



York Region Municipal Centre – Package E

17250 Yonge St., Newmarket, ON

Project No: B25-50-0003

Issue for Construction



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Toronto, ON M6R 2B7

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Division 01 – General Requirements

Section 01 10 00 – General Requirements	5
Section 01 20 00 – Price and Payment Procedures	3
Section 01 31 00 – Administration Requirements	11
Section 01 40 00 – Quality Requirements	5
Section 01 50 00 – Temporary Facilities and Controls	4
Section 01 57 00 – Temporary Controls	1
Section 01 61 00 – Common Product Requirements.....	6
Section 01 71 00 – Examination and Preparation.....	3
Section 01 73 00 – Execution	2
Section 01 73 29 – Cutting and Patching	2
Section 01 74 00 – Cleaning and Waste Management.....	2
Section 01 74 21 – Construction Waste Management	3
Section 01 77 00 – Closeout Procedures	2
Section 01 91 00 – Commissioning Requirements	21

Division 06 – Wood, Plastics and Composites

Section 06 40 00 – Shop Fabricated Architectural Woodwork.....	8
--	---

Division 07 - Thermal and Moisture Protection

Section 07 84 00 – Firestopping	10
Section 07 92 00 – Joint Sealants	10

Division 08 – Openings

Section 08 87 00 – Glazing Surface Film	2
---	---

Division 09 – Finishes

Section 09 21 16 – Gypsum Board Assemblies	16
Section 09 30 00 – Tiling	7
Section 09 51 00 – Acoustical Panel Ceilings.....	6
Section 09 61 01 – Floor Repair	5
Section 09 65 00 – Resilient Flooring and Accessories.....	6
Section 09 68 00 – Tile Carpeting	4
Section 09 84 00 – Acoustic Wall Panels	3
Section 09 91 00 – Painting.....	9

Division 11 – Equipment

Section 11 31 00 – Residential Appliances	2
---	---

Division 12 – Furnishings

Section 12 48 13 – Entrance Floor Mats.....	2
---	---

Division 21 – Fire Suppression

Section 21 08 00 – Fire Suppression System Commissioning	5
Section 21 13 13 – Sprinkler Systems.....	3

Division 22 – Plumbing

Section 22 08 00 – Plumbing System Commissioning	5
Section 22 11 10 – Plumbing Piping.....	4
Section 22 42 01 – Plumbing Specialties	2
Section 22 42 03 – Plumbing Fixtures	1

Division 23 –Heating, Ventilation, and Air Conditioning (HVAC)

Section 23 01 33 – Basic Mechanical Requirements	9
Section 23 03 13 – Electrical Motor	2
Section 23 05 01 – Electrical Wiring for Mechanical	1
Section 23 05 10 – Hydronic Piping.....	4
Section 23 05 14 – Motor Starters	1
Section 23 05 15 – Hydronic Specialties	3
Section 23 05 20 – Horizontal Fan Coil Units	2
Section 23 05 29 – Supports & Anchors	4
Section 23 05 48 – Vibration Isolation	3
Section 23 05 53 – Mechanical Identification.....	2
Section 23 05 93 – Testing Adjusting Balancing Commissioning	2
Section 23 07 13 – Duct Insulation	3
Section 23 07 15 – Insulation Schedules.....	1
Section 23 07 20 – Piping Insulation	3
Section 23 08 00 – HVAC System Commissioning	7
Section 23 31 10 – Low Pressure Ductwork.....	4
Section 23 33 00 – Ductwork Accessories	3
Section 23 33 14 – Balancing Dampers	2
Section 23 33 16 – Fire Dampers	1
Section 23 33 46 – Flexible Ductwork	2
Section 23 33 53 – Acoustic Duct Lining	2
Section 23 37 13 – Grilles Registers & Diffusers	1

Division 25 – Integrated Automation

Section 25 00 00 – Controls	13
Section 25 08 00 – Integrated Automation Commissioning	6

Division 26 – Electrical

Section 26 01 00.00 – Operating and Maintenance Instructions	3
Section 26 05 01.00 – General Instructions for Electrical Sections	24
Section 26 05 03.00 – As-Built Drawings	2
Section 26 05 04.00 – Submittals/Shop Drawings.....	2
Section 26 05 05.00 – Mounting Heights.....	2
Section 26 05 21.00 – Wires and Cables Under 2000 V	7
Section 26 05 26.00 – Grounding + Bonding.....	4
Section 26 05 29.00 – Hangers and Supports.....	2
Section 26 05 31.00 – Splitters, Junction, Pull Boxes and Cabinets	2
Section 26 05 32.00 – Outlet Boxes, Conduit Boxes and Fittings	3
Section 26 05 34.00 – Conduits, Conduit Fasteners and Fittings.....	4
Section 26 05 53.00 – Identification.....	4
Section 26 05 63.00 – Access Doors and Accessibility	2
Section 26 05 83.00 – Sleeves.....	2
Section 26 05 88.00 – Cutting and Patching	2
Section 26 12 17.00 – Dry Type Transformers – 600V Primary	3
Section 26 24 17.00 – Panelboards – Breaker Type	3

Section 26 27 19.00 – Multi-Outlet Assemblies	2
Section 26 27 26.00 – Wiring Devices	4
Section 26 28 21.00 – Moulded Case and Insulated Case Circuit Breakers	4
Section 26 51 13.00 – Lighting Equipment	7
Section 28 31 03.00 – Multiplex Fire Alarm and Voice Communication System	8

Division 27 – Audiovisual

Section 27 00 00.10 – Audiovisual Compliance Statement.....	1
Section 27 40 05.00 – Audiovisual Definitions and Abbreviations	4
Section 27 40 10.00 – General Instructions for Audiovisual System Installation	18
Section 27 41 00.00 – Audiovisual System Scope of Work	20
Section 27 41 16.11 – Displays	1
Section 27 41 16.15 – Control Systems	2
Section 27 41 16.16 – Audio Video Transmission Systems.....	4
Section 27 41 23.10 – Audiovisual Cabinets, Racks, Frames and Enclosures.....	3
Section 27 41 23.11 – Audiovisual Cabling	11
Section 27 51 50.00 – Audiovisual Networking	6

Division 27 – Communications

Section 27 00 05.10 – General Instructions for Telecommunications Sections	8
Section 27 00 05.20 – Definitions and Abbreviations	10
Section 27 00 05.30 – Codes, Standards and Regulations	3
Section 27 00 05.50 – Contract Documents	1
Section 27 00 05.60 – Administrative Requirements	4
Section 27 00 05.70 – Project Specific Requirements	3
Section 27 00 06.00 – Fire Stopping and Water Proofing.....	4
Section 27 00 07.10 – Cable and Equipment Removal	3
Section 27 05 26.00 – Grounding and Bonding for Telecommunications Systems	2
Section 27 05 28.00 – Pathways for Telecommunications Systems	4
Section 27 05 53.00 – Identification for Telecommunications Systems.....	2
Section 27 08 00.00 – Commissioning for Telecommunications Sections	3
Section 27 11 19.00 – Telecommunications Termination Blocks and Patch Panels	1
Section 27 15 00.19 – Data Telecommunications Horizontal Cabling	3
Section 27 15 43.00 – Telecommunications Faceplates and Connectors	3
Section 27 16 19.00 – Telecommunications Patch Cords and Cross Connect Wire	2

END OF SECTION

1.1 General Instructions

- .1 Read and conform to the Contract Documents including Division 1 requirements and documents referred to this Section.

1.2 Specification Format

- .1 Specifications are addressed to the Contractor. Specifications are not intended as detailed description of installation methods but serve to indicate particular requirements in completing the Work.
- .2 Where the Contract Documents do not provide sufficient information for complete installation of item, then as supplement, comply with manufacturer's written instructions for quality of work.
- .3 Portions of the Specifications are written in short form. Therefore, it shall be understood that where item of the Work is stated in heading followed by material, equipment, component, or operation, words "shall be", "shall consist of" or similar words or phrases are implied which denote supply, fabricate and supply, install, provide or commission of such materials, equipment or operations for component of the Work designated by heading.
- .4 Where items in the Contract Documents are referred to in singular, provide as many as Required to complete the Work. Words used in one gender only shall mean females as well as males and conversely.
- .5 Drawings, Lists or Schedules of Items are intended to show scope and arrangement of the Work. For location of item described refer to Such Drawings, Lists or Schedules unless location stipulated in the Specifications.

1.3 Definitions

- .1 Refer to the Definitions set out in the Contract Documents between the Owner and Contractor as amended by the Owner.

1.4 Discrepancies/Conflicts/Omissions

- .1 If discrepancies or conflicts in, or omissions from the Drawings, the Specifications or other Contract Documents are suspected, or if there is doubt as to meaning or intent thereof, notify the Consultant at once. Where there is conflict between the Contract Documents, the most stringent requirement shall prevail.
- .2 The Drawings, Specifications and other Contract Documents are intended to be in compliance with federal, provincial and municipal laws, by-laws, regulations and other requirements of authorities having jurisdiction. Perform work in conformity with such requirements. If discrepancies, conflicts or omissions are suspected, notify the Consultant at once.
- .3 Comply with the Consultant's written instructions or explanations.
- .4 Promptly and not later than within 10 Working Days of becoming aware of circumstances which may require a change in the Work or other directions, give written notice to the Consultant outlining such circumstances and request written directions. Do no work in affected area, or that would prevent the Consultant from properly assessing situation or evaluating change, without its prior written approval. The Consultant will act promptly to give the Contractor directions so the Work is not unreasonably delayed.

- 1.5 Description Of The Work
- .1 The Work of this Contract includes furnishing labour, materials, equipment, services and other related expenses to complete the Work specified under the Contract Documents.
- .2 Term "NIC" means Work of this Project which is not being performed or provided under this Contract; term means "Not In this Contract" or "Not a Part of the Work to be Performed or Provided by Contractor".
- .3 "NIC" work may be specified or indicated on the Drawings as an aid to the Contractor in scheduling amount of time and materials necessary for completion of the Contract.
- 1.6 Scheduling
- .1 Base sequence and scheduling of construction on maintaining continuous operation and access to the Work during construction.
- .2 Phase construction as described in this Section. Notify the Owner in writing 7 Days prior to beginning work in an occupied area. The Owner will accommodate request within 7 Days of the notification. Co- ordination with the Owner at the Place of the Work is crucial. Submit a progress schedule before commencement of the Work. Coordinate any suggested changes to schedule with the Owner. Ensure schedule includes adequate time for Product delivery and Shop Drawing preparation, review and resubmission.
- .3 Allow for un-scheduled interruption to schedule of the Work and suspend parts of the Work affected to permit the Owner to relocate furniture and equipment from the Place of the Work, into finished spaces. The Owner will coordinate this interruption.
- 1.7 Completion Deadlines
- .1 Phase and schedule the Work to meet deadlines originally committed to by the Contractor.
- 1.8 Inclement Weather And Cold Weather Work
- .1 Take precautions during inclement weather and provide adequate protection.
- .2 Continue the Work, including winter months, if applicable, until the Work is completed and accepted by the Consultant.
- .3 Inclement weather or extra work caused thereby shall not be considered valid reason for additional payment or delay in satisfactory conclusion of the Work.
- 1.9 Owner Occupancy
- .1 The Owner reserves right to occupy and use portions of premises, whether the Work is partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing Work.
- .2 Partial occupancy or installation of equipment by the Owner does not imply acceptance of the Work in whole, or in part, nor shall it imply acknowledgment that terms of the Contract are fulfilled.
- 1.10 Place Of The Work
- .1 Confine extent of construction activities to area indicated on the Drawings as the Place of the Work and/or within area defined by property lines. Confine all equipment, materials, debris, offices, storage sheds and storage areas to within the boundaries of the scope of the Work unless additional spaces are approved by the Owner.

- .2 The Contractor has complete and exclusive use of the Place of the Work for performance of the Work. Assume responsibility for premises assigned, for performance of the Work.
 - .3 Should the Contractor require that boundaries of the Place of the Work be temporarily extended, obtain approval of the Consultant.
 - .4 Certain restrictions are specified as to use by the Contractor of various portions of the Place of the Work. Become familiar with these restrictions and establish work plan to accommodate these restrictions. No claims for extra costs due to such restrictions will be considered by the Owner.
 - .5 Assume responsibility for care, custody and control of property which is assigned for performance of the Work. Assume responsibility for and Make Good damage to existing property attributable to performance of the Work.
- 1.11 Demolition, Security And Access
- .1 Coordinate demolition times, security requirements and access with the Owner.
- 1.12 Existing Areas And Work Of Other Contractors
- .1 Commencement of parts of the Work in existing areas and in areas provided by Other Contractors, will be deemed to signify the Contractor's acknowledgment and acceptance of those parts of the Work.
 - .2 Immediately report defects, which affect quality and performance of the Work, in writing to the Consultant.
 - .3 Existing premises will remain occupied during the Work. Execute the Work to cause minimum interference with activities in existing premises and maintain maximum safety to occupants. Take reasonable measures to minimize and control noise, dirt and dust during the Work.
 - .4 Before entering existing premises to carry out the Work or to obstruct or take out of use any area of existing premises, or to cause any other interference, request meeting with the Consultant in order to reach agreement as to time and length of time you may interfere, possess, obstruct or remove from use any such area or services.
 - .5 Maintain temporary entrances to work area including enclosed hoardings as required. Maintain access to existing service entrance(s) at all times, including ready access for fuel oil trucks and delivery vehicles.
- 1.13 Signs, Advertising And Publications
- .1 Do not erect or display devices, signs or advertisements of labour, materials or services provided to the Work. Signs relative to fire, danger and safety are exempted from this requirement.
 - .2 Do not consent to advertising of the Work, of any kind, without the Owner's and the Consultant's written approval. Do not consent to mention of the Work in any advertising or articles in any publication relating to the Work without approval of copy and written permission from the Owner and the Consultant.
- 1.14 Procedure And Supply Of Critical Materials
- .1 Supply Products in ample time to be installed into the Work together with templates, measurements and other information required for placement.

1.15 Restrictions

- .1 The Work shall be confined to the Site limits indicated on the Drawings and/or within area defined by property lines. Work on the municipal property shall be carried out under regulations of respective municipality and Authorities Having Jurisdiction including without any limitations any associated fees, permits, insurance or bonding required.
- .2 Bring following restrictions to attention of workers on the Work and enforce them:
 - .1 Restrict construction personnel to the Place of the Work and necessary access routes to it. Restrict non-construction personnel from the Site, except for the Contractor-authorized visitors.

1.16 Security Regulations

- .1 Execute the Work in accordance with following security requirements and regulations.
- .2 Ensure only necessary tools and equipment are brought to each work area where access by public is possible. Keep constant check on these items and, at end of each work shift, bring all tools and equipment to storage room as directed.
- .3 Construction work is NOT permitted weekdays between 8:00am – 4:30pm. Contractors are only permitted to work Monday to Friday 4:30pm – 8:00am and on weekends.
- .4 The Owner will provide security escort for the Work in locations it deems necessary.
- .5 The Owner may issue suitable keys to the Contractor, where possible. The Contractor shall sign receipt for keys issued and shall be responsible for admittance of its authorized personnel only to areas for which keys provide access. Return keys to the Owner immediately upon request.
- .6 Direct enquiries regarding security regulations to the Owner, who will advise the Contractor of any additional requirements.
- .7 Execute the Work taking into consideration movement of occupants.

1.17 Existing Site Services

- .1 Before commencing the Work, establish location and extent of existing services in area of the Work and notify the Consultant of findings.
- .2 If disruption of services which affects operation of existing building is necessary, give a minimum of 5 Working Days' notice to the Consultant and the Owner. Provide temporary services and obtain prior acceptance from the Consultant and the Owner with regard to timing and methods for providing temporary services.
- .3 Submit schedule to and obtain approval from the Consultant for each proposed shut-down of active service or facility. Adhere to approved schedule and provide notice to affected parties. Disconnect and relocate public utilities encountered in connection with the Work with minimum disturbance to occupants, their activities, pedestrian, vehicular traffic, public and private property. Issue notices, arrange for or provide services involving:
 - .1 water pipes.
 - .2 sanitary and storm sewers.
 - .3 telephone conduits and cables.
 - .4 electrical conduits and cables.
 - .5 other similar items.

- .4 Should any piping, cables, or similar services be encountered during work of this Contract that are not known from the Owner's and utility companies' records, notify the Consultant and do not proceed with removal or cutting until directed in writing.

1.18 Site Work

- .1 Restore existing paving, sidewalks, curbs and landscaping damaged during construction. Provide paving, walks, curbs and landscaping to match existing conditions where not otherwise shown.
- .2 Provide sod to replace damaged grass and maintain it until it has rooted properly.

1.19 No Smoking Policy

- .1 Cooperate, respect and comply with Smoke Free Workplace policy requirements of the Place of the Work. This policy applies to everyone who visits and works on this Project.

1.20 Acoustic Partitions/Ceilings

- .1 Partitions and/or ceilings with sound attenuation insulation are designated as "Acoustic Partitions and Ceilings". Provide sound rated partitions and ceilings in locations indicated to meet required minimum Sound Transmission Class (STC) ratings. If not stated otherwise, STC rating is 47.
- .2 Coordinate work of various Subcontractors to avoid "short circuiting" of the STC rating for "Acoustic Partitions and Ceilings". Carefully locate and treat ducts, grilles, diffusers, electrical outlets, boxes and other similar mechanical and electrical devices. Where electrical boxes are situated back-to-back serving each side of the partitions, locate them at least 250 mm (10") apart laterally and if interconnected, use flexible connections.
- .3 Ensure to seal around cutouts for lights, cabinets, pipes, ducts, electrical boxes and other similar items. Avoid back-to-back penetrations of the diaphragm, flanking paths and door/ borrowed light openings. Refer to Section 09 21 16 – Gypsum Board for additional requirements.

End of Section

1. REFERENCES

1.1 Abbreviations and Acronyms:

- .1 CCO: Contemplated Change Order.
- .2 CD: Change Directive.
- .3 CO: Change Order.
- .4 HST: Harmonized Sales Tax.

1.2 Cash Allowances

- .1 The purpose of the Cash Allowances, if any, in the Bid Form is to cover the cost of extra work approved by the Region at its sole discretion, if required.
- .2 If the Region requests that a Cash Allowance be expended, the Contractor shall consult with the Consultant and/or Region in the selection of the Products, services and/or vendors required to carry out the work under the Cash Allowance, and shall obtain the Region's approval for the selection of Products, services and/or vendor(s) in relation to the Cash Allowance.
- .3 If required by the Region, the Contractor shall obtain bids from a minimum of three vendors in relation to a Cash Allowance item, and submit the bids received to the Region and/or Consultant for approval.
- .4 The Contractor shall submit, with the application for payment, an invoice showing the date of purchase, the vendor from which the purchase was made, the date of delivery of the Product or service, and the price, including delivery to the Site and all applicable taxes.
- .5 Cash Allowance payments will only be made with the written authorization of the Region, and shall not include any markups whatsoever. The Contractor shall have no claim on any unused portion of any Cash Allowance item.
- .6 Extend to the Owner refunds, trade and quantity discounts which may be received in purchasing under Cash Allowances, except cash discounts for prompt payment.
- .7 In submitting final adjustments of Cash Allowances, include duplicate, summary statements and copies of receipted invoices substantiating purchases under Cash Allowances.
- .8 Cash Allowance No. 1: Inspection and Testing:
 - .1 Include the sum of: \$20,000
- .9 Cash Allowance No. 2: Altos Partition Modifications,
 - .1 Include the sum of: \$30,000
- .10 Cash Allowance No. 3: Supply and Installation of finish door hardware.
 - .1 Include the sum of: \$50,000
- .11 Cash Allowance No. 4: Fire stopping not identified on the architectural and mechanical drawings discovered during demolition.
 - .1 Include the sum of: \$ 30,000.00
- .12 Cash Allowance No.5: Floor transactions, expansion joint cover plates and miscellaneous millwork as determined during construction.
 - .1 Include the sum of: \$35,000.00

1.3 Cash Flow Schedule

- .1 Prior to commencement of the Work, submit a detailed cash flow projection schedule indicating anticipated billings on a month-by-month basis for duration of the Work, including timing of holdback release.

- .2 Update cash flow schedule monthly, recording cumulative as well as monthly totals.
- 1.4 Progress Billing Breakdown
 - .1 Prior to commencement of the Work, submit a detailed progress billing breakdown and obtain approval of the Consultant.
 - .2 Progress billing breakdown shall include itemized values, (each excluding HST), applied against each of following:
 - .1 mobilization and start-up.
 - .2 general site expenses.
 - .3 Cash Allowance amount.
 - .4 each Section of Specifications (Divisions 2 - 49 inclusive).
 - .5 as-built Drawings broken down by Architectural, Structural, Mechanical and Electrical disciplines.
 - .6 Project closeout, comprising separate sums for:
 - .1 manuals.
 - .2 maintenance materials.
 - .3 commissioning and training/demonstration for Owner's staff.
- 1.5 Changes In The Work Due To Supplemental Instructions
 - .1 Supplemental Instruction does not normally include any change in the Contract Price nor in the Contract Time. The Contractor shall formally notify the Consultant in writing within 10 Days that Supplemental Instruction requires an amendment in the Contract Price and/or the Contract Time. If satisfied, the Consultant will issue a CCO for processing, or if notification has not been received within 10 Days, it is understood that there are no anticipated changes in the Contract Price and the Contract Time.
- 1.6 Contract Modification Procedures
 - .1 Conform to PART 6 - Changes in the Work of the General Conditions of the Contract.
 - .2 Further to PART 6 - Changes in the Work, promptly and not later than 10 Working Days after becoming aware of circumstances which may require a change in the Work or other directions, give written notice to the Consultant outlining such circumstances and requesting proposed change. Do no work in affected area, or that would prevent the Consultant from properly evaluating circumstances and proposed change, without obtaining written approval. The Consultant will act promptly to give the Contractor directions so Work is not unreasonably delayed.
 - .3 Advise the Consultant in writing of any contradictions, discrepancies, omissions or errors discovered or revealed. Do not proceed before obtaining clarifications and directions from the Consultant in writing. Failure to follow this shall result in the Contractor assuming full responsibility for resulting circumstances and costs.
- 1.7 Change Order And Change Directive
 - .1 Conform to GC 6.2 – Change Order and GC 6.3 – Change Directive in the General Conditions of the Contract.
 - .2 Any variation in the Contract involving a change in total amount of the Contract Price or in Contract Schedule shall be initiated through the Consultant in form of a CCO describing work proposed under variation and requesting a quotation from Contractor
 - .3 Three copies of CCOs or CDs will be issued to Contractor. Additional copies of these documents, including referenced Drawings and Schedules, shall be provided by the Contractor.
 - .4 Immediately inform all relevant Subcontractors and Suppliers of the proposed change

- .5 Upon receipt of a CCO by the Contractor and where specifically directed by the Consultant, suspend all work affected by the proposed change until a CO is issued, or until CCO is cancelled.
 - .6 Upon receipt of a CD, begin the work described therein as soon as possible and prepare a quotation for the work.
 - .7 Return 1 copy of the CCO or CD with a quotation for the work.
 - .8 Include all work described in the CCO and all other work caused, however incidental it may be, by the proposed change. Once the CO is issued by the Owner, no further claims for extra costs or time extensions will be accepted.
 - .9 If quotation received is unacceptable, the Consultant will reject quotation and request revised quotation from the Contractor.
 - .10 When the Consultant deems quotation acceptable, it will prepare a CO.
 - .11 Value of changes in work shall be determined and processed in accordance with the General Conditions of the Contract.
- 1.8 Application For Progress Payments And Progress Payments
- .1 Conform to PART 5 PAYMENT and GC 10.1 – Taxes and Duties in the General Conditions of the Contract.

