base building Fire Alarm System Contractor. The Contractor will engage the base building contractor, pay and include in the lump-sum contract price. in the tenant electrical contractor's tender price. Provide all conduit, wiring, devices, final connections, modifications and provision of new interfacing devices in existing system control panels (i.e.: modules, relays, sub-panel, etc.) including verification. Ensure new devices to be used are compatible with the existing system. Maintain the integrity of the existing supervised circuits when new devices are to be connected. The system shall be tested and certified for proper operation upon completion of the work.

1.2.3 Fire Alarm System Contractor to update the base building active graphic software system with all devices provided, deleted and relocated as part of this scope of work and with fire alarm system zone changes as part of this scope of work.

1.2.4 Fire Alarm System Contractor to update the base building passive graphics with all devices provided, deleted and relocated as part of this scope of work and with fire alarm system zone changes as part of this scope of work.

1.2.5 Fire Alarm System Contractor to provide additional power boosters, amplifiers and all other controls and accessories as required to ensure that the existing fire alarm system can accommodate all signaling devices shown on the Contract Drawings.

1.2.6 In addition to the field devices indicated on the Contract Drawings to be provided under this contract, include in the tender price to supply and install the following quantities of additional devices throughout the scope of contract floors, complete with 23m (75'-0") of conduit and wiring, programming, testing and certification, labeling, verification and 100% repeat verification for each device post City Fire Department inspection. Reverify all existing fire alarm devices.

| Quantity of Devices | Device Type |
|----------------------------|--------------------------------|
| 2 | Fire Alarm System Horn |
| 2 | Strobe Light |
| 1 | Fire Alarm System Pull Station |

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PROJECT 22701**

Appendix 8.2, Division 28, Section 28 31 02, Multiplex Fire Alarm System Electrical

| | |
|---|---|
| 4 | Initiating Device Interface Zone Module |
| 2 | Fire Alarm System Smoke Detector |

- 1.2.7 Test and verification in conformance with CAN/ULC S1001, Integrated Systems Testing Of Fire Protection And Life Safety Systems. Provide a satisfactory Integrated Testing Report. As part of the base bid price, electrical contractor must procure (engage, coordinate and pay for) an Integrated Testing Coordinator, responsible to develop and implement the Integrated Testing Plan. The systems which must be included as part of the integrated systems testing to be determined by the Integrated Testing Coordinator hired by the Contractor. All costs related to the integrated systems testing must be included in the Contract Lump-Sum Price. The Contractor is responsible to provide all requirements to all required trades.
- 1.2.8 The Contractor must include the following scopes of work as part of the base bid price specific to the CAN/ULC S1001, Integrated Systems Testing of Fire Protection And Life Safety Systems:
- .1 Fire Alarm Technician required for operations and resetting of the fire alarm control panel for the duration.
 - .2 Electrician required for operations and initiating alarms, demonstrating wiring, etc., for the duration.
 - .3 Generator Technician required for approximately 4 hours for the Operation of the Generator and to Confirm Signals.

1.3 **Base Building Contractor for Work on Fire Alarm System**

The Contractor will engage the base building F.A Contractor, pay and include the Cost in the Lump-Sum Contract Price. The contact details are as under:

Classic Fire Life Safety

645 Garyray Drive
Toronto, ON M9L 1P9
Tel: 888-985-2357
Contact: Mrs. Blair Sarginson.

2. **PRODUCTS**

2.1 **Manufacturer**

- 2.1.1 All equipment shall be new (unless indicated otherwise), CSA approved, ULC listed and manufactured, tested, installed and verified to the following minimum standards:
- .1 Power supply: CAN4-S524.
 - .2 Audible signal devices: ULC-S525.
 - .3 Control unit: ULC-S527.
 - .4 Manual fire alarm stations: ULC-S528.
 - .5 Smoke detectors: ULC-S529.
 - .6 Thermal detectors: ULC-S530.

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- 2.1.2 All equipment used for the fire alarm system shall be designed and supplied by a single system manufacturer.
- 2.1.3 Acceptable product manufacturer: Mircom

2.2 Alarm Initiating and Signalling Devices

- 2.2.1 All devices must be new and compatible with the base building fire alarm system.
- 2.2.2 Refer to Contract Drawings and obtain a copy of the most current CAN/ULC S536: The Standard for Inspection and Testing of Fire Alarm Systems report from the Agency for existing device product details.