END OF SECTION

1.1 References

- .1 Abbreviations and Acronyms:
 - .1 SDS: Safety Data Sheets.
 - .2 OHSA: Occupational Health and Safety Act.
 - .3 WHMIS: Workplace Hazardous Materials Information System.

1.2 Project Coordination

- .1 Study the Contract Documents to determine extent of Work required by each Specification section and upon which Work of other sections depend and coordinate scope and extent of Work to be performed by each trade. Neither organization of the Specifications into Divisions and 3-part section format nor arrangements of the Drawings, schedules and Drawings shall affect in any way the Contractor's control in, or diminish its responsibility for, dividing the Work or establishing each Subcontractor's scope of Work. Claims for additional compensation arising from disputes between Subcontractors due to lack of coordination by the Contractor will not be considered.
- .2 Coordinate Work of each section as required for satisfactory and expeditious completion of the Work. Take field dimensions required. Take into account existing installations to assure best arrangements of components in available space. Consult before commencing the Work in critical locations. Fabricate and erect the Work to suit field dimensions and field conditions.
- .3 Provide forms, templates, anchors, sleeves, inserts and accessories or other components required to be fixed to or inserted in the Work. As applicable, set them in place or instruct related Specification sections as to their location.
- .4 Pay cost of extra Work if necessary to maintain the agreed upon schedule.
- .5 Coordinate Work of all Subcontractors including construction sequence, schedule and interfacing of all Work. Coordinate Work as required to incorporate metric modular components. Coordinate Work of each Subcontractor as required for satisfactory and expeditious completion of the Work. Ensure components to be built in are supplied in time with setting Drawings and other related information. Fabricate and erect the Work to suit field dimensions and field conditions.
- .6 Ensure the Contract Documents are fully coordinated with respect to architectural, structural, mechanical, electrical and other specialty requirements.
- .7 Cooperate and coordinate with the Consultant for moving the Owner's equipment into building when the Work or substantial part thereof is ready for use for purpose intended.

1.3 Documents On Site

- .1 Maintain in good condition and order on site 1 copy of Addenda, proposed changes in the Work, Change Orders, test reports, manufacturer's installation and application instructions, progress photographs, as-built Drawings, approved progress schedules, minutes of site meetings, and other modifications to the Contract Documents.

1.4 Owner, Consultant And Contractor (Occ) Meetings

- .1 Purpose: To review policy, financial status and schedule.
- .2 Period: Every 2 weeks on a mutually acceptable schedule.

- .3 Attendees:
 - .1 Owner.
 - .2 Consultant(s).
 - .3 Contractor.
 - .4 Chair: Consultant.
 - .5 The Consultant shall prepare minutes recording decisions, comments, instructions required and a report on Schedule. The Consultant will distribute minutes to each participant within 5 Working Days.
- 1.5 Site Coordination And Progress Meetings
- .1 Refer also to GC 3.1 of General Conditions of the Contract.
 - .2 Conduct site meetings at regular intervals (every 2 weeks), to identify and resolve construction coordination items, record minutes including significant proceedings and decisions and identify "action by" parties; and reproduce and distribute to meeting participants, copies of minutes within 3 Working Days after each meeting. The Consultant also reserves right to call additional special emergency site meetings on short notice without any cost to the Owner.
 - .3 Attendees:
 - .1 The Contractor's project manager and site superintendent.
 - .2 Mechanical and electrical Subcontractors.
 - .3 Subcontractors invited by Contractor.
 - .4 The Owner and/or the Consultant(s).
 - .4 Chair: Contractor.
 - .5 Include following:
 - .1 Prepare agenda for meetings.
 - .2 Distribute written notice of each meeting minimum 7 Days in advance of meeting date, stating time and place, to persons whose presence is required.
 - .3 Make physical arrangements for meetings.
 - .4 Record minutes and attendees; include significant proceedings and decisions.
 - .5 Reproduce and distribute copies of minutes after each meeting to parties attending meeting, to parties affected by decisions made at meeting and to the Consultant.
 - .6 Ensure representatives of the Contractor, the Contractor's consultants, Subcontractors and Suppliers attending meetings are qualified and authorized to act on behalf of entity each represents.
 - .6 Ensure relative information is available to allow meetings to be conducted efficiently.
 - .7 Consultant may attend meetings to ascertain whether the Work is consistent with the Contract Documents.
 - .8 Construction Progress Schedule may be reviewed to ensure rapid and efficient completion of Work in accordance with the requirements of the Contract Documents. Keep Consultant informed of progress, of delays and of potential delays during all stages of Work.
 - .9 Review, approval or correction of minutes of previous meeting.
 - .10 Review of Work progress since previous meeting.
 - .11 Field observations, problems, conflicts.

- .12 Problems which impede Construction Progress Schedule.
 - .13 Review of off-Site fabrication, delivery schedules.
 - .14 Review of submittals schedules.
 - .15 Corrective measures and procedures to regain projected schedules.
 - .16 Quality standards.
 - .17 Pending changes and substitutions.
 - .18 Other business.
- 1.6 Start-Up Meeting
- .1 Presided over by the Consultant, after award of the Contract.
 - .2 Attendees:
 - .1 Consultant(s).
 - .2 Contractor.
 - .3 Contractor's superintendent.
 - .4 Subcontractors (mechanical, electrical).
 - .5 Major equipment Suppliers.
 - .6 Others as appropriate.
 - .3 Minimum Agenda:
 - .1 List of major Subcontractors and Suppliers.
 - .4 Tentative construction progress schedules.
 - .1 Start date; submission of schedules; long term delivery items.
 - .2 Insurance Certificates, Cash Flow Schedule, Construction Schedule, Shop Drawing submission schedule, bonds including Value Added Taxes, Trade Breakdown including value for Close Out, Workplace and Safety & Insurance Board Clearance Certificate, Project Sign.
 - .3 Critical work sequencing.
 - .4 Major equipment and Product deliveries and priorities.
 - .5 Designation of responsible personnel
 - .6 Building Permit status.
 - .7 Procedures for maintaining record documents.
 - .8 Use of Premises: Office, keys, work and storage areas; Owner's requirements (storage delivery, path of construction activities, vehicle, by foot, carts, exterior and interior, elevator use, washrooms, bin location).
 - .9 Construction facilities, controls, temporary hoarding, dust partitions, parking, hours, noisy work, interruption of services, smoking, cell phone usage and construction aids.
 - .10 Construction scheduling (particularly drying time for concrete slabs).
 - .11 Temporary utilities.
 - .12 Safety and first-aid procedures.
 - .13 Security procedures.
 - .14 Housekeeping procedures.

1.7 Pre-Installation Trade Meetings

- .1 If a Subcontractor requires a meeting prior to starting Work, arrange for such meeting of all parties associated with the Subcontractor trade as designated in the Contract Documents or as requested by the Consultant. Presided over by the Contractor, include the Consultant who may attend, include Subcontractor performing the Work involved, testing company's representative and the Contractor's consultants of applicable discipline. Review the Contract Documents for the Work for which the Subcontractor is responsible and determine complete understanding of requirements and responsibilities relative to the Work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, project staffing, restrictions on areas of concrete placement and other matters affecting construction, to permit compliance with intent of trade under consideration.

1.8 Schedule Of The Work

- .1 Submit a detailed bar chart [critical path] construction schedule with activities itemized to enable the Contractor and the Consultant to monitor progress of the Work.
- .2 Schedule shall indicate without limitations dates for:
 - .1 erection and dismantling of temporary facilities.
 - .2 submission of Shop Drawings for various divisions of the Work.
 - .3 submission of mechanical and electrical trades coordination and interference Drawings.
 - .4 submission of samples and sample installations.
 - .5 commencement and completion of each major division of the Work, including Work to be done by Subcontractors.
 - .6 critical Work sequencing.
 - .7 drying time for concrete slabs to allow for placement of moisture sensitive floor coverings.
 - .8 major equipment deliveries and priorities.
 - .9 final completion date
- .3 Update and resubmit schedule on a monthly basis.

1.9 Short Term Schedule

- .1 On a bi-weekly basis, provide the Owner with a 2 week short term schedule based on above schedule, indicating important construction activities as the Owner and Consultant may see suitable for the Contract requirements.

1.10 Progress Photographs

- .1 Submit progress photographs in digital and hard copy formats, taken by a professional photographer, from date of commencement of the Work until the date of Substantial Performance of the Contract.
- .2 Submit colour, glossy, 200 mm x 250 mm (8" x 10") photographs in a clear sheet protector suitable for storage in a binder with a white patch in bottom, right corner indicating name of the Contract, compass direction of exposure, subject title, date and time of exposure.
- .3 Prior to commencement of the Work, submit 10 photographs of the Place of the Work and 6 photographs along the lines forming the perimeter of the Place of the Work.
- .4 During Work, submit 12 photographs reproduced in duplicate, each month, taken from different vantage points to illustrate progress of the Work, both exterior and interior.
- .5 Submit 36 interior photographs when the Work has been certified by the Consultant as substantially performed.

1.11 Personnel Appointment

- .1 Appoint a senior member of staff, with full authority to commit the Contractor to methods and schedules for construction, to participate actively in administration and maintenance of detailed construction schedule. Provide necessary information on progress of the Work to enable a status report to be produced every 2 weeks.

1.12 General Review

- .1 The Consultant shall conduct periodic field review to review the Work for general conformance with Contract Documents, code and Authorities Having Jurisdiction.
- .2 Review includes review of Shop Drawings, review of field work and review of reports produced by various inspection and testing agencies.
- .3 Record each review in manner suitable for submission to the Consultant at completion of the Contract along with inspection and testing reports at site meetings every second week.

1.13 Product Substitution Proposals

- .1 After award of the Contract, Product substitution proposals will be reviewed in accordance with this Section. The Owner reserve the right to reject proposed substitutions for operational, economic, aesthetic or technical reasons.
- .2 Submit following for each Product substitution proposal:
 - .1 Shop Drawings, including full details.
 - .2 samples.
 - .3 difference in price, if any, in form of certified quotations of both selected and proposed substitutions.
- .3 Submit the Contractor's written acceptance of use of substituted Products and certification substituted Products:
 - .1 will not exceed space requirements allocated for originally specified Products or, if they do, the Contractor is including with substitution submission, design drawings, to accommodate substituted Product.
 - .2 are compatible with and inert to adjacent materials.
 - .3 will not affect project schedule due to delays in delivery and installation.
 - .4 have been priced to include design adjustments required to accommodate substituted Products, indicate the Owner's acceptance in writing via a Change Order.
- .4 Proposed substitutions require the Consultant's review and acceptance in writing and, if there is a difference in price, extra or credit requires the Owner's acceptance.

1.14 Certificates And Transcripts

- .1 Immediately after receiving notification of award of the Contract, submit Workplace Safety & Insurance Certificate status, transcription of insurances and other certificates and transcripts required by the Contract Documents or the Consultant.

1.15 Contractor's Personnel And Subcontractors

- .1 Submit complete list of the Contractor's Subcontractors with addresses, phone numbers and personnel along with the Contractor's list of personnel.

1.16 Submittal Procedures

- .1 Submit to the Consultant, and to Authorities Having Jurisdiction as required, documents to be submitted for review. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of the Contract Time or extra costs and no claim for extension of the Contract Time or increase to the Contract Price by reason of such default will be allowed. Final approval of Authorities Having Jurisdiction, where required, shall be obtained prior to submitting Shop Drawing or other documentation to the Consultant.
- .2 Prior to submission to the Consultant, the Contractor shall review submittals. Submittals not stamped, signed, dated and identified as to specific Contract will be returned without being examined and shall be considered rejected. Verify field measurements and ensure affected adjacent work are coordinated. Confirm and correlate information pertaining to fabrication processes, quantities, techniques of construction and installation and similar information.

1.17 Shop Drawings

- .1 Shop Drawing Schedule: Submit a Shop Drawing schedule.
- .2 Fabrication: Do not fabricate until Shop Drawings are indicated as "REVIEWED" or "REVIEWED AS NOTED" by the Consultant.
- .3 The Consultant's Shop Drawing Review:
 - .1 The Consultant's review of Shop Drawings is for sole purpose of ascertaining conformance with general design concept.
 - .2 The Consultant's review does not provide approval of items which remain the Contractor's responsibility.
 - .3 Without limitation, among other things, the Contractor remains responsible for:
 - .1 detail design inherent in Shop Drawings.
 - .2 errors and omissions in Shop Drawings.
 - .3 meeting requirements of the Contract Documents.
 - .4 confirmed and correlated Site dimensions.
 - .5 information that pertains solely to fabrication processes, techniques of construction and installation.
 - .6 co-ordination of work of all Subcontractors.
- .4 Shop Drawing Requirements:
 - .1 Indicate following minimum requirements as applicable: 1.18.4.1.1. plans, sections and details.
 - .1 verified Site dimensions.
 - .2 materials thicknesses and finishes.
 - .3 methods of setting and sealing.
 - .4 methods of securing, fastening and anchoring including field connections.
 - .5 signed and sealed Shop Drawings and calculations where specifically required herein.
 - .2 Do not make Product substitutions on Shop Drawings without the Consultant's written acceptance in accordance with Product substitution proposal process or they will be rejected. Replace unaccepted Product substitutions and complete the Work in accordance with the Contract Documents.
 - .3 Determine which Shop Drawings the local Building Department will require for its approval and submit 2 final copies of each Shop Drawing to local Building Department. Obtain approval and pay associated charges and fees.

- .5 Shop Drawing Procedures:
- .1 The Consultant will provide a Shop Drawing stamp to the Contractor for use on the Work. Shop Drawing stamp remains the Consultant's property and must be returned at conclusion of the Work.
 - .2 Execute following prior to submitting Shop Drawings to the Consultant:
 - .1 review, check and mark-up Shop Drawings with comments and revisions and re-direct back to Subcontractor ("REVISE AND RESUBMIT", etc.) in the first instance if required prior to forwarding to the Consultant.
 - .2 stamp each Shop Drawing with Consultant's Shop Drawing stamp.
 - .3 insert applicable Specification section reference, e.g., "10 28 00" for Section 10 28 00, Washroom Accessories.
 - .4 insert next consecutive Shop Drawing number within that section, e.g., "002" for second Drawing within Section 10 28 00.
 - .5 insert the Contractor's review date and signature of the Contractor's reviewer.
 - .3 Submit following for the Consultant's review
 - .1 1 print of each stamped Shop Drawing, to be returned to the Contractor.
 - .2 3 prints of each stamped Shop Drawing, not returned to the Contractor.
 - .3 If catalogue cuts acceptable to the Consultant, submit as many copies of catalogue cuts for review as agreed to. Only 1 set to be returned to the Contractor.
 - .4 Reproductions of the Consultant's Contract Documents are not acceptable as Shop Drawings.
 - .5 Shop Drawings not conforming to above criteria will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.
 - .6 Shop Drawings submitted without specified Professional Engineer design and stamp will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.
 - .7 Do not resubmit Shop Drawings indicated as "REVIEWED" and "REVIEWED AS NOTED".
 - .8 Resubmit Shop Drawings indicated as "REVISE AND RESUBMIT" with required changes and comments addressed. Insert letter "R" after Shop Drawing number on resubmitted Shop Drawings, re-date and re-sign. Identify revisions from earlier submissions graphically on revised Shop Drawings.
 - .9 The Consultant requires 14 Days for review of Shop Drawing from time of the Consultant's receipt to time of the Consultant's return to the Contractor. The Contractor will establish a steady flow of Shop Drawings for review and avoid accumulation of an excessive quantity of Shop Drawings in a single submission.
 - .10 Provide Shop Drawings required by the Contract Documents

1.18 Interference Drawings

- .1 Prepare Drawings indicating relationship of new and existing and/or unforeseen conditions at congested areas prior to commencement of work in area.
- .2 For congested locations, before commencing installation, prepare Drawings showing relationship of ductwork, conduit, piping, sprinklers, ceiling supports and framing, communication and specialized equipment located within ceiling and shaft spaces.
- .3 Indicate locations of visible items such as air handling outlets, light fixtures, smoke detectors, sprinkler heads, communication grilles and access panels occurring at these locations.
- .4 Ensure interference Drawings are initialed by a responsible person of each Subcontractor involved along with the Contractor's signature and submitted to the Consultant for review and record purposes.

1.19 Samples

- .1 Prior to fabrication or supply of Products, submit samples for the Consultant's review. Remove and discard Products whose samples have not been reviewed and accepted by the Consultant.
- .2 Deliver samples to the Consultant as directed with charges prepaid and allow for 1 of the samples to be kept by the Consultant.
- .3 Unless otherwise specified, submit samples in duplicate.
- .4 Identify each sample with:
 - .1 Contract name and Contract number.
 - .2 date of sample submission
 - .3 component name using the Specification's terminology.
 - .4 material (including alloy).
 - .5 finish including colour, sheen, texture.
 - .6 dimensions including thickness.
- .5 Exhibit each of the following for each sample:
 - .1 materials.
 - .2 finishes:
 - .1 material.
 - .2 colour including maximum colour range within each specified colour.
 - .3 sheen, tone.
 - .4 texture.
 - .5 range of blemishes and other markings.
- .6 Alter, refinish or provide additional samples until they are reviewed and accepted by the Consultant.
- .7 Fabricate samples using same tools and techniques to be employed in actual installation of the Work.
- .8 Provide Products in the Work which are identical to accepted samples.
- .9 Provide samples required by the Contract Documents.

1.20 Access Panels And Access Doors

- .1 Before commencing installation of mechanical and electrical work, prepare, together with mechanical and electrical Subcontractors, on a set of the Drawings provided for that purpose, a complete lay-out of all access panels and access doors which will be required. Submit these lay-outs for review by the Consultant as specified for Shop Drawings and show exact sizes and locations of access panels and doors. Revisions may be required to lay-out before final review by the Consultant. Allow the Consultant to revise layout or quantity of access doors and panels by relocating related building services a maximum of 2000 mm (6' - 7") at no extra cost to the Owner. Should relocation exceed this measurement then the Contract Price may be adjusted in accordance with provisions for changes in the Contract Documents.
- .2 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated.

1.21 Whmis Requirements

- .1 Comply with WHMIS in accordance with OHSA requirements.
- .2 Before commencement of the Work and during full term of the Contract, provide a list with current SDS of all hazardous materials proposed for use on the Contract.
- .3 In addition to submission of SDS as required under regulations, submit emission reports where available or off-gassing data to help control possible harmful effects to indoor air quality during construction, occupation and including maintenance period.
- .4 Label hazardous materials used and/or supplied on the Contract in accordance with WHMIS requirements.
- .5 Provide detailed procedures for safe handling storage and use of hazardous materials. List special precautions and safe clean up and disposal procedures. Conform to the Environmental Protection Act and other requirements of Authorities for disposal and clean up requirements.
- .6 Obtain from the Owner, where applicable, a list and MSDS of hazardous materials that may be handled, stored or used by the Owner's employees and/or Other Contractors retained by the Owner at location where the Work of this Contract will be performed.
- .7 Ensure those who handle and/or are exposed to or are likely to handle or be exposed to hazardous materials are fully instructed and trained in accordance with WHMIS requirements.

1.22 Colours

- .1 Colour and gloss value to be selected by the Consultant. Obtain direction on colour and gloss value in advance of need. If requested, submit samples for colour and gloss selection. Follow colour schedule provided by the Consultant and use colours and gloss designated.

1.23 Record Drawings And Specifications

- .1 Keep 1 set of Drawing prints and Specifications on Site for use in maintaining record information. Ensure these Drawings and Specifications are kept on Site at all times available for review by the Owner and/or the Consultant at any given time.
- .2 Accurately and neatly record deviations from the Contract Documents, including Addenda, Site Instructions and Change Orders, caused by Site conditions.
- .3 Record information concurrently with construction progress. Do not conceal actual work until required information is recorded.
- .4 Legibly indicate each item to record actual construction including:
 - .1 Field changes of dimension and details.
 - .2 Details or information not on original Contract Drawings.
- .5 Catalogue field review reports and cross reference to relevant trade, building area and component. Submit inspection and testing reports in accordance with requirements of the Specifications. Highlight unsatisfactory inspection and testing results with supplementary instructions issued by the Consultant.
- .6 Identify Drawings as "Project Record Copy", maintained and available for inspection on the Site by the Consultant.
- .7 Prior to applying for Certificate of Substantial Performance submit record Drawings and Specifications to the Consultant.

- 1.24 As-Built Drawings
- .1 Prior to applying for Certification of Substantial Performance, the Consultant will provide the Contractor with electronic set of requested Drawings for as-built purposes.
 - .2 The Contractor is responsible for:
 - .1 maintaining as-built Drawings during progress of work, in complete sets, at the Place of the Work.
 - .2 including additional changes over and above those included in any Addenda, Site Instructions and Change Orders.
 - .3 including accurate locations, depths, sizes and types of underground utilities and concealed services in the as-built Drawings
 - .4 having changes recorded in a manner consistent with the original Drawings using minimum AutoCad software.
 - .5 ensuring outline clouds and notations are removed from the Drawings.
 - .6 having 1 set as-built Drawing prints submitted to the Consultant for review before final submission.
 - .7 incorporating any review comments made by the Consultant.
 - .8 resubmitting final reviewed set, in following format: 1.25.2.8.1. 1 set on electronic disk.
 - .1 1 set on reproducible prints (i.e., mylar).
 - .2 1 set of white prints.
 - .3 Refer to Divisions 21, 22, 23, 26, 27 and 28 for supplementary requirements.
- 1.25 Operation And Maintenance Instructions Manual
- .1 Upon completion of the Work, submit 3 sets of operation and maintenance instructions manual to the Consultant. Include following:
 - .1 data books and literature.
 - .2 maintenance instructions, specifying warnings of any maintenance practice that may damage or disfigure specified Products.
 - .3 operational information on Products, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information.
 - .4 recommended maintenance Products.
 - .2 Submit instructions in plain language to guide the Owner in proper operation and maintenance of building components.
 - .3 Organize contents into applicable categories of the Work, numbered to match the Specification section numbering system.
 - .4 Bind contents of operation and maintenance instructions manual in 3-ring, hard-covered, vinyl jacketed binders, label spine "OPERATION AND MAINTENANCE INSTRUCTIONS MANUAL" and include following:
 - .1 title sheet, labelled "OPERATION AND MAINTENANCE INSTRUCTIONS", containing project name and completion date.
 - .2 list of contents.
 - .3 list of names, addresses and telephone numbers of installing Subcontractors and Suppliers for future repair or maintenance.
 - .4 schedule of Finishes (as-built) listing paints, colours and fabrics provided.
 - .5 Refer to Divisions 21, 22, 23, 26, 27 and 28 for supplementary requirements.
 - .6 Provide operation and maintenance instructions as required by the Contract Documents.

1.26 Miscellaneous Submittals

- .1 Supply submittals required by the Contract Documents (e.g., plans, reports, certifications, results, records, etc.) for the Consultant's review

END OF SECTION

1.1 Reference Standards

- .1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.
- .2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However, if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.
- .3 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.
- .4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Consultant for clarification.
- .5 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or initialisms:
 - .1 AA - Aluminum Association
 - .2 ACI - American Concrete Institute
 - .3 AISC - American Institute of Steel Construction
 - .4 ANSI - American National Standards Institute
 - .5 ASME - American Society of Mechanical Engineers
 - .6 ASTM – ASTM International
 - .7 AWMAC - Architectural Woodwork Manufacturers Association of Canada
 - .8 AWWA - American Wire Producers Association
 - .9 CaGBC - Canadian Green Building Council
 - .10 CGSB - Canadian General Standards Board
 - .11 CISC - Canadian Institute of Steel Construction
 - .12 CPCI - Canadian Prestressed Concrete Institute
 - .13 CSA – CSA Group
 - .14 CSSBI - Canadian Sheet Steel Building Institute
 - .15 CWB – Canadian Welding Bureau
 - .16 ICEA - Insulated Cable Engineers Association
 - .17 IEEE - Institute of Electrical and Electronics Engineers
 - .18 IGMAC – Insulating Glass Manufacturers Association of Canada
 - .19 LEED - Leadership in Energy and Environmental Design
 - .20 MPI – Master Painters Institute
 - .21 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry
 - .22 NAAMM - National Association of Architectural Metal Manufacturers
 - .23 NEMA - National Electrical Manufacturers Association
 - .24 NFPA - National Fire Protection Association
 - .25 NHLA - National Hardwood Lumber Association
 - .26 NLGA - National Lumber Grades Authority
 - .27 SSPC – The Society for Protective Coatings
 - .28 TTMAC - Terrazzo, Tile and Marble Association of Canada
 - .29 ULC - Underwriters' Laboratories of Canada

1.2 Independent Inspection And Testing Agencies

- .1 Except as otherwise specified, Owner will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the Work.
- .2 Retain and pay for inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

- .3 Section 01 21 00 – Allowances specifies a cash allowance for independent inspection and testing services to be retained and paid for by Contractor. Cash allowance excludes any inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.
- .4 Employment of inspection and testing agencies by Contractor or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.
- .5 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.
- .6 For inspection and testing required by Contract Documents or by authorities having jurisdiction, provide Consultant and inspection and testing agencies with timely notification in advance of required inspection and testing.
- .7 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

1.3 Inspection And Testing Agency Reports

- .1 For inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies, submit to Consultant and Owner copies of reports. Submit within 5 days after completion of inspection and testing.
- .2 For inspection and testing performed by Owner retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.

1.4 Mock-Ups

- .1 Prepare mock-ups of Work as specified in the technical Specifications. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Consultant.
- .2 Modify mock-up as required until Consultant approval is obtained.
- .3 Approved mock-ups establish an acceptable standard for the Work.
- .4 Protect mock-ups from damage until the Work they represent is complete.
- .5 Unless otherwise specified in the technical Specifications, approved mock-ups forming part of the Work may remain as part of the Work.
- .6 Remove mock-ups only when the Work they represent is complete or when otherwise directed by Consultant.

1.5 Regulation Requirements

- .1 Comply with the *Building Code Act, 1992*, S.O. 1992, c. 23 as amended, and the Building Code, O. Reg. 332/12, as amended and Regulations and bylaws of other Authorities Having Jurisdiction, including latest amendments thereto; all hereafter referred to as the Code. Where the Code or the Contract Documents do not cover particular requirements which are covered by NBC, as amended, conform to requirements of NBC including its related supplements. Where the Contract Documents exceed the Code requirements, satisfy such additional requirements.

- .2 Pre-Start Health and Safety Review (PSR): Whether or not this is required by law, under this Contract ensure any Product, tool or process provided as Work of this Contract complies with the requirements of the *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1, Regulation 851: Industrial Establishments, R.R.O. 1990, Reg. 851, as amended and certify same to Consultant prior to Substantial Performance of the Contract. For guidance, refer to "Guidelines for Pre- Start Health and Safety Reviews: How to Apply Section 7 of the Regulation for Industrial Establishments" dated April 2001 published by the Government of Ontario. Ensure all exemption documents or PSR reports are complete and correct prior to handing over to the Owner. Provide [3] sets of originals to the Owner.
- .3 Conform to NFPA 101 for exit requirements.
- .4 Conform to the Fire Code, O. Reg. 213/07: enacted under *Fire Protection and Prevention Act*, 1997, S.O. 1997, c. 4, , as amended.
- .5 Where material is designated in the Contract Documents for certain application, unless otherwise specified, that material shall conform to standards designated in OBC and in absence of more restrictive requirement comply with Division B, Part 9 "Housing and Small Buildings" of the Code. Similarly, unless otherwise specified and not required otherwise by OBC, installation methods and standards of workmanship shall also conform to standards of Division B, Part 9. Where specific requirements for a material are not specified for certain use, select from choice offered in Division B, Part 9.
- .6 Unless otherwise indicated in the Contract Documents, obtain and pay for all other permits, licenses and certificates of inspection. Ensure permits, licenses and certificates included under specific sections are obtained as specified. Forward copies of all permits to the Consultant before commencing work.
- .7 Comply with all requirements of the *Workplace Safety and Insurance Act*, 1997, S.O. 1997, c. 16, Sched. A, including payments due thereunder.
- .8 Apply the *Ontario College of Trades and Apprenticeship Act*, 2009, S.O. 2009, c. 22, and regulations thereunder, as amended, to performance of this Contract.

1.6 Imperial/International System Of Units (Si)

- .1 Submittals containing measurements of any kind in Imperial system of measurement shall be on the Consultant's approval only. Submit all measurements in International System of Units (SI).
- .2 Submittals containing measurements of any kind shall have measurements in language of International System of Units (SI) conforming to CAN/CSA-Z234.1.

1.7 Quality Assurance

- .1 Study and be aware of principles discussed in above documents in order to understand their significance to the Contract Documents.
- .2 Some information in above reference documents may not be applicable to the Work and no recommendations or statement therein is a mandatory requirement of the Contract unless required by the Contract Documents.

1.8 Tolerances

- .1 Unless more stringent tolerances are required by a section of the Specifications or a referenced standard, meet following tolerances for installed work:

- .1 "plumb" means plumb within 3 mm in 3 m (1/8" in 10' - 0").
- .2 "level" means level within 3 mm in 3 m (1/8" in 10' - 0").
- .3 "square" means not in excess of 10 seconds, less or more than 90°.
- .4 "straight" means within 3 mm in 3 m (1/8" in 10' - 0"), under a 3 m (10' - 0") straightedge.

1.9 Qualifications

- .1 For manufacturer's, fabricator's and installer's qualifications, conform to requirements specified under respective trade section, as applicable. Where applicable, manufacturer's field services shall be obtained as specified under respective trade section.

1.10 Professional Engineer's Qualifications

- .1 Employ a professional engineer registered to practice in Province of Ontario carrying a minimum \$2,000,000.00 professional liability insurance to:
 - .1 design components of the Work of this Project specific to their license to practice.
 - .2 be responsible for determining sizes or other specific requirements within their license to practice in accordance with applicable codes and regulations.
 - .3 be responsible for production and review of Shop Drawings.
 - .4 inspect work of this Section during fabrication and erection/installation.
 - .5 be responsible for stamping and signing each Shop Drawing and associated calculations performed.
 - .6 provide site administration and inspection of this part of the Work.
 - .7 Certification: Submit certification stating performance of engineered work will perform as required.

1.11 Testing Agency Qualifications

- .1 Conduct testing in accordance with requirements of OBC unless advised otherwise in the Contract Documents or by the Consultant. Obtain certification where required by applicable codes and standards.
- .2 Ensure testing agency is an independent testing agency with experience and capability to conduct testing indicated, as documented according to ASTM E329.
- .3 Qualifications of inspectors: Submit list of inspectors to be employed on this Contract and obtain the Consultant's approval.
- .4 Ensure testing and inspection is performed by qualified inspectors and/or technologist certified by the Professional Engineer or performed directly by the Professional Engineer in conformance with applicable codes and certification programs.
- .5 Ensure inspectors are qualified to perform type of inspection or testing required.
- .6 Perform concrete testing using a testing company conforming to requirements of CSA A283 as required for this Contract. Inspection report format and distribution requirements will be established by the Consultant.

1.12 Contractor's Qualifications

- .1 Prior to commencement of the Work, establish quality control system protocols, rules, related chain of commands and commitment to provide quality work as intended in the Contract Documents for the Work.

- .2 Provide position Specification of quality control staff, shop and field supervisors complete with their skills, knowledge, duties and responsibilities.

1.13 Source Quality Control

- .1 Refer to respective Specification sections for source quality control requirements.

1.14 Testing And Inspection Of Mechanical And Electrical Systems

- .1 Provide testing and inspection of mechanical and electrical systems as defined in the Contract Documents under trade sections of Divisions 21, 22, 23, 26, 27 and 28 respectively.

1.15 Interior

- .1 Architectural millwork: Refer to Section 06 40 00 for AWMAC Guarantee.
- .2 Manufacturer Warranty: Warrant work of this Section for a period of 2 years against defects and/or deficiencies in accordance in Article A-6 of the Contract between Owner and Contractor and GC 37 of the General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of the Consultant and at no expense to the Owner. Defects include but are not limited to, delamination of plastic laminate, opening of seams, warpage and extensive colour fading.

END OF SECTION

1.1 Temporary Utilities - General

- .1 Provide temporary utilities as specified and as otherwise necessary to perform the Work expeditiously.
- .2 Remove temporary utilities after use.
- .3 Temporary Protection: Provide and maintain following temporary protection at all times:
 - .1 Window Openings: Translucent, weatherproof protection until windows and glazing are installed.
 - .2 Door Openings: Minimum wood doors, frames, hinges, locks and bolts to exterior and interior to existing areas.
 - .3 Air Intakes: Provide protection against infiltration of dirt, dust and other deleterious matter.
 - .4 Temporary Dust Tight Partitions: Separate areas of work from occupied portions of building with temporary dust tight partitions constructed from floor to underside of structure. Construct temporary dust tight partitions as fire separations having a fire resistance rating of 1 hour consisting of 16 mm (5/8") gypsum board, both sides on steel stud partition conforming to ULC Design No. W407 and to ULC Design No. W408. Paint public sides of partitions with minimum 2 coats of low VOC paint in colours selected by the Consultant. Seal edges and joints to achieve positive protection. Provide lockable door(s) in temporary dust tight partition(s) where indicated on Drawings and extra key to the Consultant. Remove temporary dust tight partitions promptly when no longer required and Make Good adjacent surfaces. Hoarding/temporary dust tight partitions are to remain in-place unless noted otherwise.
 - .5 Provide temporary dust tight partitions beyond those shown on Drawings where risk of falling objects exist, to protect the public and the Owner's personnel.

1.2 Temporary Fire Protection:

- .1 Provide and maintain sufficient temporary standpipes and connections, fire hose, valves, temporary cabinets and extinguishers, to comply with requirements of the governing municipal and provincial authorities to satisfaction of the Consultant and local fire department and insurance authorities in order to protect the property of the Owner against fire hazards during construction.
- .2 Adjust and modify temporary fire protection facilities to accommodate progress of the Work.
- .3 Bulk storage of flammable liquids and other hazardous materials is not allowed on the Site.
- .4 Bringing in, use and disposal of gasoline, benzene or other flammable materials must be handled with good and safe practice as required by authorities having jurisdictions.
- .5 Maintain temporary fire protection systems in operation 24 hours a Day.
- .6 Provide and maintain temporary access routes to exits, clear and visibly identified, 24 hours a Day.
- .7 Take necessary precautions to eliminate fire hazards and to prevent damage to Work, building materials, equipment and other property, both public and private, having to do with the Work. Inspect Work of this Contract at least once a week for this purpose.
- .8 In areas of existing building being renovated and adjacent areas where affected by construction activities, make necessary adjustments and modifications to temporary fire protection as required during progress of the Work, removing such temporary modifications when the permanent system is installed and operating. Maintain all existing fire exits at all times.

- .9 Provide fire protection to satisfaction of the Consultant, to Authorities Having Jurisdiction and to insurance Authorities stipulated by Owner. Maintain in operation 24 hours a Day.
- .10 Provide and maintain free access from street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment, permanent or temporary; and maintain free access to control valves and hoses on fire lines within building and to all portable fire extinguishers. Ensure devices are visibly identified 24 hours a Day.
- .11 Provide and maintain in working order, suitable Underwriters' Laboratories of Canada labelled fire extinguishers and locate in prominent positions, to approval of Authorities Having Jurisdiction. Such extinguishers remain property of the Contractor. Remove from building at date of Substantial Performance of the Work.
- .12 Store and locate materials and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner. Place approved types of fire fighting equipment in vicinity of materials or equipment packed in this type of crate or carton until permanent fire protection and equipment are available.
- .13 Store rags and waste containing oil, grease or other flammable materials in an approved metal container and remove from Site at end of each Working Day.
- .14 Only fire-resistant tarpaulins are permitted on Site.
- .15 Provide temporary standpipes as Work proceeds in accordance with the regulations under the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, as amended.
- .16 In eliminating fire risks, or effectively controlling Site activities to minimize fire risk, observe following precautions as a minimum:
 - .1 Prior to commencing Work in any area, ensure workers are acquainted with the location of all fire-fighting apparatus and are familiar with its proper use and apparatus is in good working order.
 - .2 Stop all Work immediately when any deficiencies in fire protection are encountered after Work commences. Remedy all such deficiencies before resuming any other Work.
- .17 Notify the Newmarket Fire Department and the Consultant immediately should a fire of any nature occur whether the fire has been extinguished or not. Notify the Newmarket Fire Department and the Consultant of any fire alarm shutdowns; notify once fire alarm has been recertified and operational.
- .18 If the Contractor is the cause of a false alarm, it may be required to reimburse the Owner for any charges from the Newmarket Fire Department resulting from the false alarm.
- .19 Establish a logbook maintained by the Contractor which records all activity affecting the Owner's fire alarm system. The log book shall record the date, time, trade, worker's name, nature and location of Work performed, zone or zones affected, status of the system while Work was performed, time and date of completion of the operation, and status of the system upon completion of the Work. At the end of each Working Day, the Contractor shall review the log and sign indicating system is fully operational, except as recorded by the log. Inform the Owner of system status and which zones may be affected daily prior to the commencement of any new operation that affects the fire alarm system.

1.3 Construction Facilities

- .1 Contractor's Field Offices and Sheds:
 - .1 Provide the Contractor's field offices and storage sheds within the Place of the Work only. Provide offices and sheds, properly painted and maintained.

- .2 Provide following field office facilities:
 - .1 A room to accommodate 15 persons for Site conference and job meetings, heated and air conditioned to maintain a temperature of 21 deg C (70 deg F) +/-2 deg C (4 deg F).
 - .2 Telephone services for the Contractor's own use.
 - .3 "No Smoking" signs.
 - .4 Provide proper flammable and explosive materials storage.
- .3 Floor Area: Minimum 250 sq. ft.

.2 Facilities:

- .1 one desk (900 mm x 1500 mm (3' x 5') minimum).
- .2 one desk lamp (incandescent).
- .3 one smartphone.
- .4 three chairs.
- .5 one table and lamp.
- .6 one full-length, counter-height plan table with 3 plan drawers and storage under.
- .7 two tall stools.
- .8 one openable window to the outside (minimum 600 mm x 900 mm (2' x 3')).

.3 Services:

- .1 electrical (minimum 3 receptacles).
- .2 lighting.
- .3 air conditioning.

1.4 Sanitary Facilities

- .1 Existing toilet facilities may be used as directed provided they are kept clean and serviced. Repair damage to existing toilet facilities and clean before completion of the Work.
- .2 The Owner may back charge the Contractor for additional cleaning of facilities if not kept clean.

1.5 Garbage Removal

- .1 Do not use institutional garbage bin facilities for removal of construction rubbish and debris. Provide garbage bins and schedule pick up of garbage. Coordinate location of garbage bins with Consultant. Conform to the Consultant's requirements. Repair damage to Site surface upon removal of garbage.

1.6 Construction Aids

- .1 Scaffolding: Erect fixed or mobile scaffolding as applicable independent of walls. Use it in manner as to interfere as little as possible with other sections. When not in use, move it as necessary to permit installation of other work. Construct and maintain scaffolding in rigid, secure and safe manner. Remove it promptly when no longer required, and if required for longer than a Day, remove it at the end of each Day and store in secure place as directed.

1.7 Vehicular Access And Parking

- .1 Parking for the Contractor's vehicles shall be arranged with the Consultant. The Owner will not be responsible for parking fines incurred by the Contractor, Subcontractors or their employees.
- .2 Do not be nuisance to public traffic any time. Manage construction traffic by using designated roads and by providing trained flag persons to direct public traffic as appropriate.
- .3 Existing Parking Facilities: Parking is available to construction personnel. Arrangements must be made with Owner regarding the location of parking to be provided.

1.8 Temporary Controls

- .1 Pollution Control: Take appropriate dust control measures to avoid contamination of adjacent areas near Site from dust. Respond immediately to complaints of dust received from public, Authorities, or the Consultant. Keep public and private roads free of dust, mud and construction debris resulting from trucks employed on this project.
- .2 Noise and Vibration Control: Control noise and vibration generated by the Work. Respond immediately to complaints of noise and vibration received from public, Authorities or Consultant

1.9 Existing Building Heating, Ventilation, Power, And Lighting

- .1 Existing building heating, ventilation, power, and lighting may be relied upon and used during construction [except during hours or days when the building is not operational].
- .2 Coordinate and make arrangements with the building operator and pay any costs required for provision of these services during hours or days when the building is not operational.

END OF SECTION

1.1 Temporary Controls - General

- .1 Provide temporary controls as necessary for performance of the Work and in compliance with applicable regulatory requirements.
- .2 Maintain temporary controls in good condition for the duration of the Work.
- .3 Remove temporary controls and Construction Equipment used to provide temporary controls from Place of the Work when no longer required.

1.2 Dust And Particulate Control

- .1 Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.
- .2 Execute Work by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.
- .3 Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .5 Use appropriate covers on trucks hauling fine, dusty, or loose materials.

1.3 Pollution Control

- .1 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.
- .2 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur.
- .3 Promptly report spills and releases that may occur to:
 - .1 authority having jurisdiction,
 - .2 person causing or having control of pollution source, if known, and
 - .3 Owner and Consultant.
- .4 Contact manufacturer of pollutant, if known and applicable, to obtain material safety data sheets (SDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.
- .5 Take immediate action to contain and mitigate harmful effects of the spill or release.

END OF SECTION

1.1 General

- .1 Provide Products that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by Consultant, furnish evidence as to type, source and quality of Products provided.
- .2 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.
- .3 Permanent manufacturer's markings, labels, trademarks, and nameplates on Products are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

1.2 Product Options

- .1 Substitution Procedures:
 - .1 Wherever a Product or manufacturer is specified by a single proprietary name, provide the named Product only.
 - .2
 - .3 Wherever more than one Product or manufacturer is specified by proprietary name for a single application, provide any one of the named Products.
- .2 Wherever a Product is specified by reference to a standard only, provide any Product that meets or exceeds the specified standard. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.
- .3 Wherever a Product is specified by descriptive or performance requirements only, provide any Product that meets or exceeds the specified requirements. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified requirements.

1.3 Product Availability And Delivery Times

- .1 Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time.
- .2 If a specified Product is no longer available, promptly notify Consultant. Consultant will take action as required.
- .3 If delivery delays are foreseeable, for any reason, promptly notify Consultant.
 - .1 If a delivery delay is beyond Contractor's control, Consultant will provide direction.
 - .2 If a delivery delay is caused by something that was or is within Contractor's control, Contractor shall propose actions to maintain the construction progress schedule for Consultant's review and acceptance.

1.4 Storage, Handling, And Protection

- .1 Store, handle, and protect Products during transportation to Place of the Work and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.
- .2 Comply with manufacturer's instructions for storage, handling and protection.
- .3 Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work.

- .4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of material safety data sheets (MSDS).
- .5 Store Products subject to damage from weather in weatherproof enclosures.
- .6 Store sheet Products on flat, solid, supports and keep clear of ground. Slope to shed moisture.
- .7 Remove and replace damaged Products.

1.5 Basic Product Requirements

- .1 Material, Machinery, Equipment and Fixtures: Product employed in the Work shall be those which affect indoor air quality as little as possible. Provide adequate ventilation during installation of finishing materials to avoid effect on indoor air quality.
- .2 Material, plant, equipment and fixtures specified shall form basis of the Contract. Where more than 1 brand or manufacturer is named in Specifications, or on Drawings, Contractor shall have choice to use 1 of specified manufacturer or brand or Equivalent provided requirements of the Drawings and Specifications are met.
- .3 Ensure materials, plant, equipment and fixtures are not damaged or defective and of quality specified and compatible for purpose intended. If requested provide evidence as to type, source and quality. Remove and replace defective Products, at own expense, regardless of previous reviews and be responsible for delays and expenses caused thereby. Replace factory finished equipment, or parts thereof, whose paint finish is damaged and cannot be reasonably remedied by paint touch-up.
- .4 When conflict occurs between specified technical description and manufacturer's standard model numbers and/or manufacturer's printed description of given model number, technical description specified in the Contract Documents shall govern. Manufacturers shall make necessary modifications in their manufacturing methods to meet requirements specified.
- .5 Do not expose trademarks, labels and nameplates, including applied labels, in finished Work. Remove visible trademarks and labels except those which are giving operating instructions, which are essential to obtain identification of mechanical and electrical equipment for maintenance and replacement purposes and for mandatory fire ratings.
- .6 In general, the Owner retains right to select all choices available within specified Products colours, finishes and other options unless specified otherwise in the Contract Documents.

1.6 Toxic or Hazardous Substances and Materials

- .1 Definitions:
 - .1 Normal Mould Concentrations: Indoor concentrations of spores, hyphae and mycelia fragment (both airborne and on surfaces) that are similar in concentration and species population distribution that would be found outdoors in natural environment.
 - .2 Mould Amplification: Growth or elevated population of mould (both airborne and on surfaces) including visible growth or staining on any building material. This amplification is most often caused by water damage to building materials.
- .2 Products and materials incorporated in the Work shall be as free as possible of noxious or toxic volatile emissions or emissions of irritating or toxic particles, so interior air of completed building is as pollution-free as possible. (For example, Products emitting benzene, mercury, lead or other known toxic compounds are not acceptable.)

1.7 Availability

- .1 Immediately upon signing the Contract, review Product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of Products are likely or possible, or Products are no longer available, or a specified manufacturer is no longer in business, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the Work.
- .2 Products which are specified by their proprietary names, by part, or catalogue number form basis of the Contract. Alternative products, materials or manufacturers may be proposed by the Contractor during the course of the Contract. The Contractor shall demonstrate to the Consultant's satisfaction that the proposed substitutions are equivalent to the particular product, material or manufacturer prescribed by the Contract Documents and obtain the Consultant's written acceptance of the proposed alternative products prior to incorporating any substitutes into the Work.
- .3 In the event of failure to notify the Consultant at commencement of the Work of supply delays or Product availability issues, and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves right to substitute more readily available Products of similar character, at no increase in the Contract Price.
- .4 No substitution of materials will be allowed on basis of long deliveries, unless such long delivery problems are identified during the tendering process.