3. EXECUTION**3.1 Installation**

- 3.1.1 Install all equipment in accordance with the manufacturer's instructions, CSA/ULC-S524, OBC, Electrical Safety Code and these documents.
- 3.1.2 Smoke detectors and multi sensor detectors shall be mounted a minimum of 900 mm from an air supply outlet and 600 mm from an air exhaust outlet. Maintain a clear space of at least 600 mm on the ceiling, below and around smoke and multi sensor detectors.
- 3.1.3 Duct mount smoke detectors shall be installed in the main supply duct, downstream of the mixing box, filters and fan.
- 3.1.4 Install main control panel as indicated and connect to power supply.
- 3.1.5 Install manual alarm stations as indicated and connect to alarm circuits.
- 3.1.6 Install end-of-line devices at the end of signaling circuits as required and locate in room housing transponder.
- 3.1.7 Joints in wiring are not allowed.
- 3.1.8 Label conductors at the panel and each junction point, with plastic wire markers indicating, audible or control circuit number.
- 3.1.9 T-tapping of circuit wiring is not allowed.
- 3.1.10 Wiring for fire alarm initiating devices and for signaling devices must be in two separate conduit systems.
- 3.1.11 Surface mount all wall mounted devices utilizing EMT conduit and finished manufacturer surface mounted backboxes.
- 3.1.12 Power requirements for ancillary devices and visual signaling devices must be provided from local transponder.
- 3.1.13 Addressable smoke detectors in rooms shall be addressed with respective room number. Addressable smoke detectors in corridors shall be addressed with the corridor designation.
- 3.1.14 Duct smoke detectors shall be furnished, wired and connected as part of this scope of work. Provide duct opening to install the duct smoke detectors.

3.2 Testing and Certification

- 3.2.1 Arrange with the manufacturer to conduct a complete inspection and test of all installed fire alarm equipment, including all components such as manual pull
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- stations, signalling devices, fire detectors, controls, etc. Test and verify connections to equipment of other divisions such as sprinkler valves, etc.
- 3.2.2 Once the entire system is fully operational, test and verify the complete life safety system to ensure satisfactory operation in conformance with CAN/ULC S537-M97, 'Standard for the Verification of Fire Alarm System Installations'. All testing must be witnessed by the Consultant/Agency prior to acceptance. Tests shall include recording of audibility levels (dB reading) with alarm tone in every corridor and room of the entire Facility.
- 3.2.3 All factory and site testing must be carried out by members in good standing of the Canadian Fire Alarm Association (CFAA).
- 3.2.4 Contractor must be present and witness factory testing of all hardware and software components of the system.
- 3.2.5 Prepare data sheets in duplicate with spaces to record:
- .1 Date.
 - .2 Manufacturer's name and system number.
 - .3 Control panel serial number.
 - .4 Transponder serial number(s).
 - .5 Annunciator serial number(s).
 - .6 Testing methodology, results of tests and remedial work undertaken.
 - .7 Signatures of testing and manufacturer's Engineers indicating concurrence with results of tests and that some equipment is at site that was factory tested.
 - .6 Prior to verification, thoroughly clean all multisensor and smoke detectors.
 - .7 All verification results shall be recorded onto forms prepared by the Canadian Fire Alarm Association.
 - .8 After the site testing and verification and after all deficiencies have been rectified, notify the Electrical Consultant and the Fire Department and in their presence demonstrate the proper functioning of the entire system. Include in the Tender Price for 100 percent repeat verification of the complete system including all equipment, components and connections to equipment of other Divisions in the presence of the Fire Department.
 - .9 Provide an approved "Certificate of Verification" to the Electrical Consultant. Display one copy near the control panel and retain a copy with the system documentation. Provide an equipment schedule listing each device and showing confirmation that it was verified.
 - .10 Inspect all equipment installed as part of the system for visible damage or tampering which might interfere with its intended operation.
 - .11 Ensure correct operation of all PA/voice EVAC zones, input and output signal quality and controls.
 - .12 Test annunciator(s) to ensure proper operation, voltage, zoning and visibility of all legends.
 - .13 For all required system testing, inspection and verification, provide qualified personnel to monitor and operate control panel. In addition, provide a minimum of two (2) qualified personnel to walk with the Fire Department during 100% repeat verification.
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3.3 Sequence of Testing and Verification

- .1 Carry out testing, verification and certification as discussed above as follows:
 - .1 System test in conjunction with the manufacturer.
 - .2 Test and verification in conformance with CAN/ULC S537 (most current edition).
 - .3 Correction of all deficiencies.
 - .4 Test and verification in conformance with CAN/ULC S1001, Integrated Systems Testing Of Fire Protection And Life Safety Systems. Provide a satisfactory Integrated Testing Report. As part of the base bid price, electrical contractor must coordinate and pay for an Integrated Testing Coordinator, responsible to develop and implement the Integrated Testing Plan.
 - .5 Submission of test results and audibility levels to Consultant for review including letter of Certification from the manufacturer.
 - .6 Re-testing and reverification of the complete system in the presence of the Fire Department (authority having jurisdiction), Consultant and manufacturer's representative.
 - .7 Correction of any deficiencies noted by the authority having jurisdiction.
 - .8 Submission of manuals with final verification sheets (each verification sheet must be signed by the technician and must include the technician's CFAA registration number.

END OF SECTION