1.8 Gauges

- .1 Interpret gauges of uncoated steel sheet based on manufacturer's standard gauge (msg), stainless steel sheet based on "United States Standard Gauge (Revised)" and non-ferrous sheet metals based on "Brown & Sharpe Gauge". For galvanized steel sheet based on galvanized sheet gauge (ga).
- .2 Interpret gauges specified for wire as "Steel Standard" and for non-ferrous wire, as "American".

1.9 Fire Rating

- .1 Where material, component or assembly is required to be fire rated, fire rating shall be determined on basis of results of tests conducted in conformance with CAN/ULC-S101 by 1 of following testing authorities acceptable to Authorities Having Jurisdiction:
 - .1 Underwriters Laboratories of Canada (ULC); www.ulc.ca
 - .2 Underwriters Laboratories Inc. (UL); www.ul.com
 - .3 FM Global; www.fmglobal.com
 - .4 National Research Council of Canada; www.nrc.ca
 - .5 National Board of Fire Underwriters.
 - .6 Warnock Hersey Mark www.warnockhersey.com
- .2 Where reference is made to only 1 testing authority, an equivalent fire rating as determined or listed by another of aforementioned testing authorities is acceptable if approved by Authorities Having Jurisdiction. Obtain and submit such approval of Authorities, in writing, when requesting acceptance of a proposed equivalent rating or test design.

1.10 Manufacturers' Written Instructions

- .1 Unless specified otherwise, use each Product in accordance with manufacturer's published written instructions regarding handling, storage, preparation, methods of installation, protection and cleaning. Take into account Site conditions and provide ancillary Products or accessories.

- .2 Conform to manufacturer's recommended installation temperatures. If finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and the Consultant. Repair resulting damage should expansion provisions prove inadequate.
- .3 Notify the Consultant, in writing, of conflicts between the Contract Documents and manufacturer's instructions, so the Consultant may establish course of action to be taken. If requested, make a copy of those instructions available at the Site.
- .4 Improper installation or erection of Products, due to failure to comply with these requirements, shall require removal and re-installation at no increase in the Contract Price.
- .5 Whenever specific reference to following manufacturer's directions or instructions is made in Specifications, upon request submit copies thereof for review by Consultant before commencing such Work.

1.11 Anchors and Fasteners

- .1 Supply appropriate anchors, fasteners, accessories and adhesives required for fabrication and erection of the Work.
- .2 Unless specified otherwise use exposed metal fastenings and accessories of same texture, colour and finish as Product being fastened.
- .3 Use metal fastenings of same material as metal component being fastened, or of metal which will not generate electrolytic action and cause damage to fastening or metal component under moist conditions. In general use non-corrosive or hot dip galvanized steel anchors occurring on or in exterior wall, slab or other exterior locations, unless higher standard is indicated or specified.
- .4 Fastening devices or adhesives shall be of appropriate type, used in sufficient quantity and in such manner to provide positive, permanent fastening which will not shift, work loose or fail during occupancy of building due to vibration or other causes resulting from normal use of building. Install anchors at spacing to provide required load/stress carrying capacity. Do not use wood plugs.
- .5 Lay out fastenings neatly, evenly spaced and aligned. Keep exposed fastenings to minimum.
- .6 Supply adequate instructions and templates and, if necessary supervise installation, where fastenings or accessories for sections which are required to be built into work of other sections.
- .7 Do not use fastenings which will cause spalling, cracking, or deformation or deterioration of material being fastened by or to.
- .8 Do not use powder actuated fastening devices, which are used in tension, without approval. Take stringent safety precautions when using powder actuated fastenings. Use only low velocity plunger-type devices.
- .9 Use adhesives specified, or if not specified, those recommended by manufacturer of materials involved, compatible with materials to be joined, and effective in forming permanent joint of adequate strength.
- .10 Use screws, nails, staples and other similar driven fasteners suitable to materials to be joined and to conditions under which they are installed and used. Ensure in finished work, fasteners are sized to take durable hold under stress to be encountered without damage to, or weakening of, elements secured together and fastenings will not corrode or cause staining of exposed surfaces.

- .11 Security Screws: Complying with ANSI/ASME B18.6.3; provide only tamper-resistant Torx-Plus® break off type screws as specified and noted on Drawings. Provide flathead security screws where Torx-Plus® or Equivalent break off is indicated to be counter sunk otherwise provide only trusshead or buttonhead for Torx-Plus® or equivalent and only roundhead for break off type. Torx-Plus® Temper resistant screws or Equivalent with heads having a deep hex-lobular recess with a solid post formed in the centre requiring a special metal driver to install or remove screw. Fasteners and tools shall be of type produced by licensed manufacturer. Break off head security screws with drive heads having an additional hexagonal shaped head designed to break off after installation at a predetermined torque level. Grind remaining portion of neck smooth after hex-head is broken off. Acceptable manufacturers, Temper Proof Screws Inc. or Folger Adam Security Inc, or Sentry Security Fasteners, Inc. or Temper Proof Screw Co. or Equivalent.
 - .12 Do brazing or soldering to form durable connections of strength adequate to resist stresses to be encountered without deformation of elements joined. Prepare base metals and use methods and materials to ensure clean joint, and to prevent staining, corrosion, discolouration, deformation or other damage to the finished Work.
 - .13 Do welding to CSA W59 for steel and to CSA W59.2-M for aluminum, unless specified otherwise. Have welding performed by companies certified operatives to CSA W47.1 or CSA W47.2-M.
 - .14 Provide accessory items or materials required, such as brackets, cleats, connectors, sealants, lubricants, cleaners, protection and similar items, whether specified or not, so the Work is complete and performs as required.
- 1.12 General
- .1 Built in Items: Provide and coordinate location of chases, slots and reglets including frames, sleeves, inserts, anchors, fasteners and bolts, forms and templates.
 - .2 Patents: Verify existence or exclusivity of patent licenses for Products prior to installation.
 - .3 Trademarks and Labels: Do not expose trademarks and labels, including applied labels, in finished Work. Remove visible trademarks and labels except those which are essential to obtain identification of mechanical and electrical equipment for maintenance and replacement purposes and for mandatory fire ratings.
- 1.13 Barrier Free Design Requirements:
- .1 Conform to the latest edition of the Ontario Building Code requirements for barrier free installations.
 - .2 Install switches, telephones, fire-alarm pull stations, and other equipment and devices requiring accessibility by building staff and public, excluding mechanical and electrical room installations, to meet barrier-free requirements. If there is conflict between this requirement and any other Building Code requirement bring to attention of Consultant prior to installation.
- 1.14 Product Delivery, Handling And Storage
- .1 Package, crate and brace Products to prevent damage during delivery, storage and handling.
 - .2 Provide protection to finished surfaces to prevent damage during delivery, storage and handling.
 - .3 Store packaged materials in original, undamaged condition with manufacturers' labels and seals intact.

- .4 Handle and store materials in accordance with manufacturers' and Suppliers' recommendations, in protected locations.
 - .5 Store materials susceptible to environmental damage in weather-tight enclosures, raised clear of the ground and protected from weather, dampness and deterioration.
 - .6 Replace Products damaged during delivery to the Place of the Work, storage, handling and installation.
 - .7 Conform to written procedures for safe handling, storage and use of noxious and hazardous materials including special precaution, safe clean-up and disposal procedures.
- 1.15 Mould Control during Product Storage and Handling:
- .1 Do not bring building Products onto Site containing toxic moulds.
 - .2 Exercise continuous quality control and enforce mould control requirements upon Subcontractors and establish proper Product storage and delivery sequence to protect Products from weather and other exposures conducive to mould growth.
 - .3 Take special care while handling and storing materials, without limitation, such as particleboard, plywood, cellulose materials, wallpaper, ceiling panels, gypsum boards and insulation with kraft paper back up.
 - .4 Monitor humidity levels and provide adequate ventilation in storage areas. Be watchful of any moisture condition in storage areas. Do not use materials which have been damaged by exposure to moisture and/or showing signs of mould growth.
 - .5 Take measures during Product storage and handling to provide mould free finished construction.
- 1.16 Concealment of Services
- .1 Conceal pipes, service lines and ducts in chases, behind furring or above ceilings, except where they are indicated as being exposed to view. Where no ceiling is provided, such items may be exposed, but must be neatly and logically arranged.
- 1.17 Manufactured items
- .1 Where a conflict occurs between specified technical description and manufacturer's standard model numbers and/or manufacturer's printed description of given model number, technical description specified herein governs. The Contractor shall ensure that manufacturers make necessary modifications in their manufacturing methods to meet all aspects of these Specifications

END OF SECTION

1.1 Verification Of Existing Conditions

- .1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.
- .2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of Products used.
- .3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- .4 Notify Consultant in writing of unacceptable conditions.

1.2 Acceptance of Conditions:

- .1 Examine Site at no cost or risk to the Owner for all matters relating to the Work, extent of the Work, means of access and egress, all obstacles, rights and interests of other parties which may be interfered with during execution of the Work, all conditions and limitations Contractor to take into consideration in performing the Work, including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of project and any other consideration which may affect performance of the Work.
- .2 Where available obtain existing Drawings pertaining existing building layout, architectural, structural, mechanical, electrical details and assess impact in performing the Work of this Contract.
- .3 Examine existing conditions at no additional cost to the Owner, surfaces and substrata upon which Work depends. Drawings are, in part, diagrammatic and are intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of fixtures, equipment, ducts, piping, conduit and outlets and similar items. Obtain more accurate information about locations, arrangement and sizes from study and coordination of the Drawings, including Shop Drawings and manufacturers' literature and become familiar with conditions and spaces affecting these matters before proceeding with the Work.
- .4 Ensure each Subcontractor has full understanding of extent of its Work. Report in writing defects in such Work and notify Subcontractors responsible for unfavourable and unsatisfactory conditions. Do not commence the Work until unsatisfactory conditions have been corrected. Verify corrected Work prior to commencing Work. Execution and application of Work shall be deemed acceptance of Work upon which Work depends.

1.3 Existing Activities, Facilities and Conditions:

- .1 Existing institution may be in operation throughout the Work. Do not interrupt existing services, facilities and activities at complex, except for authorized and scheduled interruptions of services acceptable to the Owner. Obtain written permission of the Owner a minimum of 3 Working Days in advance of any shutdown required for tie-in of new construction systems. Written requests for shutdown permission shall clearly identify exact extent of systems affected, time and duration.
- .2 Make necessary enquiries to determine locations of existing services such as hydro, telephone, water, natural gas, sewer and like. Make arrangements and pay all costs to temporarily relocate, shore, underpin or in any way accommodate existing services which affect the Work of this Contract.

- .3 Should any piping, sewers, cables, or similar services be encountered during Work of this Contract that are not known from the Owner's and utilities companies' records, notify Consultant and do not proceed with removal or cutting until directed.
- .4 Protect and maintain in operation all existing services and systems. When removing or altering existing services, make safe, secure and maintain seals as applicable for all lines affected.
- .5 Perform required shutdowns outside of normal working hours at no increase in cost if requested by the Owner.

1.4 Materials

- .1 Where Specification requirements include design of a Product or system, and minimum material requirements are specified, design of such Product or system shall employ materials specified within applicable section. Where materials or components are not specified, the Contractor shall augment materials with those of its choice within applicable Municipal, Federal and Provincial regulatory limitations while maintaining integrity of design and architectural requirements.
- .2 Defective Products, whenever identified prior to completion of the Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective and/or damaged Products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Ensure new materials used to repair damage are compatible with existing Work.

1.5 Planning, Scheduling & Coordination of Alterations:

- .1 Plan and schedule alterations to accommodate anticipated difficulties, indicated on and inferable from the Contract Documents.
- .2 Plan, schedule and coordinate alterations to accommodate on-going operations of the Owner with minimal disruption.
- .3 Plan, schedule and coordinate alterations, required in the Owner-occupied spaces or adjoining or below the Place of the Work, on a room-by-room basis and in accordance with a schedule mutually agreed upon with the Owner. Requests for access to occupied areas shall be made to the Owner a minimum of 1 week in advance of requested access time.
- .4 Co-ordinate alterations with Other Contractors and proceed with the Work expeditiously.

1.6 Existing Conditions:

- .1 Make Good surfaces and finishes damaged or disturbed due to the Work of this Contract to match existing. Ensure materials used to repair damage are compatible with existing Work.
- .2 Restore the Site to condition equal to or, if specified elsewhere, to condition better than existing conditions.
- .3 Restore lands outside of limits of Work which are disturbed due to the Work to original condition in addition to complying with requirements of the General Conditions of the Contract.

- 1.7 Installation:
- .1 Except where specified otherwise, use each Product in accordance with manufacturer's published or written instructions, Specifications or recommendations regarding handling, storage, preparation, Site conditions, ancillary Products or accessories, methods of installation, protection and cleaning. Submit copy of such instructions and indicate if and where there is discrepancy between them and requirements of Specifications and obtain direction from Consultant if necessary.
 - .2 Whenever specific reference to following manufacturer's directions or instructions is made in Specifications, submit copies as requested thereof for review before commencing such Work.
 - .3 Do the Work in accordance with industry practice for type of Work unless the Contract Documents stipulate more precise requirements. Do not let unskilled, incompetent workers perform Work.
 - .4 Do the Work in neat and careful manner to retain the Work plumb, square and straight.
 - .5 Ensure the Work is properly related to form close joints and appropriately aligned junctions, edges and surfaces and is free of warp, twist, wind, wave or other irregularities.
 - .6 When required by the Specifications or by manufacturer's recommendations, have manufacturer, Supplier or accredited agent, inspect Work which incorporates their Products.
 - .7 Do not permit materials to come in contact with other materials whether in presence of moisture or otherwise if conditions will result in corrosion, stain or discolouration or deterioration of the completed Work. Provide compatible, durable separators where such contact is unavoidable.
 - .8 Load no part of structure during construction with load greater than it is calculated to bear safely when completed. Make every temporary support as strong as permanent support. Place no load on concrete structure until it has sufficient strength to safely carry such load.
 - .9 Conceal pipes, ducts, conduits, tubing, wiring and other items requiring concealment in floor, wall and ceiling construction of finished areas except where indicated or specified otherwise in the Contract Documents. If in doubt as to method of concealment, or intention of the Contract Documents in this connection, request clarification from the Consultant before proceeding with Work in question.
 - .10 Install and arrange fixtures, equipment, ducts, piping and conduit to conserve as much headroom and space as possible, and avoid interference and obstruction of access. Observe good installation practice for safety, access, maintenance and follow manufacturer's recommendations. Location of fixtures, access panels, outlets and mechanical and electrical components indicated are approximate.
 - .11 If requested by the Consultant, and before installation, relocate equipment, services, doors, openings, furring and other work at no additional cost to the Owner; provided such relocation involves only reasonable minor adjustments and reasonable advance notice is given in writing. Ensure identification of electrical and mechanical system installations and other automated systems or equipment shall be provided in accordance with the Contract Documents.

END OF SECTION

1.1 Summary

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

1.2 Manufacturer's Instructions

- .1 Install, erect, or apply Products in strict accordance with manufacturer's instructions.
- .2 Notify Consultant, in writing, of conflicts between Contract Documents and manufacturer's instructions where, in Contractor's opinion, conformance with Contract Documents instead of the manufacturer's instructions may be detrimental to the Work or may jeopardize the manufacturer's warranty.
- .3 Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- .4 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

1.3 Concealment

- .1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:
 - .1 after review by Consultant and authority having jurisdiction, and
 - .2 where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.
- .2 Provide incidental furring or other enclosures as required.
- .3 Notify Consultant in writing of interferences before installation.

1.4 Fastenings - General

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials.
- .2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.
- .3 Use non-corrosive fasteners and anchors for securing exterior work [and in spaces where high humidity levels are anticipated].
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.5 Fastenings - Equipment

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

- .2 Bolts shall not project more than one diameter beyond nuts.
- 1.6 Fire Rated Assemblies
 - .1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.
 - .2 Continuity of Fire Separations:
 - .1 Conform to following requirements to maintain continuity of fire separations:
 - .1 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are noncombustible and are tightly fitted.
 - .2 Where a fire separation is required to be of noncombustible construction terminates at exterior wall, underside of floor, ceiling or roof structures and at floors, opening shall be fire stopped with a ULC approved Listed material.
 - .2 Combustible members, fastenings and like shall not be used to anchor fixtures to fire separations.
 - .3 Continuity of Sound Attenuating Partitions and Ceilings: Maintain acoustical value of partitions and sound attenuated ceilings by careful location and treatment of ducts, grilles, diffusers and similar mechanical devices and of electrical outlets, boxes and similar electrical devices. Where electrical boxes are situated back-to-back, serving each side of partition, locate them at recommended distance apart laterally and if interconnected, use flexible connections.
 - .4 Holes Through Walls, Floors and Roof: Ensure holes through walls, floors and roof are provided by trades as specified and are complete with sleeves, packing insulation, fire stopping and sealant as required for each particular condition.
- 1.7 Location Of Fixtures, Outlets And Devices
 - .1 Consider location of fixtures, outlets, and devices indicated on Drawings as approximate.
 - .2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.
 - .3 Promptly notify Consultant in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.
- 1.8 Protection Of Completed Work And Work In Progress
 - .1 Adequately protect parts of the Work completed and in progress from any kind of damage.
 - .2 Promptly remove, replace, clean, or repair, as directed by Consultant, work damaged as a result of inadequate protection.
 - .3 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.
- 1.9 Remedial Work
 - .1 Notify Consultant of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

END OF SECTION

1.1 Request For Cutting, Patching And Remedial Work

- .1 Submit written request in advance of cutting, coring, or alteration which affects or is likely to affect:
 - .1 Structural integrity of any element of the *Work*.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of *Owner* or other contractors.
 - .6 Warranty of *Products* affected.
- .2 Include in request:
 - .1 Identification of *Project*.
 - .2 Location and description of affected work, including drawings or sketches as required.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed work, and *Products* to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on work of *Owner* or other contractors.
 - .7 Written permission of affected other contractors.
 - .8 Date and time work will be executed.

1.2 Products

- .1 Unless otherwise specified, when replacing existing or previously installed *Products* in the course of cutting and patching work, use replacement *Products* of the same character and quality as those being replaced.
- .2 If an existing or previously installed *Product* must be replaced with a different *Product*, submit request for substitution.

1.3 Preparation

- .1 Inspect existing conditions in accordance with Section 01 71 00 - Examination and Preparation.
- .2 Provide supports to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the *Work* from damage.
- .3 Provide protection from elements for areas that may be exposed by uncovering work.

1.4 Existing Utilities

- .1 Where the *Work* involves breaking into or connecting to existing services, give *Owner* *minimum* 48 hours notice for necessary interruption of mechanical or electrical services.
- .2 Keep duration of interruptions to a minimum.
- .3 Carry out interruptions after regular working hours of occupants, preferably on weekends, unless *Owner's* prior written approval is obtained.
- .4 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.
- .5 Construct or erect barriers in accordance with Section 01 50 00 - Temporary Facilities and Controls as required to protect pedestrian and vehicular traffic.

- 1.5 Cutting, Patching, And Remedial Work
- .1 Coordinate and perform the *Work* to ensure that cutting and patching work is kept to a minimum.
 - .2 Perform cutting, fitting, patching, and remedial work [including excavation and fill,] to make the affected parts of the *Work* come together properly and complete the *Work*.
 - .3 Provide openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work.
 - .4 Perform cutting by methods to avoid damage to other work
 - .5 Provide proper surfaces to receive patching, remedial work, and finishing.
 - .6 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the *Products* affected, in a manner that neither damages nor endangers the *Work*.
 - .7 Do not use pneumatic or impact tools without *Consultant's* prior approval.
 - .8 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.
 - .9 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.
 - .10 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.
 - .11 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

END OF SECTION

1.1 Regulatory Requirements

- .1 Comply with applicable regulatory requirements when disposing of waste materials.
- .2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

1.2 General Cleaning Requirements

- .1 Provide adequate ventilation during use of volatile or noxious substances.
- .2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .3 Prevent cross-contamination during the cleaning process.
- .4 Notify the Consultant of the need for cleaning caused by Owner or other contractors.

1.3 Progressive Cleaning And Waste Management

- .1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.
- .2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables. Locate containers where indicated by Owner's representative.
- .3 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.
- .4 Remove waste materials and recyclables from Place of the Work [daily] [weekly] [at regular intervals].
- .5 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
- .6 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly finished surfaces nor contaminate building systems.

1.4 Final Cleaning

- .1 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that Owner, Consultant, Contractor and cleaning company are in attendance.
- .2 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.
- .3 Provide professional cleaning by a qualified, established cleaning company.
- .4 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- .5 Re-clean as necessary areas that have been accessed by Contractor's workers prior to Owner occupancy.

- .6 Remove stains, spots, marks, and dirt from finished surfaces, electrical and mechanical fixtures, furniture fitments, walls, floors .
 - .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and all other finished surfaces, including mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.
 - .8 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.
 - .9 Vacuum clean and dust exposed wall, floor, and ceiling surfaces, behind grilles, louvres and screens.
 - .10 Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment if equipment is used during construction.
 - .11 Remove waste material and debris from crawlspaces and other accessible concealed spaces.
 - .12 Remove stains, spots, marks, and dirt from exterior facades.
 - .13 Clean exterior and interior window glass and frames.
- 1.5 Waste Management And Disposal
- .1 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.
 - .2 Do not burn or bury waste materials at Place of the Work.
 - .3 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.
 - .4 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

1. GENERAL**1.1 Related Documents**

- .1 The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

- .1 This Section includes administrative and procedural requirements for the following:

- .1 Recycling non-hazardous construction waste.
- .2 Disposing of non-hazardous construction waste.

1.3 Definitions

- .1 Construction Waste: Building and Site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes
- .2 Demolition Waste: Building and Site improvement materials resulting from demolition or selective demolition operations.
- .3 Disposal: Removal off-Site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to Authorities Having Jurisdiction.
- .4 Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- .5 Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- .6 Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 Performance Requirements

- .1 General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of
 - .1 Construction Waste (including but not limited to):
 - .1 Concrete.
 - .2 Concrete reinforcing steel.
 - .3 Structural and miscellaneous steel.
 - .4 Glazing.
 - .5 Acoustical tile and panels.
 - .6 Supports and hangers.
 - .7 Wood Sheet Materials
 - .8 Rubber base
 - .9 Lumber.
 - .10 Metals.
 - .11 Insulation.
 - .12 Carpet and pad.
 - .13 Gypsum board.
- .2 Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - .1 Paper.
 - .2 Cardboard.
 - .3 Boxes.
 - .4 Plastic sheet and film.
 - .5 Polystyrene packaging.
 - .6 Wood crates.
 - .7 Plastic pails.

- 1.5 Submittals
- .1 Waste Management Plan: Submit 3 copies of plan within 7 Working Days of receipt of Notice to Commence the Work.
 - .2 Waste Reduction Progress Reports: Reports are sent weekly tracking the volume sent out. Submit three copies of report. Include the following information:
 - .1 Generation point of waste.
 - .2 Total quantity of waste by volume.
 - .3 Quantity of waste salvaged, both estimated and actual in cubic meters.
 - .4 Quantity of waste recycled, both estimated and actual in cubic meters.
 - .5 Total quantity of waste recovered in cubic meters.
 - .6 Total quantity of waste recovered as a percentage of total waste.
 - .7 Waste Reduction Calculations: Before request for Substantial Performance of the Contract, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
 - .8 Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 - .9 Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is taxexempt.
 - .10 Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, volume receipts, and invoices.
 - .11 Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, volume tickets, receipts, and invoices.
- 1.6 Quality Assurance
- .1 Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification
 - .2 Regulatory Requirements: Comply with hauling and disposal regulations of Authorities Having Jurisdiction.
 - .3 Waste Management Conference: Conduct conference at the Site to comply with requirements related to waste management including, but not limited to, the following:
 - .1 Review and discuss waste management plan.
 - .2 Review requirements for documenting quantities of each type of waste and its disposition.
 - .3 Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - .4 Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - .5 Review waste management requirements for each trade.
- 1.7 Waste Management Plan
- .1 General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by volume, but use same units of measure throughout waste management plan.
 - .2 Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
 - .3 Waste Reduction Work Plan: List whether each load of waste will be recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - .1 Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - .2 Disposed Materials: Indicate how and where materials will be disposed of.
 - .3 Include name, address, and telephone number of each landfill and incinerator facility.

- .4 Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on project Site where materials separation will be located.
- .5 Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - .1 Total quantity of waste.
 - .2 Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 - .3 Total cost of disposal (with no waste management).
 - .4 Revenue from recycled materials.
 - .5 Savings in hauling and tipping fees by donating materials.
 - .6 Savings in hauling and tipping fees that are avoided.
 - .7 Handling and transportation costs. Include cost of

2. PART 2 - PRODUCTS (NOTUSED)

3. PART 3 - EXECUTION

3.1 Recycling Construction Waste

- .1 Packaging:
 - .1 Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - .2 Polystyrene Packaging: Separate and bag materials.
 - .3 Pallets: As much as possible, require deliveries using pallets to remove from project Site. For pallets that remain on-Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - .4 Crates: Break down crates into component wood pieces and comply with requirements
- .2 Wood Materials:
 - .1 Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - .2 Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.2 Disposal Of Waste

- .1 General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from project Site and legally dispose of them in a landfill or incinerator acceptable to Authorities Having Jurisdiction.
 - .1 Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-Site.
 - .2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- .2 Burning: Do not burn waste materials.
- .3 Disposal: Transport waste materials and dispose of at designated spoil areas on the Owner's property.
- .4 Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

- 1.1 Ready-For-Takeover
 - .1 The prerequisites to attaining Ready-for-Takeover of the Work are described in the General Conditions of the Contract.
- 1.2 Inspection And Review Before Ready-For-Takeover
 - .1 Contractor's Inspection: Before applying for the Consultant's review to establish Ready-for-Takeover of the Work:
 - .1 Ensure that the specified prerequisites to Ready-for-Takeover of the Work are completed.
 - .2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.
 - .3 Prepare a comprehensive and detailed list of items to be completed or corrected.
 - .4 Provide an anticipated schedule and costs for items to be completed or corrected.
 - .2 Consultant's Review: Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant will review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for-Takeover and will provide the Contractor with a list of items, if any, to be added to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the Contractor's revised list.
- 1.3 Prerequisites To Final Payment
 - .1 After Ready-for-Takeover of the Work and before submitting an application for final payment in accordance with the General Conditions of Contract:
 - .1 Correct or complete all remaining defective, deficient, and incomplete work.
 - .2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.
 - .3 Perform final cleaning and waste removal necessitated by the Contractor's work performed after Ready-for-Takeover, as specified in Section 01 74 00 – Cleaning and Waste Management.
- 1.4 Partial User Occupancy
 - .1 If partial Owner occupancy of a part of the Work is required before the date of Ready-for-Takeover of the entire Work of the Contract, the provisions of this Section shall apply, to the extent applicable, to that part of the Work that the Owner intends to occupy.
- 1.5 Substantial Performance Of The Work
 - .1 The prerequisites to, and the procedures for, attaining substantial performance of the Work, or similar such milestone as provided for in the lien legislation applicable to the Place of the Work, shall be:
 - .1 independent of those for attaining Ready-for-Takeover of the Work, and
 - .2 in accordance with the lien legislation applicable to the Place of the Work.

1.6 Spare Parts

- .1 Supply extra maintenance materials and/or spare parts and store in a locked room as directed by the Owner.

.1

Extra Materials to be Submitted by the Contractor	
Material/Equipment	Quantity
Carpet Tiles	20 boxes (un-used)
Flooring in Kitchen	2 Unopen boxes
Rubber Base	500 linear feet
Ceramic Tile used at back splash in the kitchen	20 extra tiles
Paint: <ul style="list-style-type: none">• Main wall colour (white)• Accent Colour• Ceiling Paint	4 gallons (not opened) 2 gallons (not opened) 2 gallons (not opened)
Light Bulbs <ul style="list-style-type: none">• LED Fixture (1'x4')	Ten (10)
Ceiling Tiles	50 new ceiling tiles (un-cut)

- .2 Suitably package maintenance materials in accordance with manufacturer's instructions and label to identify Product type, manufacturer, Product name, colour number, dye lot and quantity.
- .3 Store maintenance materials e.g., positioning, proper side up etc., in accordance with manufacturer's recommendations.

END OF SECTION

1. GENERAL

1.1 Applicable Standards

- .1 2015 ASHRAE Handbook – HVAC Applications Chapter 43 HVAC Commissioning
- .2 ASHRAE Guideline 1.1 – 2007 – The HVAC&R Technical Requirements for the Commissioning Process
- .3 CSA Z320-11 (R2016) Building Commissioning Standard & Check Sheets

1.2 Description

- .1 Commissioning is a systematic process of ensuring that all building systems perform interactively according to the requirements of the Contract Documents and the Region's operational needs. The commissioning process begins in the design phase and continues through construction, acceptance and the warranty period. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, functional testing and training.
- .2 Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - .1 Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and industry best practices, and that they receive adequate operational checkout by installing Subcontractors;
 - .2 Verify and document proper performance of equipment and systems;
 - .3 Verify that Operations and Maintenance documentation left on Site is complete; and
 - .4 Verify that the Region's operating personnel are adequately trained.
- .3 The commissioning process does not take away from or reduce the responsibility of the system designers or the Contractor to provide a finished and fully functioning product.

1.3 Abbreviations

- .1 The following are common abbreviations used in the Commissioning Specifications and in the Commissioning Plan. Definitions are found in Section 1.8.

A/E-	Architect and Design Engineers (the "Consultant")	FT-	Functional performance test
CA-	Commissioning Authority	GC-	General Contractor, including its project manager (the 'Contractor')
CC-	Controls Subcontractor	MC-	Mechanical Subcontractor
		PC-	Pre-functional checklists
Cx-	Commissioning	Subs-	Subcontractors to GC
Cx Plan-	Commissioning Plan document	TAB-	Test and Balance Subcontractor
EC-	Electrical Subcontractor	FM-	Facility Management
DDC-	Direct Digital Control	EMS-	Energy Management System

1.4 COORDINATION

- .1 Commissioning Team. The commissioning team consists of the representatives from the Region, the Facility Management (FM) Staff, Commissioning Authority (CA), the General Contractor (GC or Contractor), the Architect and Design Engineers (A/E) (the "Consultant"), the mechanical Subcontractor (MC), the Electrical Subcontractor (EC), the Testing and Balancing (TAB) Subcontractor, the Controls Subcontractor (CC), any other installing subcontractors or suppliers of equipment.
- .2 Management. The CA is hired by the Region and follows the rules of an Independent Commissioning Authority. The CA directs and coordinates the commissioning activities and reports to the Region. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
- .3 Scheduling. The CA will work with the Region and GC to schedule the commissioning activities. The CA will provide sufficient notice to the Region and GC for scheduling commissioning activities. The GC shall integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process. The CA will work with the GC to provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan provides a format for this schedule. As construction progresses more detailed schedules are developed by the GC and the CA. The Commissioning Plan also provides a format for detailed schedules.

1.5 COMMISSIONING PROCESS

- .1 Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Following the commissioning scoping meeting, the CA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.
- .2 Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
 - .1 Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
 - .2 Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
 - .3 Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures and Shop Drawings.
 - .4 The CA works with the Subs in developing start-up plans and start-up documentation formats, including providing the Subs with pre-functional test sheets to be completed during the startup process.
 - .5 In general, the checkout and performance verification proceeds from simple to complex; from component level, to equipment, to systems, and finally intersystem levels with pre- functional test sheets being completed before functional testing.
 - .6 The Subs, under their own direction, execute and document the pre-functional test sheets and perform startup and initial checkout. The CA documents that the test sheets and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
 - .7 The CA develops specific equipment and system functional performance test procedures with the assistance of Subs as required. The Subs review the test procedures once prepared.

PAGE 01 91 00 - 2

- .8 The procedures are executed by the Subs, under the supervision of, and documented by the CA.
- .9 Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
- .10 The CA reviews the O&M documentation for completeness.
- .11 Commissioning is completed before Substantial Performance of the Contract.
- .12 Deferred testing is conducted, as specified or required.

1.6 RELATED WORK

- .1 Specific commissioning requirements are given in the following Sections of these Specifications. All of the following sections apply to the Work of this Section.

01 91 00	Commissioning	<i>Describes the commissioning process, responsibilities common to all parties, responsibilities of the Consultant, CA, GC and Suppliers, focusing on the CA. The unique MC, CC, TAB and EC (including the Subcontractors for the Special Systems) responsibilities are included in Divisions 21, 22, 23, 25 and 26</i>
21 08 00	Fire Suppresion	<i>Describes the Cx responsibilities of the Fire Protection, Plumbing, Mechanical, TAB and Controls Contractors and the pre-functional testing and startup responsibilities of each. Points to 01 91 00 for functional testing requirements and provides the pre-functional and the specific functional testing requirements for Division 21, 22, 23 and 25 equipment, for use on this project.</i>
	System Cx	
22 08 00	Plumbing Cx	
23 05 93	TAB	
23 08 00	HVAC Cx	
25 08 00	Integrated Automation Cx	
26 08 00	Electrical Cx	<i>Describes the specific Cx responsibilities of the Division 26 Subcontractor.</i>

1.7 RESPONSIBILITIES

- .1 General: General Commissioning Responsibilities are as follows:
 - .1 The responsibilities of various parties in the commissioning process are provided in this Section. The responsibilities of the mechanical Subcontractor and TAB are in Division 23 and controls Subcontractor are in Division 25; those of the electrical Subcontractor in Division 26, and Electronic Safety and Security in Division 28. It is noted that the services for the Region, and the Consultants including HVAC, Mechanical, and Electrical Designers/Engineers, are not provided for in this Section. That is, the Contractor is not responsible for providing services covered under these parties' scope; their responsibilities are listed here to clarify the commissioning process.
- .2 All Parties: Commissioning responsibilities for all parties are as follows:
 - .1 Attend commissioning scoping meeting and additional meetings, as necessary.
- .3 Architect (of the Consultant): Commissioning responsibilities of the Architect are as follows:
 - .1 Attend the commissioning scoping meeting and selected commissioning team meetings.

- .2 Perform normal submittal review, construction observation, as-built drawing preparation, O &M manual preparation, etc., as contracted.
- .3 Provide any design narrative documentation requested by the CA.
- .4 Coordinate resolution of system deficiencies identified during commissioning, according to the Contract Documents.
- .5 Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review the O&M manuals.
- .6 Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.
- .4 Mechanical and Electrical Designers/Engineers as subconsultants to G. Bruce Stratton Architects:
Commissioning responsibilities of the Mechanical and Electrical Engineers are as follows:
 - .1 Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One Site observation should be completed just prior to system startup.
 - .2 Provide any design narrative and sequences documentation requested by the CA. The Designers shall assist (along with the GC and/or Subcontractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
 - .3 Attend commissioning scoping meetings and other selected commissioning team meetings.
 - .4 Participate in the resolution of system deficiencies identified during commissioning, according to the Contract Documents.
 - .5 Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review the O&M manuals.
 - .6 From the Contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as Shop Drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.
 - .7 Provide a presentation at one of the training sessions for the Region's personnel.
 - .8 Witness testing of selected pieces of equipment and systems.
 - .9 Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

- .5 Commissioning Authority (CA): Commissioning Responsibilities of the Commissioning Authority are as follows:
- .1 The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor and the Consultant. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The GC and/or Subcontractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CA.
 - .2 Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 - .3 Coordinate the commissioning work and, with the GC ensure that commissioning activities are being scheduled into the master schedule.
 - .4 Develop and issue the Commissioning Plan.
 - .5 Plan and conduct a commissioning scoping meeting and other commissioning meetings.
 - .6 Before startup, review the current control sequences and interlocks and work with the GC and Subcontractors and Design Engineers until sufficient clarity has been obtained, in writing, to be able to write detailed functional testing procedures.
 - .7 Review submittals provided by the GC and Subcontractors applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Consultant reviews. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
 - .8 Write and distribute pre-functional tests and test sheets.
 - .9 Develop an enhanced start-up and initial systems checkout plan with Subs.
 - .10 Perform Site visits, as necessary, to observe component and system installations. Attend selected planning and Site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
 - .11 Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Notify the Region of any deficiencies in results or procedures.
 - .12 Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Notify the Region of any deficiencies in results or procedures.
 - .13 Approve pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected Site observation and spot checking.
 - .14 Approve systems start-up by reviewing start-up reports and by selected Site observation.
 - .15 Review TAB execution plan.

- .16 Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
 - .17 Review air and water systems balancing by spot testing, by reviewing completed reports, and by selected Site observation.
 - .18 With necessary assistance and review from installing Subcontractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone data-logger monitoring, or manual functional testing.
 - .19 Analyze any functional performance trend logs and monitoring data to verify performance.
 - .20 Coordinate, witness and approve manual functional performance tests performed by installing Subcontractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing with contractors on equipment so specified in Section 01 91 00 sub-section 1.9.
 - .21 Maintain a master deficiency and resolution log and a separate testing record. Provide the Region with written progress reports and test results with recommended actions.
 - .22 Witness performance testing of smoke control systems by others and all other Region contracted tests or tests by manufacturer's personnel over which the CA may not have direct control. Document these tests and include this documentation in Commissioning Binders.
 - .23 Review equipment warranties to ensure that the Region's responsibilities are clearly defined.
 - .24 Oversee and approve the training of the Region's operating personnel. Compile and maintain a commissioning record book(s).
 - .25 Review the preparation of the O&M manuals. Provide a final commissioning report (as described in this Section).
 - .26 Develop a Systems Operating Manual.
 - .27 Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
 - .28 Return to the Site at 20 months into the 24-month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
- .6 Contractor/Project Manager (PM): Commissioning Responsibilities of the Contractor/Project Manager are as follows:
- .1 Facilitate the coordination of the commissioning work by the CA, and ensure that commissioning activities are being scheduled into the master schedule.
 - .2 Review the final Commissioning Plan.
 - .3 Attend a commissioning scoping meeting and other commissioning team meetings.
 - .4 Include the cost of commissioning in the total Contract Price submitted in the Contractor's bid.

- .5 Perform the normal review of the Contractor's submittals.
- .6 Furnish a copy of all construction documents, addenda, change orders and approved submittals and Shop Drawings related to commissioned equipment to the CA.
- .7 In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
- .8 Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
- .9 Observe and witness pre-functional test sheets, startup and functional testing.
- .10 Review commissioning progress and deficiency reports.
- .11 Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
- .12 Sign-off on individual commissioning tests as completed and passing.
- .13 Coordinate the training of Region personnel.
- .14 Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Final Commissioning Program.
- .15 Assist the CA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
- .16 Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
- .17 Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and As-Built Drawings for applicable issues identified in any seasonal testing.
- .7 Equipment Suppliers: Commissioning Responsibilities of the Equipment Suppliers are as follows:
 - .1 Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Region to keep warranties in force.
 - .2 Assist in equipment testing per agreements with Subs, which may include factory tests and the development of associated reports.
 - .3 All costs associated with provision of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents shall be included in the total Contract Price submitted in the Contractor's bid, except for stand-alone data-logging equipment that may be used by the CA.
 - .4 Through the Contractors to which products are supplied, analyze specified products and verify that the Consultant has specified the newest most updated equipment reasonable for this project's scope and budget.
 - .5 Provide information requested by CA regarding equipment sequence of operation and testing procedures.
 - .6 Review test procedures for equipment installed by factory representatives.

1.8 DEFINITIONS

The following definitions apply to this Section in addition to the defined term included in the Definitions Section of the Contract:

- .1 Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
- .2 Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. The basis of design is the technical response to the design intent.
- .3 Commissioning Authority (CA) – The CA works independent of the design and constructions teams. The CA directs and coordinates the day-to-day commissioning activities. The CA does not take an oversight role like the Contractor. The CA is part of the Region's project team or shall report directly to the Region.
- .4 Commissioning Plan - an overall plan that provides the structure, schedule and coordination planning for the commissioning process.
- .5 Control system - the central building energy management control system.
- .6 Direct Digital Control (DDC) – Automated building control utilizing analog or digital signals to building controllers, actuators, valves, sensors, and other HVAC control related components
- .7 Data-logging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data-loggers separate from the control system.
- .8 Deferred Functional Tests – FT's that are performed later, after achieving Substantial Performance of the Contract, due to partial occupancy, equipment, seasonal requirements, design or other Site conditions that disallow the test from being performed.
- .9 Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not compliant with the design intent).
- .10 Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.
- .11 Energy Management System (EMS) – an integrated software system that collects, logs and displays data from sources of energy use
- .12 Factory Testing - testing of equipment on Site or at the factory by factory personnel with a Region representative present.
- .13 Functional Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB Subcontractor's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing Subcontractor or vendor. FTs are performed after pre-functional test sheets and startup are complete.
- .14 Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

- .15 Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data-loggers or the trending capabilities of control systems.
- .16 Non-Compliance - see Deficiency.
- .17 Non-Conformance - see Deficiency.
- .18 Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."
- .19 Region-Contracted Tests - tests paid for by the Region outside the GC's Contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.
- .20 Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.
- .21 Pre-functional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Pre-functional test sheets are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels satisfactory, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). Pre-functional refers to before functional testing and shall be completed by the installing Subcontractor. Pre-functional test sheets augment and are combined with the manufacturer's start-up checklist. The CA may choose to witness pre-functional tests for large/critical pieces of equipment.
- .22 Project Manager (PM) - the General Contractor's representative in the day-to-day activities of construction.
- .23 Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 01 91 00, Part 3.5.9.8 for details.
- .24 Seasonal Performance Tests - FT's that are deferred until the system(s) will experience conditions closer to their design conditions.
- .25 Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).
- .26 Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and Direct Digital Control (DDC) system to simulate a sensor value.
- .27 Startup - the initial starting or activating of dynamic equipment, including executing pre-functional test sheets.
- .28 Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.
- .29 Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents (Sections 25 08 00 and 26 08 00)
- .30 Trending - monitoring using the building control system.
- .31 Vendor - supplier of equipment.
- .32 Warranty Period - warranty period for entire project as set out in Article A-6 of the Articles of Agreement and GC 38 -Warranty of the General Conditions, including equipment components.

1.9 SYSTEMS TO BE COMMISSIONED

- .1 Systems to be commissioned have been detailed below:
 - .1 Building Automation System – For Equipment/Systems in scope of work only
 - .2 Fan Coil Units
 - .3 Valves
 - .4 Air Handling Units
 - .5 Humidifiers
 - .6 Lighting and Lighting Controls

PART 2- PRODUCTS

2.1 Test Equipment

- .1 The Contractor shall ensure that all standard testing equipment required to perform startup and initial checkout and required functional performance testing be provided by the GC or Division Subcontractor for the equipment being tested. For example, the HVAC Subcontractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls systems except for equipment specific to and used by TAB in their commissioning responsibilities.
- .2 All costs associated with the special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the total Contract Price submitted by the Contractor in its Bid, except for stand-alone data-logging equipment that may be used by the CA.
- .3 Data-logging equipment and software required to test equipment will be provided by the CA, but shall not become the property of the Region.
- .4 All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.28°C (0.5°F) and a resolution of $\pm 0.056^{\circ}\text{C}$ (0.1°F). Pressure sensors shall have an accuracy of $\pm 2.0\%$ of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3- EXECUTION

3.1 Meetings

- .1 The CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA. Information gathered from this meeting will allow the CA to create the Commissioning Plan to its "final" version, which will also be distributed to all parties.
- .2 Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs.

3.2 Reporting

- .1 The CA will provide regular reports to the Contractor and the Region, depending on the management structure, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the Commissioning Plan.
- .2 The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- .3 Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.
- .4 A final summary report developed by the CA will be provided to the Contractor and the Region, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. Pre-functional test sheets and functional tests will not be part of the final report.

3.3 Submittals

- .1 The Contractor and its Subcontractors shall provide the CA standard submittals required to facilitate the commissioning work. This process will be integrated into the normal submittal process and protocol of the construction team. At a minimum, the submittals will include equipment Shop Drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings, and details of Region contracted tests. In addition, the installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority. The Contractor shall ensure that all documentation requested by the CA is included by the Subs in their O&M manual contributions.
- .2 The Commissioning Authority will review submittals related to the commissioned equipment for conformance to Region's project requirements as they relate to the commissioning process.
- .3 The CA may request additional design narrative from the Consultant and controls Subcontractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
- .4 These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review them.

3.4 Start-up, Pre-Functional Test Sheets and Initial Checkout

- .1 The following procedures apply to all equipment to be commissioned. Some systems that are not comprised so much of actual dynamic machinery (e.g. electrical system power quality) may have very simplified PCs and startup.
 - .1 General. Pre-functional test sheets are a critical commissioning piece in order to ensure functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. No sampling strategies are used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

- .2 Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for pre-functional test sheets and startup are identified in the commissioning scoping meeting and in the checklist forms. The parties responsible for executing functioning performance testing are detailed in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details).
- .3 Pre-functional test scripts are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
- .4 The Contractor shall ensure that the Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's test sheets with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include test sheets and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
 - .1 The CA's pre-functional test sheets.
 - .2 The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - .3 The manufacturer's normally used field checkout sheets.
- .5 The Contractor submits the full startup plan to the CA for review.
- .6 The CA reviews the procedures and the format for documenting them, noting any procedures that need to be added.
- .7 The full start-up procedures and the approval form may be provided to the Contractor for review depending on management protocol.
- .2 Sensor and Actuator Calibration:
 - .1 All field-installed temperature, relative humidity, CO/CO2, and pressure sensors/gauges, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if accepted by the Region in advance. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
 - .2 All procedures used shall be fully documented on the pre-functional test sheets or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
- .3 Sensor Calibration Methods:
 - .1 All Sensors verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F or .11°C of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure.

- .2 Sensors without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the Site sensor. Verify that the sensor reading (via the permanent thermostat, gage or Building Automation System (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
- .3 Sensors with Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the Site sensor. Verify that the sensor reading (via the permanent thermostat, gage or BAS) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.
- .4 Tolerances, Standard Applications

Sensor	Required Tolerance [+/-]
Cooling coil, chilled and condenser water temps	0.22°C (0.4°F)
AHU wet bulb or dew point	1.11°C (2.0°F)
Hot water coil and boiler water temp	0.83°C (1.5°F)
Outside air, space air, duct air temps	0.22°C (0.4°F)
Watt hour, voltage & amperage	1% of design
Pressures, air, water and gas	3% of design
Flow rates, air	10% of design

Sensor	Required Tolerance (+/-)
Flow rates, water	4% of design
Relative humidity	4% of design
Combustion flue temps	2.78°C (5.0°F)
Oxygen or CO ₂ monitor	0.1 % pts
CO monitor	0.01 % pts
Natural gas and oil flow rate	1% of design
Steam flow rate	3% of design
Barometric pressure	338.639 Pa (0.1 in. of Hg)

.5 Valve and Damper Stroke Setup and Check:

- .1 EMS Readout For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- .2 Closure for heating coil valves (NO): Set heating setpoint 11.11°C (20°F) above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 11.11°C (20°F) below room temperature. Observe the valve close. Restore to normal.

- .3 Closure for cooling coil valves (NC): Set cooling setpoint 11.11°C (20°F) above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 11.11°C (20°F) below room temperature. Observe valve open. Restore to normal.
- .6 Execution of Pre-functional Test Sheets and Startup:
 - .1 The Contractor shall ensure that, a minimum of 28 Days prior to startup, the Subs and vendors schedule startup and checkout with the Contractor and CA. The performance of the pre-functional test sheets, startup and checkout are directed and executed by the Sub or vendor. When checking off pre-functional test sheets, signatures may be required of other Subs for verification of completion of their work.
 - .2 The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as accepted by the PM).
 - .3 For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the pre-functional and start-up procedures.
 - .4 The Contractor shall ensure that the Subs and vendors execute startup and provide the CA with a signed and dated copy of the completed start-up and pre-functional tests and test sheets.
 - .5 Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.
- .7 Deficiencies, Non-Conformance and Approval in Test Sheets and Startup:
 - .1 The Contractor shall ensure that the Subs clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
 - .2 The CA reviews the report and submits either a non-compliance report or an approval form to the Region. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the Contractor and others as necessary. The Contractor shall ensure that the installing Subs or vendors correct all areas that are deficient or incomplete in the test sheets and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the test sheets and startup of each system to the Contractor using a standard form.

3.5 Functional Testing

- .1 This sub-section applies to all commissioning functional testing for all divisions.
- .2 Systems to be Commissioned: The list of equipment to be commissioned is detailed in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details).
- .3 Objectives and Scope: The objective of functional performance testing is to demonstrate that each system is operating according to the Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

- .4 In general, each system should be operated by the Contractor through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response and from the approved Shop Drawings. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
- .5 Development of Test Procedures: Before test procedures are written, the CA shall obtain all requested documentation and a current list of Change Orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details), the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. The Contractor shall ensure that each Sub or vendor responsible to execute a test provides limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the Consultant for review, if requested.
- .6 The CA shall review Region-contracted, factory testing or required Region acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
- .7 The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
- .8 The test procedure forms developed by the CA shall include (but not be limited to) the following information:
 - .1 System and equipment or component name(s)
 - .2 Equipment location and ID number
 - .3 Date
 - .4 Project name
 - .5 Participating parties
 - .6 A copy of the specification section describing the test requirements
 - .7 A copy of the specific sequence of operations or other specified parameters being verified
 - .8 Required pre-test field measurements (filled-up pre-functional tests)
 - .9 Instructions for setting up the test.
 - .10 Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 - .11 Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 - .12 A section for comments
 - .13 Signatures and date block for the CA and all participating parties.

.9 Test Methods:

- .1 Test Execution Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data-loggers. The CA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the Region. This may require a change order and adjustment in charge to the Region. The CA will determine which method is most appropriate for tests that do not have a method specified.
- .2 Simulated Conditions Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
- .3 Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
- .4 Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
- .5 Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F or 13°C, when the outside air temperature is above 55°F or 13°C, temporarily change the lockout setpoint to be 2°F or 1.1°C above the current outside air temperature.
- .6 Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.
- .7 Setup: Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Contractor shall ensure that the Sub executing the test provides all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
- .8 Sampling: Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in pre-functional checklist execution.

A common sampling strategy referenced in the Specifications as the “xx% Sampling— yy% Failure Rule” is defined by the following example.

xx = the percent of the group of identical equipment to be included in each sample.

yy = the percent of the sample that if failing, will require another sample to be tested.

The example below describes a 20% Sampling—10% Failure Rule.

- .9 Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”
 - .10 If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
 - .11 If 10% of the units in the second sample fail, test all remaining units in the whole group.
 - .12 If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification as determined by the CA, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.
- .10 Coordination and Scheduling:
- .1 The Subs shall provide sufficient notice to the CA regarding their completion schedule for the pre-functional test sheets and startup of all equipment and systems. The CA will schedule functional tests through the Contractor and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Contractor shall ensure that the Subs execute the tests.
 - .2 In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
- .11 Test Equipment: Refer to Section 01 91 00, Part 2 for test equipment requirements.
- .12 Problem Solving: The CA will recommend solutions to problems found, however it is the responsibility of the Subs, and the GC to solve, correct and retest problems.

3.6 Documentation, Non-Conformance and Approval of Tests

- .1 Documentation: The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Contractor and its Subs for review. The CA will include the filled-out forms in the Commissioning Binders.
- .2 Non-Conformance:
 - .1 All deficiencies or non-conformance issues shall be noted and reported to the Region on a standard non-compliance form.
 - .2 Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.

- .3 Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues.
 - .4 As tests progress and a deficiency is identified, the CA discusses the issue with the executing Subcontractor.
 - .1 When there is no dispute on the deficiency and the Sub accepts responsibility to correct, the following course of action occurs:
 - .2 The CA documents the deficiency in deficiency tracking log and issues to the Project Team. The Sub corrects the issue and signs off on the deficiency tracking log indicating the issue has been resolved.
 - .3 The CA reschedules the test and the test is repeated. If the test is successful, the CA closes the item.
 - .5 If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - .1 The deficiency shall be documented on the deficiency tracking log with the Sub's response and a copy given to the Contractor and to the Sub representative assumed to be responsible.
 - .2 Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Consultant. Final acceptance authority is with the Region.
 - .3 The CA documents the resolution process.
 - .4 Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs off on the deficiency tracking log and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved, at which time the CA closes the item.
 - .6 Cost of Retesting:
 - .1 The cost for the Sub to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC. The Region shall not be responsible for any costs associated with retesting due to a deficiency caused by the GC or a Subcontractor.
 - .2 For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The CA and the Contractor will direct the retesting of the equipment once at no "charge" to the GC for their time.
 - .3 Refer to the sampling section of Section 01 91 00, Part 3.5 for requirements for testing and retesting identical equipment.
 - .7 The Contractor shall respond in writing to the CA and the Region at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
 - .8 The CA retains the original deficiency tracking log until the end of the project.
 - .9 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- .3 Approval:

- .1 The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the Region, if necessary. The CA recommends acceptance of each test to the Region using a standard form. The Region gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.7 Operation and Maintenance Manuals

- .1 The specific content and format requirements for the standard O&M manuals are detailed in Mechanical and Electrical Specifications by the Contractor.
- .2 Consultant Contribution: The Consultant will include in the beginning of the O&M manuals a separate section describing the systems including:
 - .1 The design intent narrative prepared by the Consultant and provided as part of the Contract Documents, updated to as-built status by the Consultant. These documents will be provided to the Contractor at time of Substantial Performance of the Work.
 - .2 Simplified professionally drawn single line system diagrams on 215.9mm x 279.4mm (8 1/2" x 11") or 279.4mm x 431.8mm (11" x 17") sheets. These shall include chilled water system, water system, heating system, steam system, supply air systems, exhaust systems, domestic hot water and electrical single lines. These shall show major pieces of equipment.
- .3 CA Review Prior to Substantial Performance of the Contract, the CA shall review the O&M manuals, documentation and redline as-builts for systems that were commissioned and to verify compliance with the Specifications. The CA will communicate deficiencies in the manuals to the Region or Consultant, as requested. Upon a successful review of the corrections, the CA recommends acceptance of these sections of the O&M manuals to the Region or Consultant. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the Consultant's review of the O&M manuals.

3.8 Training of Region Personnel

- .1 The GC shall be responsible for training coordination and scheduling, and ultimately for ensuring that training is completed.
- .2 The CA shall interview the facility manager and Consultant to determine the special needs and areas where training will be most valuable. The Region and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
- .3 In addition to these general requirements, the detailed training requirements of the Region personnel by Subs and vendors is detailed in specific commissioning specification sections (refer to Section 01 91 00 Subsection 1.6 of this document for details).
- .4 Each Sub and vendor responsible for training will submit a written training plan to the CA for review and written approval prior to training. The plan will cover the following elements:
 - .1 Equipment (included in training)
 - .2 Intended audience
 - .3 Location of training
 - .4 Objectives
 - .5 Subjects covered (description, duration of discussion, special methods, etc.)

- .6 Duration of training on each subject
- .7 Instructor for each subject
- .8 Methods (classroom lecture, video, Site walk-through, actual operational demonstrations, written handouts, etc.)
- .9 Instructor and qualifications
- .5 For the primary HVAC equipment, the controls Subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
- .6 The CA develops an overall training plan and coordinates and schedules, with the Region, the overall training for the commissioned systems. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the Region using a standard form. The Region will also sign the approval form.
- .7 The Mechanical and Electrical Design Engineer who are G. Bruce Stratton Architects' subconsultants shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, heating systems, air distribution system, control system strategies, electrical distribution, fire systems, etc.

3.9 Deferred Testing

- .1 Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of test sheets and functional testing may be delayed upon approval of the Region. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- .2 Seasonal Testing During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.10 WRITTEN WORK PRODUCTS

- .1 The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

<u>Product</u>	<u>Developed By</u>
1. Final commissioning plan	CA
2. Commissioning Meeting Minutes	CA
3. Commissioning Schedule	CA with GC
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
6. Pre-functional test sheets	CA
7. Startup and initial checkout plan	Subs and CA (compilation of existing documents)
8. Startup and initial checkout forms filled out	Subs

9. Final TAB report	TAB Subcontractor
10. Issues log (deficiencies)	CA
11. Commissioning Progress Record	CA
12. Functional test forms	CA
13. Filled out functional tests	CA
14. O&M manuals	Subs
15. Final Commissioning Documentation	CA
16. Overall training plan	CA
17. Specific training agendas	Subs
18. Final commissioning report	CA
19. Misc. approvals	CA

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide shop fabricated architectural woodwork in accordance with requirements of the Contract Documents.

1.2 References

- .1 Architectural Woodwork Standards referenced in this Section form the basis of the quality standards for materials and installation; materials standards and grading authorities referenced in this Section and listed in the Architectural Woodwork Standard are applicable where specifically referenced and are considered to form a part of and be applicable to this Section.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC):
- .1 NAAWS 4.1 Edition
- .2 AWMAC Architectural Woodwork Standards
- .3 ASTM International (ASTM):
- .1 ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- .2 ASTM C920, Standard Specification for Elastomeric Joint Sealants
- .3 ASTM D1037, Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
- .4 ASTM D3574, Standard Test Methods for Flexible Cellular Materials-Slab, Bonded, and Molded Urethane Foams
- .5 ASTM D5672/D5672M, Standard Test Method for Testing Flexible Cellular Materials Measurement of Indentation Force Deflection Using a 25-mm [1-in.] Deflection Technique
- .4 American National Standards Institute (ANSI):
- .1 ANSI A135.4, Basic Hardboard
- .2 ANSI A208.1, Particleboard
- .3 ANSI A208.2, Medium Density Fiberboard (MDF) for Interior Applications
- .5 CSA Group (CSA):
- .1 CAN/CSA A172, High Pressure Paper Base, Decorative Laminates
- .2 CAN/CSA O121, Douglas Fir Plywood
- .3 CAN/CSA O141, Softwood Lumber
- .4 CAN/CSA O151, Canadian Softwood Plywood
- .6 Underwriters Laboratories Canada (ULC):
- .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .7 National Electrical Manufacturers Association (NEMA):
- .1 NEMA LD 3, High Pressure Decorative Laminates
- 1.3 Administrative Requirements
- .1 Coordination: Architectural woodwork Trade Contractor and the Construction Manager are jointly responsible for the following items:

- .1 Coordinate delivery of casework components at a time when building and storage areas are sufficiently dry so that the casework will not be damaged by excessive changes in moisture content.
 - .2 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that interior casework can be supported and installed including; but not limited to, the following:
 - .1 Metal support brackets and fittings that are part of building structure
 - .2 Plumbing, electrical fixtures and telephone equipment
- 1.4 Submittals
- .1 Product Data: Submit for Consultant's action. Furnish each type of product including hardware and panel accessories, adhesive materials, laminates, veneers and accessories to be used in the Work.
 - .1 Submit product data for each type of product indicated including, but not limited to, the following:
 - .1 Cabinet hardware and accessories
 - .2 Finishing materials and processes
 - .3 Manufactured hardboard, medium density fibreboard
 - .4 High pressure decorative laminate and adhesive for bonding decorative laminate
 - .5 Low pressure decorative laminate
 - .2 Shop Drawings: Submit for Consultant's action. Furnish shop drawings indicating location of each item referenced to actual site dimensions, dimensioned plans and elevations, large scale detailed and thickness of materials, attachment devices, scribe strip locations, locations of exposed fastenings and other components as applicable to work of this section.
 - .3 Samples: Submit for Consultant's action. Submit two (2) samples prior to fabrication of casework as follows; accepted samples will form the standard of acceptance for the remainder of the work:
 - .1 High Pressure Decorative Laminate Clad Panel Products: Laid-up on specified core material, 300 mm x 300 mm for each type, colour, pattern, and surface finish.
 - .2 Low Pressure Decorative Overlay (Melamine) Surfaced Panel Products: Laid-up on specified core material, 300 mm x 300 mm for each type, colour, pattern, and surface finish.
 - .3 Exposed Cabinet Fasteners, Hardware and Accessories: One unit for each type.
 - .4 Certificates: Submit for Consultant's information. Furnish certified test reports.
 - .5 Project Closeout Submissions: Submit for Consultant's action. Submit three (3) copies of Project Record Sheet identifying the following:
 - .1 Project title and address
 - .2 Owner, Consultant, Construction Manager, and casework Trade Contractor
 - .3 Materials and finishes used for casework and whether shop finished or site finished and by whom
 - .4 Type and source of cabinet hardware and any specialty items used under casework
 - .6 Quality Control Submittals: Submit for Consultant's action. Provide proof of qualifications:
 - .1 Project Quality Standard: Architectural Woodwork Standard (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and forms part of this project specification, and as follows:
 - .1 Modifications made in this Section that change the requirements of the AWS will govern in case of conflict.
 - .2 References to Economy, Custom or Premium Grade in this specification are as defined in the AWS; any item not given a specific quality grade will be Custom Grade as defined in the AWS.
 - .3 Provide a copy of the AWS for reference purposes on the job site.
 - .4 References in this specification to part and item numbers mean those parts and items contained within the AWS.

1.5 Delivery Storage and Handling

- .1 Delivery and Acceptance Requirements: Deliver woodwork materials only when building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period, as follows:
 - .1 Deliver, store, and handle casework in accordance with AWS Section 2 Care and Storage.
 - .2 Delivered materials that are damaged in any way or do not comply with these specifications will be rejected by the Consultant; remove rejected materials from job site and replace with acceptable materials.

1.6 Site Conditions

- .1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on Shop Drawings where casework is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by site measurements before being enclosed and indicate measurements on Shop Drawings.
- .2 Established Dimensions: Establish dimensions and proceed with fabricating casework without confirmed site measurements where site measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.
- .3 Ambient Conditions: Maintain area or room in which casework is being installed at a uniform temperature and humidity for 24 hours prior to, during and after installation in accordance with AWS for relative humidity and moisture content; provide additional lighting to maintain a minimum of 430 lx on surfaces and areas where casework is being installed.

1.7 Maintenance

- .1 Maintenance Manuals: Submit for Owner's documentation. Furnish complete manuals describing the materials, and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures and lists describing actual materials used in the Work, including metal alloys, finishes, hardware and other major components.

1.8 Warranty

- .1 Manufacturer Warranty: Warrant work of this Section for a period of 2 years against defects and/or deficiencies in accordance in Article A-6 of the Contract between Owner and Contractor and GC 37 of the General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of the Consultant and at no expense to the Owner. Defects include but are not limited to, delamination of plastic laminate, opening of seams, warpage and extensive colour fading.

2. PRODUCTS

2.1 Materials

- .1 Description:
 - .1 Regulatory Requirements: Provide a Pre-Start Health and Safety Review in accordance with the *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1 Regulation 851, Industrial Establishments, as amended. Refer to Section 01 40 00 – Quality Requirements for further requirements.
 - .2 Performance/Design Requirements: Ensure millwork (e.g. countertops, wall cabinets, etc.) are capable of supporting structural loads without deflection in accordance with Casework Integrity in Appendix A of AWS.

- .3 Framing Lumber: Select Merchantable Western White Spruce, kiln dried, or sound material of any species may be used for concealed members, free from sap, shakes, knots, splits and other defects.
- .4 Architectural Lumber: Clear, straight, kiln dried, Select Yellow Birch for fitments and door jambs. Provide kiln dried lumber to 7% moisture content, free from blemishes that would be apparent after finish is applied.
- .5 Plywood: "A" grade selected birch veneer for exposed faces and "B" grade birch veneer for unexposed faces.
- .6 Solid Birch: of uniform grain, colour and premium grade.
- .7 High Pressure, Paper Base, Decorative Laminates (PLAM):
 - .1 Products of following manufacturers are acceptable subject to conformance to requirements of the Drawings, schedules and the Specifications:
 - .1 Arborite; www.arborite.com
 - .2 Formica Inc.; www.formica.com
 - .3 Nevamar Company, LLC; www.nevamar.com
 - .4 Wilsonart Canada; www.wilsonart.com
 - .5 Industrial Laminates/Norplex, Inc.; www.micarta.com
 - .6 Pionite Decorative Laminates; www.pionite.com
 - .2 Provide following types and thicknesses conforming to ANSI/NEMA LD 3 and Section 4, Rule 4.2c of AWS:
 - .1 Horizontal General Purpose: HGS - 1.2 mm (0.048").
 - .2 Horizontal Light Duty: HGL - 1.0 mm (0.039").
 - .3 Vertical General Purpose: VGS - 0.7 mm (0.028").
 - .4 Vertical Light Duty: VGL - 0.5 mm (0.020").
 - .5 Postforming Horizontal: HGP - 1.0 mm (0.039").
 - .6 Postforming Vertical: VGP - 0.7 mm (0.028").
 - .7 Cabinet Liner: CLS - 0.5 mm (0.020").
 - .8 Backer Sheet: BKV - 0.7 mm (0.028").
 - .9 Backer Sheet: BKM - 1.0 mm (0.039").
 - .10 Backer Sheet: BKH - 1.2 mm (0.048").
 - .11 Backer Sheet: BKL - 0.5 mm (0.020").
 - .12 Special Purpose: HSH - 3.0 mm (0.118").
 - .13 Special Purpose: HSM - 1.5 mm (0.059").
 - .14 Flooring Grade, High Wear: HDH - 3.0 mm (0.118").
 - .15 Flooring Grade, High Wear: HDM - 1.5 mm (0.059").
 - .16 Flooring Grade, High Wear: HDS - 1.2 mm (0.048").
 - .17 Flame Retardant: SGF - 1.5 mm (0.059").
 - .18 Flame Retardant: HGF - 1.2 mm (0.048").
 - .19 Flame Retardant: VGF - 0.8 mm (0.032").
- .8 Colours and Finishes: Provide full colour range including solid, woodgrain and printed patterns, textured, mirror, suede or matte, glossy, high luster/furniture crystal and ashwood finishes. Refer to Drawing ID0.05 for ML-1, PL-1, PL-2, WD-1, VW-1.
- .9 Plastic Laminate Adhesive:
 - .1 Heat-cured urea-formaldehyde type resin in accordance with requirements of CSA O112 Series-M for Work except as otherwise specified in the Contract Documents.
 - .2 Heat-cured resorcinol resin in accordance with requirements of CSA O112 Series-M for wet areas and counter tops with sinks and lavatories built-in.

.10 Wood Cores:

- .1 Particleboard Laminating Core: Particleboard core of minimum 720 kg/m³ (45 lbs/cu ft) density conforming to ANSI A208.1, Grade R, sanded both sides.
- .2 MDF Core: Medium density panels, meeting requirements of ANSI/NPA A208.2, balanced design, manufactured from 100% recycled materials, without the use of formaldehyde resins,, of minimum density of 770 kg/m³ (48 lb/cu ft) and surface character to match sample in Consultant's possession. Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during manufacturing and achieve a maximum flame spread rating of 25 with a maximum smoke developed of 200 when tested to ASTM E84. Do not use MDF panels in moist areas. Acceptable Products are "Excel+ MDF" by Uniboard Canada Inc.; www.uniboard.com or Canfibre Group Limited or Equivalent.
- .3 Plywood Core: Poplar plywood conforming to CSA O153-M, Grades A and B.

2.2 Solid surface

- .1 Homogenous compression moulded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fibre reinforcement, and colouring agents, conforming to ANSI Z124 and FED WW-P-541E, and meeting the following requirements:
- .2 Manufacturers: Provide Products by the following manufacturers as specified:
 - .1 The Swan Corporation,
 - .2 Corian,
 - .3 Wilsonart, .
 - .4 Avonite Surfaces,
- .3 Adhesives and Colour Matched Silicon Sealants: As recommended by the manufacturer to suit details and conditions.
- .4 Sheet thickness: 12 mm nominal size.
- .5 Colour (SS-1): Refer to Drawing ID0.05.

2.3 Finishing

- .1 Prime unexposed surfaces including backs of fitments against walls and underside of fitments.
- .2 Before priming, treat knots and sap streaks, with a coat of shellac and then prime with a wood primer.
- .3 Shop finish natural finished wood surfaces.

2.4 Hardware and Equipment

- .1 Hardware: HW-1 to HW-6 as indicated on Drawing ID0.05
 - .1 Millwork pulls shall be "#527160" in #195 stainless steel finish by Richelieu or equivalent.
 - .2 Provide standard hinges and glides, refer to the Drawings.
- .2 Refer to Drawing ID0.06 for Specialty Equipment EQ4, EQ5, EQ6, EQ7, EQ8, EQ9, EQ10, EQ11.

2.5 Components

- .1 Exposed Parts Core: Composition board veneer plywood.
- .2 Exposed Parts Finish: Premium grade in accordance with Section 10, paragraph 1.2.10 of AWS.

- .3 Semi-Exposed Parts Core: Composition board veneer plywood.
- .4 Semi-Exposed Parts Finish: Premium grade in accordance with Section 10, paragraph 1.2.11 of AWS.
- .5 Casework for Opaque Finish:
 - .1 NAAWS Quality Grade: Premium.
 - .2 Construction: Ensure casework conforms to Section 10 of AWS.
 - .3 Exposed Parts Core: Composition board veneer.
 - .4 Exposed Parts Finish: Premium grade in accordance with Section 10, paragraph 1.2.10 of AWS.
 - .5 Semi-Exposed Parts Core: Composition board veneer.
 - .6 Semi-Exposed Parts Finish: Premium grade in accordance with Section 10, paragraph 1.2.11 of NAAWS.
- .6 Casework for Plastic Laminate Finish:
 - .1 NAAWS Quality Grade: Premium.
 - .2 Construction: Ensure casework conforms to Section 10 of AWS.
 - .3 Exposed Parts Core: Composition board veneer.
 - .4 Exposed Parts Finish: Plastic laminate; HGS for horizontal surfaces and VGS for vertical surfaces in accordance with Section 10, paragraph 1.2.10 of AWS.
 - .5 Semi-Exposed Parts Core: Composition board veneer.
 - .6 Semi-Exposed Parts Finish: Plastic laminate; HGS for horizontal surfaces and VGS for vertical surfaces in accordance with Section 10, paragraph 1.2.11 of AWS.
 - .7 Concealed Parts Finish: Backing sheet; BKV.
- .7 Edge banding: 6 mm solid wood edge on all exposed edges and adjustable shelf.
- .8 Solid Surface Countertops:
 - .1 Ensure front edge type is 6 mm pencil edge. Refer to Drawings.
- .9 Exterior Frames:
 - .1 AWI/AWMAC/WI Quality Grade: Premium.
- .10 Factory Finishing:
 - .1 Apply finishes in accordance with Section 5 of AWS.
- .11 Field Touch-Up: Field touch-up is responsibility of Contractor. Field touch-up includes filling and touch-up of exposed job-made nail and screw holes, refinishing of raw surface resulting from job fitting, repair of job-inflicted scratches and mars and final cleaning up of finished surfaces.
- .12 Fabrication:
 - .1 Fabricate joints accurately fitted, coped where possible and well glued up. Fabricate joints mitred to perfect fit and alignments carefully matched.
 - .2 Fabricate finished woodwork in 1 piece where possible. Fabricate running members in the longest lengths obtainable.
 - .3 Fabricate to conceal fastenings.
 - .4 Provide plastic laminate work in shop.
 - .5 Fabricate exposed gables to match the required exposed finishes.
 - .6 Exposed wood construction:
 - .1 Fabricate joints carefully matched for grain and colour.
 - .2 Fabricate millwork with slow fed machines free from sticker and/or sander markings, with sections and moulding work cut accurately to profiles.

- .3 Sandpaper woodwork, smooth removing burrs, feathers, sleeves, raised grain and sharp arises and leave exposed surfaces perfectly clean and smooth ready for finishing.
- .4 Provide edges noted to be solid, as minimum 6 mm (1/4") thick wood to match exposed veneer, glued to core prior to the application of face veneers.
- .7 Countertops:
 - .1 Fabricate and assemble countertops and splashbacks in shop to profiles and lengths indicated in the Drawings.
 - .2 Fabricate cutouts for services penetrations.
 - .3 Verify governing dimensions before fabricating items which abut wall surfaces.
- .13 Provide cutouts and round internal corners, chamfer edges and seal exposed core

3. EXECUTION

3.1 Examination

- .1 Visit site and note state of completion within various areas in which casework is being installed; verify that surfaces are ready to receive work of this Section and that other work is finished and painted before being built-over or covered in any way by installed casework:
 - .1 Verify that areas in which casework is scheduled are finished and ready to accept work of this Section; with walls painted, ceilings finished, overhead services completed, tested and accepted.
 - .2 Starting work will be considered as acceptance of conditions.

3.2 Preparation

- .1 Confirm access is sufficient for large pieces of casework, and that they can be transported easily and safely to final installation location.
- .2 Protect adjacent finished surfaces and materials from damage by work of this Section.
- .3 Back prime casework immediately after delivery to site.

3.3 Installation

- .1 Install casework plumb, level and true to locations indicated on Drawings and in accordance with AWS.
- .2 Anchor to floor, walls or ceiling using fastening devices and hardware consistent with materials being fastened into and quality of finish, and as follows:
 - .1 Do not use wood plugs
 - .2 Do not use plastic plugs for ceilings or walls
 - .3 Provide wall cleats fastened to wall blocking as required
 - .4 Shim level and square in relation to adjoining surfaces
 - .5 Scribe accurately to adjacent work
 - .6 Provide allowance for finish flooring installation to base by related sections of work
 - .7 Set on steel support framing; coordinate fabrication requirements with Section 05 51 00
- .3 Scribe neatly and accurately to smooth snug fit with adjoining surfaces and materials to align work properly; mitre corners accurately.
- .4 Perform cutting, fitting, repairing in woodwork as required by other trades where their Work is connected to or part of this Work.
- .5 Cut out openings for mechanical and electrical fittings and fixtures; coordinate and cooperate with mechanical and electrical work and obtain required templates, cutting locations and dimensions.

- .6 Apply neat bead of sealant white between plumbing fixtures countertops and adjoining walls and casework; seal edges of cut out core material before fixtures installed with moisture resistant compound.
- .7 Install any finishing hardware shipped loose.
- .8 Thoroughly fix and anchor Work of this section into position.
- .9 Mechanical and Electrical Fittings:
 - .1 Provide openings required to accommodate mechanical and electrical fittings as part of the Work of this Section and provide a core sealant to protect counter cores which are exposed to accommodate:
 - .1 mechanical services and fittings.
 - .2 washroom accessories.
 - .2 Mechanical and electrical fittings and services will be provided as part of the Work of Divisions 21, 22, 23, 26, 27 and 28.
- .10 Installation of Hardware:
 - .1 Install architectural woodwork hardware in accordance with manufacturer's requirements and templates. Adjust architectural woodwork hardware to provide smooth operation and ensure clearances are maintained. Repair damage to adjacent surfaces resulting from failure to conform with this requirement.
 - .2 Provide lubricants required and use in manner to ensure smooth function of hardware consistent with manufacturer's recommendations.
 - .3 Verify fastening components are tightened securely. Align screws, bolts and similar fastenings such that relationship of screw head indentations, similar surfaces and slots are perpendicular to matching vertical or horizontal position when on same surface. Do not burr or otherwise mar edges of surfaces of hardware components. Repair defects caused by work of this section in an acceptable manner.
- 3.4 Closeout Activities
 - .1 Deficient Work: Replace, rework or refinish work that does not meet AWS requirements as directed by Consultant.
 - .2 Adjusting: Adjust hardware and operating parts during and after installation to provide smooth and proper operation of casework components.
 - .3 Cleaning: Clean casework, cabinets, countertops, shelves and fixtures, and remove marks, scratches or marring on exposed and semi-exposed surfaces after work of this Section is complete and prior to Substantial Performance for the project.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide firestopping in accordance with requirements of the Contract Documents.

1.2 References

- .1 ASTM International (ASTM):
- .1 ASTM A1008/A1008M, 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
 - .2 ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .3 ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems.
 - .4 ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems.
 - .5 ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.
- .2 Underwriters Laboratories of Canada (ULC):
- .1 ULC Guide No. 40 U19, Firestop Systems
 - .2 CAN/ULC S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .4 CAN/ULC S114, Standard Method of Test for Determination of Non-combustibility in Building Materials.
 - .5 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.
- .3 Underwriters Laboratories (UL):
- .1 UL 1479, Standard for Fire Tests of Penetration Firestops

1.3 System Description

- .1 Firestop Systems: Provide firestop materials and systems designed, tested and installed to resist the spread of fire and the passage of smoke and gases through openings in fire rated assemblies, including floor and wall construction classified in accordance with ANSI/UL 263 (ASTM E119).
- .1 Firestop conditions indicated on the Drawings are relative to design conditions. Contractor's selection of firestop systems shall be suitable for the field conditions, based on the actual size, location and materials used in the Work.
- .2 Test Standards for Firestop Systems: Provide firestop materials which have been tested and rated as systems applicable to each firestop condition in the Work, as listed by ULC "Fire Resistance Directory" or by other qualified testing agency acceptable to the authorities having jurisdiction.
- .1 Firestop system tests are specified by reference to ULC standards, and also by reference to equivalent (ASTM) standards for use in comparison with ratings from other acceptable testing agencies. In the event of a difference or discrepancy in ratings or test methods, the provisions of ULC standards shall apply.
- .3 Ratings for Through-Penetration Firestop Systems (FSS): Provide firestop systems tested and classified with ratings to meet the specified requirements.
- .1 Test Procedures for Through-Penetrations: UL 1479 (ASTM E814). Through-penetration systems shall pass test procedures for fire resistance, temperature rise, leakage, and watertightness, as applicable to meet the specified rating requirements.

- .2 Fire Resistance: The “F Rating” shall equal the fire resistance rating of the surrounding construction, but not less than 1-hour, and shall not exceed the fire resistance rating where the surrounding construction is gypsum board.
 - .3 Temperature Rise: The “T Rating” shall equal the “F Rating”, except where a “T Rating” for the firestop condition is exempted by applicable code.
 - .4 Leakage: The “L Rating” shall not exceed 0.005m³/s m² for each penetration or a total of 0.005 m³/s m² for a 9.3 m² area.
 - .5 Watertightness: The “W Rating” shall meet or exceed a Class 1 resistance to water pressure for firestop systems in the following locations.
 - .1 Penetrations in exterior wall and roof construction.
 - .2 Floor penetrations in rooms or spaces having a floor drain, and wall penetrations in such areas if any portion of the firestop is 75 mm or less above the floor, such as mechanical / electrical equipment rooms, janitorial rooms or closets, toilet or shower rooms, garage or loading dock areas.
 - .6 Insulated Penetrations: Provide firestop systems which shall not require removal of insulation or coverings integral to the penetrants, such as thermal insulation and protective jackets as well as insulation or coverings of electrified components.
 - .7 Wall-Opening Protective Materials: Firestop systems are required for protection of wall openings or membrane penetrations such as electrical boxes that pass only through one side of fire-resistance rated walls and partitions. The membrane penetrations and wall-opening protective materials shall meet the firestop conditions set forth by the individual fire test classifications of the wall and partition assemblies.
- .4 Ratings for Firestop Joint Systems (FSS): Provide firestop joint systems tested and classified with ratings to meet the specified requirements.
- .1 Test Procedures for Joint Systems: ANSI/UL 2079 (ASTM E1966). Firestop joint systems shall pass test procedures for fire resistance, leakage, watertightness, movement capability, and load capacity, as applicable to meet the specified rating requirements.
 - .2 Fire Resistance: Firestop joint “Assembly Rating” shall equal the fire resistance rating of surrounding construction, but not less than 1-hour, and shall not exceed the fire resistance rating where surrounding construction is gypsum board.
 - .3 Leakage: The “L Rating” shall not exceed 0.005 m³/s m² for each penetration or a total of 0.005 m³/s m² for a 9.3 m² area.
 - .4 Watertightness: The “W Rating” shall meet or exceed a Class 1 resistance to water pressure for firestop systems in the following locations.
 - .1 Firestop joints in exterior wall and roof construction.
 - .2 Firestop joints behind floor joint cover assemblies where not equipped with a water drainage system.
 - .3 Floor joints in rooms or spaces having a floor drain, and wall joints in such areas if any portion of the firestop is 75 mm or less above the floor, such as mechanical / electrical equipment rooms, janitorial rooms or closets, toilet or shower rooms, garage or loading dock areas.
 - .5 Movement for Dynamic Joints: The “Movement Capabilities” rating shall be Class I, II, or III, and compatible with the intended movement range for the dynamic joint conditions.
- .5 Ratings for Perimeter Fire-Containment Systems (FSS): ANSI/UL 2079 (ASTM E2307). Provide perimeter fire-containment systems tested and classified with the specified ratings to meet the design requirements.
- .1 Test Procedures for Perimeter Systems: ANSI/UL 2079 (ASTM E2307). Perimeter fire-containment systems shall pass test procedures for fire resistance, integrity, temperature rise, insulation, leakage, and movement capability, as applicable to meet the specified rating requirements.
 - .2 Fire Resistance: The “F Rating” shall equal the fire resistance rating of the floor assembly.
 - .3 Integrity: The “Integrity Rating” shall equal the “F Rating”.
 - .4 Temperature Rise: The “T Rating” shall equal the “F Rating”.
 - .5 Insulation: The “Insulation Rating” shall equal the “T Rating”.
 - .6 Leakage: The “L Rating” shall not exceed 0.005 m³/s m² for each penetration or a total of 0.005 m³/s m² for a 9.3 m² area.

- .6 Movement for Dynamic Joints: The “Movement Capabilities” rating shall be Class I, II, or III, and compatible with the intended movement range for the dynamic joint conditions.

1.4 Administrative Requirements

- .1 Coordination: Coordinate construction of openings and penetrating items and verify that firestopping and smoke seals systems are installed according to specified requirements and as follows:
 - .1 Coordinate sizing of sleeves, openings, core drilled holes, or cut openings to accommodate firestopping and smoke seals systems.
 - .2 Leave firestopping and smoke seals or joint system installations that will become concealed behind other construction open until Consultant and building inspector, if required by authorities having jurisdiction, have examined each installation.
- .2 Pre-Construction Meeting: Arrange a pre-construction meeting as follows:
 - .1 Meeting shall be attended by Contractor, Subcontractor responsible for firestopping, subcontractors affected by work of this Section.
 - .2 Meeting will discuss requirements for engineered judgements, site conditions, coordination issues and single source responsibility for application of firestop systems; either by the Contractor or by specialty firestop applicator.

1.5 Submittals

- .1 Product Data: Submit for Consultant's action. Furnish each type of product and accessories to be used in the Work; before starting work of this section.
 - .1 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.
- .2 Shop Drawings and Schedules: Submit for Consultant's action.
 - .1 Not later than 30 working days following Award of Contract, submit a schedule listing surfaces or components to which firestopping and smoke seals are to be applied, and indicating the manufacturer's firestopping and smoke seal systems, required materials, and detailed installation procedures for review by the Consultant.
 - .2 Determine thickness of applied materials from tests of assemblies identical to the assembly to be protected where possible, conducted in accordance with reference standards listed above.
 - .3 Determine system from available engineering studies, or correspondence with the labelling agency indicating the effect of the differences on the fire separation of the assembly where the assembly to be protected does not correspond exactly to a tested assembly; confirm acceptance of system by local authorities having jurisdiction in writing.
 - .4 Use the same system and material as would be required for a tested assembly with similar conditions where the assembly includes conditions which do not correspond to those included in any previously tested assembly and for which no relevant engineering information is available.

1.6 Quality Assurance

- .1 Regulatory Requirements: Use materials and methods of determining required thickness of application that have the full acceptance of Authority Having Jurisdiction and that are materials tested to ULC S115.
- .2 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Ratings: Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to authority having jurisdiction.
 - .2 Materials: Provide materials having fire test response characteristics.

- .3 Installers: Apply firestopping and smoke seal materials or systems specified in this Section using fully experienced applicators trained by manufacturer, using proper equipment in strict accordance with manufacturer's instructions. Firestopping Installers shall provide proof of being a current member and in good standing with FCIA. Firestopping Installers shall provide proof of possessing a certificate of training from ULC and provide a letter from ULC stating that they are in good standing.
- .4 Source Responsibility: Obtain through penetration firestop and joint systems, for each kind of penetration and construction condition indicated, from a single source of installation responsibility.

1.7 Delivery, Storage and Handling

- .1 Deliver and store materials in a dry protected area, in original undamaged sealed containers with the manufacturer's labels, application instructions, and labelling agency's labels intact.
- .2 Keep materials dry until ready for use.
- .3 Keep the packages of material off the ground, under cover, and away from sweating walls and other damp surfaces. Discard material that has been exposed to water before actual use.
- .4 Use stock before its expiration date.

1.8 Project Conditions

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.
- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

2. PRODUCTS

2.1 Manufacturers

- .1 Subject to compliance with requirements, firestopping and smoke seals systems that may be incorporated into the Work include, but are not limited to, those systems indicated:
 - .1 A/D Fire Protection Systems Inc.
 - .2 Passive Fire Protection Partners Firestop Systems Inc.
 - .3 Hilti Canada Ltd.
 - .4 Johns Manville Fire protection Systems
 - .5 Nuco Self Seal Firestopping Products
 - .6 EZ-Path Fire Rated Pathways
 - .7 Roxtec, Preformed Fire Stopping Systems
 - .8 Specified Technologies Inc.
 - .9 3M Canada Inc.
 - .10 Rockwool
 - .11 Tremco Ltd.

2.2 Design Requirements

- .1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to withstand fire ratings indicated and in accordance with requirements of the Building Code.

- .2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the Building Code, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:
 - .1 Provide through penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
 - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.
 - .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
 - .3 Fire resistance rated floor assemblies.
 - .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115 or ASTM E814, but not less than that equaling or exceeding fire resistance rating of constructions penetrated.
 - .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115 or ASTM E814, where systems protect penetrating items exposed to potential contact with adjacent materials:
 - .1 Penetrations located outside wall cavities.
 - .2 Penetrations located outside fire resistive shaft enclosures.
 - .3 Penetrations located in construction containing fire protection rated openings.
 - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross sectional area.
 - .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
 - .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
 - .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
 - .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire resistance rating of constructions in which joints are located.
- 2.3 Firestopping and Smoke seals
 - .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.

- .4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
 - .5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
 - .2 Accessories: Provide components for each firestopping and smoke seals system that are needed to install fill materials and to comply with 1.2 above. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.
 - .5 Steel sleeves.
 - .6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
 - .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
 - .8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.912 mm.
 - .9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:
 - .1 Acceptable material: Hilti CP777 Speed Plugs.
 - .10 Labels: Peel-and-stick labels printed with the following information:
 - .1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY
 - .2 Name of firestopping manufacturer;
 - .3 Names of products used;
 - .4 Hour Rating of Assembly;
 - .5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or cUL_{US} Number;
 - .6 Date of installation;
 - .7 Name of installing Subcontractor;
 - .8 Contact telephone number for repair or replacement of firestopping materials.
- 2.4 Fill Materials
- .1 General:
 - .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke seals System Schedule below by reference to the types of materials described in this Article.
 - .2 Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
 - .3 Firestopping products shall have the ability to provide a minimum of STC 55 and have Volatile Organic Compound (VOC) of less than 250 g/L.
 - .4 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.

- .2 Cast-in-Place Firestopping and Smoke seals Devices: Factory assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- .3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .4 Firestopping and Smoke seals Devices: Factory assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .5 Cable Penetration Devices: Premanufactured intumescent blocks, consisting of a system of inserts and adjustable cores; or premanufactured fire rated cable pathway systems, and as follows:
 - .1 EZ-Path Fire Rated Pathway
 - .2 Roxtec Intumescent Blocks.
- .6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.
- .7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.
- .8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.
- .9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
- .10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- .11 Pillows/Bags: Reusable, heat expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire retardant additives.
- .12 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .13 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:
 - .1 Grade for Horizontal Surfaces: Pourable (self levelling) formulation for openings in floors and other horizontal surfaces.
 - .2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.5 Mixing

- .1 For those products requiring mixing before application, comply with firestopping and smoke seals system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

3. EXECUTION

3.1 Examination

- .1 Examine surfaces, components, materials to receive firestopping and smoke seals material; report any conditions that would detrimentally affect the application of the material or the proper firestopping and smoke seals of the system.

- .2 Commence Work when conditions of surfaces and the working conditions are suitable.
- .3 Verify service lines are in place, tested and approved where penetration sealants or caulking are required.
- .4 Verify that proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping and smoke seals. Notify Consultant in writing of any deficiencies affecting the proper performance of the firestopping and smoke seals, do not proceed until deficiencies are corrected.
- .5 Prepare surfaces in contact with firestopping and smoke seals materials and smoke seals to manufacturer's instructions.
- .6 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier where applicable.
- .7 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 Preparation

- .1 Provide and maintain masking, drop cloths and polyethylene coverings for such surfaces to protect them during installation operations where adjacent finished floors, walls and similar surfaces are going to be exposed.
- .2 Provide complete enclosures and human protective devices when installing or mixing hazardous materials.
- .3 Surfaces shall be free of oil, grease, dirt, loose paint, mill scale or any other matter that could impair bond, including paint.
- .4 Prime surfaces as required.
- .5 Make provisions for natural ventilation during and subsequent to application of firestopping and smoke seals, sealant or caulking; circulate interior air by use of temporary circulators or exhaust fans in enclosed areas or area lacking openings for natural ventilation.

3.3 Application

- .1 Apply firestopping and smoke seals materials in strict accordance with manufacturer's printed instructions, accepted and approved tested assemblies, and approved details.
- .2 Apply firestopping and smoke seals materials/systems to maintain the fire separations in the project as indicated on drawings.
- .3 Seal holes or voids made by through penetrations, poke through termination devices, and unpenetrated openings or joints and verify continuity and integrity of fire separation are maintained.
- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to a neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.
- .7 Place self-sticking labels on a permanent surface adjacent to firestopping or smoke seal installation. Confirm location with Consultant when exposed to view or in predominant locations.

3.4 Inspection

- .1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping and smoke seals materials and service penetration assemblies.

- .2 Cut tests may be made at random by the Owner. Frequency of cut tests shall be determined by the Consultant, but will not be more than 1% of total length of firestopping and smoke seals.
 - .3 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.
 - .4 Owner to engage a Fire Science Engineer to review drawings, submittal of tested assemblies, perform site inspections and provide site reports.
- 3.5 Clean-Up
- .1 After completion of firestopping and smoke seals work, remove equipment and clean exposed wall and floor areas to remove excess materials, spatter.
- 3.6 System Schedule
- .1 Design and provide through penetration firestopping and smoke seals as follows for:
 - .1 Systems with No Penetrating Items: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent spray foam.
 - .2 Systems for Metallic Pipes, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent spray foam.
 - .3 Systems for Non-metallic Pipe, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent wrap strips.
 - .5 Firestopping and Smoke seals device.
 - .6 Intumescent spray foam.
 - .4 Systems for Electrical, and Data and Communications Cables: Select one or more of the following fill materials:
 - .1 Latex sealant
 - .2 Silicone sealant
 - .3 Intumescent putty
 - .4 Silicone foam
 - .5 Prefabricated Firestop Sleeve (Hilti)
 - .6 Prefabricated Cable Pathways (EZ-Path)
 - .7 Intumescent foam blocks or boards
 - .8 Intumescent spray foam
 - .5 Systems for Cable Trays: Select one or more of the following fill materials:
 - .1 Latex sealant
 - .2 Intumescent putty
 - .3 Silicone foam
 - .4 Pillows/bags

- .6 Systems for Insulated Pipes: Select one or more of the following fill materials:
- .1 Latex sealant
 - .2 Intumescent putty
 - .3 Silicone foam
 - .4 Intumescent wrap strips
 - .5 Intumescent spray foam
- .7 Systems for Miscellaneous Electrical Penetrations: Select one or more of the following fill materials:
- .1 Latex sealant
 - .2 Intumescent putty
 - .3 Intumescent spray foam
- .8 Systems for Miscellaneous Mechanical Penetrations: Select one or more of the following fill materials:
- .1 Latex sealant
 - .2 Intumescent spray foam
- .9 Systems for Groupings of Penetrations: Select one or more of the following fill materials:
- .1 Latex sealant
 - .2 Intumescent wrap strips
 - .3 Firestopping and Smoke seals device
 - .4 Intumescent composite sheet
 - .5 Intumescent spray foam
- .2 Design and provide joint firestopping and smoke seals as follows for:
- .1 Floor-to-Floor, Fire Resistive Joint System: Provide materials to meet the following criteria:
- .1 Assembly Rating: as indicated.
 - .2 Nominal Joint Width: As indicated
 - .3 Movement Capabilities: To be confirmed, compression or extension.
- .2 Floor-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
- .1 Assembly Rating: as indicated.
 - .2 Nominal Joint Width: As indicated
 - .3 Movement Capabilities: To be confirmed, compression, extension, or horizontal shear
- .3 Head-of-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
- .1 Assembly Rating: as indicated
 - .2 Nominal Joint Width: As indicated
 - .3 Movement Capabilities: Compression and extension
- .4 Wall-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
- .1 Assembly Rating: as indicated
 - .2 Nominal Joint Width: As indicated
 - .3 Movement Capabilities: Compression and extension
- .5 Design and provide perimeter fire containment firestopping and smoke seals as follows for:
- .1 Perimeter Fire Containment System: Provide materials to meet the following criteria:
- Integrity Rating: as indicated.
 - Insulation Rating: as indicated.
 - Linear Opening Width: As indicated.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide joint sealants in accordance with requirements of the Contract Documents.

1.2 System Description

- .1 Compatibility: Provide only the sealants and joint fillers which are explicitly recommended by the manufacturer for the application, and which have been determined by tests to be totally compatible with the joint surfaces and each other, as stated in the manufacturer's published data or certified by the manufacturer for each application.
- .2 Staining: Provide sealant systems which shall not cause or contribute to staining of substrate surfaces. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C510, C1248 and ASTM D2203 methods for each joint substrate condition in the Work.
- .3 Adhesion: For elastomeric sealant systems, manufacturer shall test each sealant for bond with each joint substrate condition in the Work. ASTM C719, no failure in adhesion or cohesion. ASTM C794, minimum 66.8 N peel strength with no loss in adhesion.
- .4 Hardness: For sealant systems to be exposed to abrasion and traffic, provide the sealants having suitable hardness to resist damage including indentation by stiletto heel shoes. Determine the proper sealant system and hardness or compressibility in consultation with the manufacturer, considering movement and exposure for the size of each joint.
- .5 Sealant Colour: For fully concealed joints, provide the manufacturer's standard colour which has the best overall performance characteristics for the application. For exposed joints provide the colours as follows.
- .1 Standard Colour: Provide colour selected by the Consultant from manufacturer's standard colours, to match or blend with adjoining materials in a manner to be determined by the Consultant.
- .2 Custom Colour: Provide custom colours where noted, to match the Consultant's sample, or to match or blend adjoining materials in a manner to be determined by the Consultant.

1.3 References

- .1 ASTM International (ASTM):
- .1 ASTM C510, Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
- .2 ASTM C719, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
- .3 ASTM C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- .4 ASTM C834, Standard Specification for Latex Sealants.
- .5 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
- .6 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
- .7 ASTM C1193, Standard Guide for Use of Joint Sealants.
- .8 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- .9 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- .10 ASTM D2203, Standard Test Method for Staining from Sealants.
- .11 ASTM D2240, Standard Test Method for Rubber Property-Durometer Hardness.

- .2 Canadian General Standards Board (CGSB):
 - .1 CGSB 19-GP-13, Sealing Compound, One Component, Polysulphide Base, Chemical Curing (withdrawn).
 - .2 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing (withdrawn).
 - .3 CAN/CGSB 19.17, One Component, Acrylic Emulsion Base Sealing Compound (withdrawn).
 - .4 CAN/CGSB 19.21, Sealing and Bedding Compound, Acoustical (withdrawn).
 - .5 CAN/CGSB 19.24, Sealing Compound, Multi-Component, Chemical Curing (withdrawn).
- 1.4 Submittals
 - .1 Product Data: Submit for Consultant's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
 - .1 Furnish technical data describing the quality and performance of each material component or system to be used in the Work, e.g., the staining, peel strength, hardness, or other such primary characteristics as required by the Drawings or Specifications.
 - .2 Samples: Submit for Consultant's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for colour and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples of each type and colour of joint sealer, not less than 300 mm, installed between 2 samples of the materials to be sealed.
 - .3 Certifications: Submit for Consultant's information.
 - .1 Furnish certified test reports verifying that sealants to be used in the Work meet the specified performance requirements.
 - .4 Quality Control Submittals: Submit for Consultant's information.
 - .1 Test Reports: Furnish reports of the specified test procedures.
 - .5 Closeout Submittals: Submit for Owner's documentation.
 - .1 Warranty.
- 1.5 Quality Assurance
 - .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
 - .2 Sealant Manufacturer: Do not use sealant produced by manufacturer who will not agree to send a qualified technical representative to the project site, when requested, for the purpose of rendering advice concerning the proper installation of materials. Begin the installation of each major type of sealant only in the presence of the manufacturer's technical representative.
 - .3 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of National, Provincial and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- 1.6 Delivery, Storage, and Handling
 - .1 General: Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

2. PRODUCTS

2.1 Manufacturers

- .1 Subject to compliance with requirements, manufacturer's products that may be incorporated into the Work include, but are not limited to, the following:

- .1 GE Silicone by Momenive
- .2 BASF Construction Systems
- .3 Dow Corning Canada Inc.
- .4 Sika Canada Inc.
- .5 Tremco Ltd.

2.2 Materials

- .1 Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and site experience.
- .2 Colours of exposed joint sealants will be selected by the Consultant from manufacturer's complete range to match adjacent finish materials. Provide paintable sealants for all visible interior locations.
- .3 Elastomeric Joint Sealants: Provide sealants in accordance with ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates and as follows:
- .1 Provide products that have been tested in accordance with ASTM C1248 where elastomeric sealants are required for non-staining to porous substrate applications.
- .4 Latex Joint Sealants: Provide sealants in accordance with ASTM C834, temperature Grade to suit related exposure and joint substrates, paintable, non-sag and non-staining for general application.
- .5 Acoustical Sealant for Concealed Joints: Provide sealants in accordance with CAN/CGSB-19.21-M, non-drying, non-hardening, non-skinning, non-staining, gun grade, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission. Coordinate with Section 09 21 16.
- .6 Performance Requirements:
- .1 Provide elastomeric joint sealants for exterior applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
 - .2 Provide joint sealants for interior applications that establish and maintain airtight and water resistant continuous joint seals without staining or deteriorating joint substrates.

2.3 Liquid Sealants

- .1 Type S-1; acrylic sealant: One part acrylic latex, Shore A Hardness 20, conforming to CAN/CGSB-19.17-M and ASTM C834:
- .1 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.
 - .1 Acceptable Materials:
 - Spectrem 1
 - GE RCS 20.02 by Momenive
 - Tremco Tremflex 834
- .2 Type S-2; Silicone Sealant: Mould and mildew resistant, Shore A Hardness 15-25, conforming to ASTM C920, Type S, Grade NS, Class 25, use NT, G, and A:
- .1 Use mould and mildew resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens; do not use on floors.
 - .1 Acceptable Materials:

- GE SCS 1700 by Momenive
 - Dow Corning 786
 - Sikasil GP
 - Tremco Tremsil 200
- .3 Type S-3; Silicone Sealant: Exterior Weatherproofing Sealant, One-part, low modulus, neutral cure, Shore A Hardness 15-25, conforming to CAN/CGSB-19.13-M, Classification C-1-40-B-N and C-1-25-B-N, and ASTM C 920, Type S, Grade NS, Class 25, use NT, M, G, A and O, colour as selected by Consultant from Standard Range:
 - .1 Use silicone general construction sealant Type S-3 or polyurethane sealant Type S-7 and S-10 for all joints, interior and exterior, where no other specific sealant type specified; do not use on horizontal traffic joints or where immersed in water.
 - .1 Acceptable Materials:
 - GE SCS 2700 Silpruf LM or GE SWS
 - Dow Corning 791
 - Sikasil N Plus
 - Tremco Spectrum 1/Spectrum 3
- .4 Type S-4, Silicone Sealant: Butt glazing, one part, moisture curing, shore A hardness 15-25, conforming to CAN/CGSB-19.13-M, Classification C-1-40-B-N and C-1-25-B-N and ASTM C920, Type S, Grade NS, Class 25, use NT, G, A, O; Colour: clear (translucent):
 - .1 Use silicone glazing type S-4 for sealing butt glazing joints.
 - .1 Acceptable Materials:
 - GE SCS2000 Silpruf by Momenive
 - Dow Corning 795
 - Multiseal
 - Sikasil WS 295
 - Tremco Spectrem 2
- .5 NOT USED. Type S-4; Silicone Sealant: Structural glazing, Shore A Hardness 15-25, conforming to CAN/CGSB-19.13-M, Classification C-1-40-B-N and C-1-25-B-N, and ASTM C 920, Type S, Grade P, Class25, use T, M:
 - .1 Acceptable materials:
 - .1 GE SSG4000 Ultra Glaze by Momenive.
 - .2 Dow-Corning 995.
 - .3 Sikasil N Plus
 - .4 Tremco Spectrem 2 (2 sided) Proglaze SSG (4 sided).
- .6 Type S-5; interior acoustical sealant: Non-skinning, non-hardening, single component synthetic rubber sealant, conforming to CAN/CGSB-19.21-M:
 - .1 Use acoustical sealant Type S-5 for interior applications only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.
 - .1 Acceptable Materials:
 - Metaseal
 - Tremco Acoustic Sealant
- .7 Type S-6; air-seal sealant: One part, silicone, shore A hardness 15 – 25, conforming to CGSB 19-GP-13M, classification C-1-40-B-N and C-1-25-B-N and ASTM C920, Type S, Grade NS, Class 25. Use NT, M, G, A and O:
 - .1 Use air seal sealant Type S-6 for exterior walls only where constant or consistent air pressure difference will exist across the joint
 - .1 Acceptable Materials:

- Dow Corning 790
 - GE SCS2700 Silpruf LM by Momenitive
 - Sikasil N Plus
 - Tremco Spectrum 1
- .8 Type S-7; two part multi-component sealant: Chemical curing, non-sag, exterior wall sealant, Shore A Hardness 20-35, conforming to CAN/CGSB-19.24-M, Type 2, Class B, and ASTM C920, Type S, Grade NS, Class 25, use NT, M, and A:
- .1 Use silicone general construction sealant Type S-3 or polyurethane sealant Type S-7 and S-10 for all joints, interior and exterior, where no other specific sealant type specified; do not use on horizontal traffic joints or where immersed in water.
 - .2 Use multi-component sealant Type S-7 for exterior vertical joints where large movement is anticipated; not for continuous water immersion.
 - .3 Use multi-component sealant type S-7 for edge joint sealant at slab edges at walls, columns, interior shaft walls and grade beams.
 - .1 Acceptable Materials:
 - BASF MasterSeal NP2
 - Sikaflex 2c NS E2 Mix
 - Tremco Dymonic FC (single component)
- .9 Type S-8; horizontal joint sealant: Two component, self levelling, conforming to CAN/CGSB-19.24M, Type 1, Class A, and ASTM C920, Type M, Grade P, Class 5, use T, M, and O:
- .1 Use multi-component sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.
 - .1 Acceptable Materials:
 - Sikaflex 2c SL
 - MasterSeal SL 2
- .10 NOT USED. Type S-9; fuel resistant sealant: Two component, polyurethane elastomeric, chemical cured, conforming to ASTM C 920, Type M, Grade P, Class 25:
- .1 Use two component polysulphide fuel resistant sealant Type S-9 in pavement around diesel generators, and wherever fuel oils may be present.
 - .1 Acceptable Materials:
 - BASF MasterSeal SL2
 - Dow Corning 888
 - Sikaflex-2c NS/SL
 - Sika Duoflex NS/SL
 - Tremco Dymonic 100 (jet fuel)
- .11 Type S-10; polyurethane sealant: One component, non-sag, for general construction, Shore A Hardness 15+, conforming to CAN/CGSB-19.13-M, Type 2, Classification MCG-2-25-A-N and ASTM C920, Type S, Grade NS, Class 25, Use NT, M, and A:
- .1 Use silicone general construction sealant Type S-3 or polyurethane sealant Type S-7 and S-10 for all joints, interior and exterior, where no other specific sealant type specified; do not use on horizontal traffic joints or where immersed in water.
 - .1 Acceptable Materials:
 - BASF MasterSeal NP100
 - Multiflex
 - Sikaflex 1-a
 - Tremco Dymonic FC
 - Tremco Vulkem 116
- .12 Type S-11; saw-cut sealant: Multi-component, self-levelling, conforming to ASTM D2240:

- .1 Use multi-component sealant type S-11 for saw-cuts in slabs on grade and horizontal joint sealant of plaza, floors and decks, interior areas only.
 - .1 Acceptable Materials:
 - BASF MasterSeal CR100
 - Sika Loadflex 524EZ
 - Vulkem 45SSL
- .13 Type S-12; control joint sealant: Two-component, solvent free, flexible urethane, load bearing, conforming to ASTM D2240, Shore A Hardness 65-75:
 - .1 Use sealant type S-12 for joint sealant where floor finished "concrete with hardener" and "Ashford Sealer" are specified elsewhere in the Project Manual.
 - .1 Acceptable Materials:
 - BASF MasterSeal NP2
 - Sika 2C
- 2.4 Accessories
 - .1 Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant substrate tests and site tests.
 - .2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
 - .3 Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.
- 3. **EXECUTION**
 - 3.1 Examination
 - .1 Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.
 - .2 Proceed with installation after unsatisfactory conditions have been corrected.
 - .3 Pre-Construction Site Adhesion Testing: Site test adhesive adhesion to joint substrates before installing sealants as follows:
 - .1 Locate test joints where indicated on Drawings or, if not indicated, as directed by Consultant.
 - .2 Conduct site tests for each application indicated below:
 - .1 Each type of elastomeric sealant and joint substrate indicated.
 - .2 Each type of non-elastomeric sealant and joint substrate indicated.
 - .3 Notify Consultant seven (7) days in advance of dates and times when test joints will be installed.
 - .4 Arrange for tests to take place with joint sealant manufacturer's technical representative present in accordance with ASTM C1193, and as follows:
 - .1 Test Method: X1.1 Method A, Site Applied Sealant Joint Hand Pull Tab
 - .5 Verify adhesion to each substrate separately for joints with dissimilar substrates; extend cut along one side, verifying adhesion to opposite side; repeat procedure for opposite side.
 - .6 Report whether sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively:

- .1 Include data on pull distance used to test each type of product and joint substrate.
- .2 Retest until satisfactory adhesion is obtained for sealants that fail adhesively.
- .7 Evaluation of Pre-construction Site Adhesion Test Results:
 - .1 Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory.
 - .2 Do not use sealants that fail to adhere to joint substrates during testing.

3.2 Preparation

- .1 Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - .1 Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - .2 Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - .3 Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil free compressed air.
 - .4 Remove laitance and form release agents from concrete.
 - .5 Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - .6 Porous joint substrates include the following:
 - .1 Concrete.
 - .2 Masonry.
 - .3 Unglazed surfaces of ceramic tile.
 - .7 Nonporous joint substrates include the following:
 - .1 Metal.
 - .2 Glass.
 - .3 Porcelain enamel.
 - .4 Glazed surfaces of ceramic tile.
- .2 Prime joint substrates as recommended in writing by joint sealant manufacturer, based on pre-construction joint sealant substrate tests or prior experience:
 - .1 Apply primer to comply with joint sealant manufacturer's written instructions.
 - .2 Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- .3 Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears; remove tape immediately after tooling without disturbing joint seal.

3.3 Installation of Joint Sealants

- .1 Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- .2 Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- .3 Acoustical Sealant Application Standard: Comply with recommendations in ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

- .4 Install sealant backings of type indicated to support sealants during application and at position required to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - .1 Do not leave gaps between ends of sealant backings.
 - .2 Do not stretch, twist, puncture, or tear sealant backings.
 - .3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
 - .5 Install bond breaker tape behind sealants where sealant backings are not used between sealants and backs of moving joints.
 - .6 Install sealants at the same time backings are installed, and as follows:
 - .1 Place sealants so they directly contact and fully wet joint substrates.
 - .2 Completely fill recesses in each joint configuration.
 - .3 Produce uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - .7 Sealants: Immediately after sealant application and before skinning or curing begins, tool non-sag sealants to form smooth, uniform beads, to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint, and as follows:
 - .1 Remove excess sealant from surfaces adjacent to joints.
 - .2 Use tooling agents and profiles that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces in accordance with the figures listed in ASTM C1193 as follows:
 - .1 Provide concave joints in accordance with Figure 5A.
 - .2 Provide flush joint in accordance with Figure 5B.
 - .3 Provide recessed joint configuration in accordance with Figure 5C.
 - .4 Use masking tape to protect surfaces adjacent to recessed tooled joints.
 - .8 Install preformed tapes in accordance with manufacturer's written instructions.
 - .9 Install preformed silicone sealant system as follows:
 - .1 Apply masking tape to each side of joint, outside of area covered by sealant system.
 - .2 Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone sealant system manufacturer's written instructions and covering a bonding area of not less than 10 mm ($\frac{3}{8}$ ").
 - .3 Hold edge of sealant bead 6 mm ($\frac{1}{4}$ ") inside masking tape.
 - .4 Press silicone extrusion into sealant to wet extrusion and substrate within 10 minutes of sealant application.
 - .5 Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - .6 Complete installation of sealant system in horizontal joints before installing in vertical joints.
 - .7 Lap vertical joints over horizontal joints.
 - .8 Cut silicone extrusion with a razor knife at ends of joints.
- 3.4 Site Quality Control
- .1 If required, Owner will appoint and pay for the services of a testing agency to conduct site adhesion testing, as follows:
 - .1 Extent of Testing: Test completed elastomeric sealant joints as follows:
 - .1 Perform ten (10) tests for the first 300 metres (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - .2 Perform one (1) test for each 300 metres (1000 feet) of joint length thereafter or one (1) test for each floor and elevation.
 - .2 Test Method: Test joint sealants according to Method A, Site Applied Sealant Joint Hand Pull Tab, as appropriate for type of joint sealant application indicated.

- .3 Verify adhesion to each substrate separately for joints having dissimilar substrates; do this by extending cut along one side, verifying adhesion to opposite side, repeat procedure for opposite side.
 - .4 Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements.
 - .5 Record results in a site adhesion test log, and submit to Owner as a part of Record Document submissions.
 - .6 Inspect tested joints and report on the following:
 - .1 Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively:
 - Include data on pull distance used to test each type of product and joint substrate.
 - Compare these results to determine if adhesion passes sealant manufacturer's site adhesion hand pull test criteria.
 - .2 Whether sealants filled joint cavities and are free of voids.
 - .3 Whether sealant dimensions and configurations comply with specified requirements.
 - .4 Record test results in a site adhesion test log:
 - Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 - Report any failed tests to the Contractor and the Consultant, and indicate repair procedure undertaken to correct failed sealant.
 - .7 Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints, ensuring that original sealant surfaces are clean and that new sealant contacts original sealant.
- .2 Sealants not evidencing adhesive failure from testing or non-compliance with other indicated requirements will be considered satisfactory:
- .1 Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements.
 - .2 Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.5 Cleaning
- .1 Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.6 Protection
- .1 Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Performance.
 - .2 Cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work if, despite protection measures, damage or deterioration occurs.
- 3.7 Joint Sealant Schedule
- .1 Where no specified type of sealant is shown or specified choose one of the sealants specified in this Section applicable to that intended application, and consistent with manufacturer's recommendations.

- .2 Seal at all locations where dissimilar material meet, and as follows:
 - .1 Seal perimeters of hollow metal door frames on both sides, and at junction between door frame and resilient or solid flooring materials.
 - .2 Seal perimeters of aluminum door frames on both sides.
 - .3 Seal elevator door frames where they abut concrete or masonry
 - .4 Seal control joints in gypsum board, and junctures between interior partitions with exterior walls.
 - .5 Seal control joints in unit masonry at exterior face.
 - .6 Seal window and door frames around the inside perimeter, so that an airtight seal is obtained, as indicated on drawings.
 - .7 Seal joints at heads of non-load-bearing block walls on both sides, as indicated on drawings.
 - .8 Seal control, expansion joints in floors and walls and around service and fixture penetrations.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide glazing films in accordance with requirements of the Contract Documents.

1.2 Administrative Requirements

- .1 Coordination: Coordinate the Work of this Section with the installation of glazing; sequence work so that installation of glazing films coincides with installation of glass materials without causing delay to the Work.
- .2 Pre-Installation Conference: Conduct on site pre-installation conference before installing glazing films and in conjunction with installation of mock-up attended by Contractor, Consultant, Owner, glazing film Installer and glazing film manufacturer's representative to:
 - .1 Review methods and procedures related to installation, including manufacturer's written instructions
 - .2 Examine substrate conditions for compliance with manufacturers installation requirements
 - .3 Review temporary protection measures required during and after installation.

1.3 Submittals

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Verification Samples: Submit 300 mm x 300 mm sample of each type of film to the Consultant.

1.4 Project Closeout Submissions

- .1 Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning solutions, materials and procedures, include name of original installer and contact information.

1.5 Quality Assurance

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Installer: Use installers having documented experience with projects of similar extent and complexity and that have experience laminating film to glass on site.

1.6 Delivery, Storage and Handling

- .1 Delivery and Acceptance Requirements: Deliver and store packaged materials in their original containers with manufacturer's labels and seals intact; store as recommended by manufacturer in a weatherproof enclosure.

1.7 Site Conditions

- .1 Ambient Conditions: Proceed with film installation when ambient and substrate temperature conditions are within limits permitted by manufacturer and when glass substrates are free from wetness arising from frost, condensation, or other causes detrimental to adhesion.

2. PRODUCTS

2.1 Glazing Films

- .1 Indicated as GLF-1 and GLF-2 on ID0.05.

3. EXECUTION

3.1 Examination

- .1 Examine glass and surrounding adjacent surfaces for conditions affecting installation; proceed with installation after verification and correction of surface conditions acceptable to manufacturer.

3.2 Preparation

- .1 Prepare glazing films using computer generated CNC cutting methods to eliminate any cutting of films directly on glass at project site.
- .2 Clean glass surfaces of substances that could impair glazing film bond including mould, mildew, oil, grease, dirt and other foreign materials immediately before beginning installation of films.
- .3 Protect window frames and surrounding conditions from damage during installation.

3.3 Installation

- .1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, and level over clean glazing.
- .2 Install film continuously, but not necessarily in one continuous length, with no gaps or overlaps and as follows:
 - .1 Install seams vertical and plumb where necessary; horizontal seams will not be allowed.
 - .2 Do not remove release liner from film until just before each piece of film is cut and ready for installation.
 - .3 Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 3 mm of window frame.
 - .4 Remove air bubbles, wrinkles, blisters, and other defects.
- .3 Installation Tolerances: Consultant will view film installation from a distance of 3 metres against a bright uniform sky or background and will accept installation where it appears uniform in appearance with no visible streaks, banding, thin spots or pinholes; remove and replace with new film when directed by the Consultant for materials not meeting requirements.

END OF SECTION

1 GENERAL

1.1 Summary

- .1 Provide Gypsum Board Assemblies in accordance with the requirements of the Contract Documents.

1.2 References

- .1 ASTM International (ASTM):
- .1 ASTM A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
 - .3 ASTM A510/A510M, Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
 - .4 ASTM A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .5 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .6 ASTM B221/B221M, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .7 ASTM C11, Standard Terminology Relating to Gypsum and Related Building Materials and Systems.
 - .8 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .9 ASTM C475/C475, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .10 ASTM C645, Standard Specification for Nonstructural Steel Framing Members.
 - .11 ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .12 ASTM C834, Standard Specification for Latex Sealants.
 - .13 ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.
 - .14 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
 - .15 ASTM C954, 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.
 - .16 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .17 ASTM C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .18 ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .19 ASTM C1280, Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
 - .20 ASTM C1396, Standard Specification for Gypsum Board.
 - .21 ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - .22 ASTM D5420, Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 - .23 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .24 ASTM E136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
- .2 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-19.21, Sealing and Bedding Compound for Acoustical

- .3 CSA Group (CSA):
 - .1 CAN/CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members and S136.1-12 - Commentary on North American specification for the design of cold-formed steel structural members.
- .4 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .4 CAN/ULC S702, Standard for Thermal Insulation Mineral Fibre for Buildings.
 - .5 Underwriters' Laboratories of Canada (ULC), List of Equipment and Materials

1.3 System Description

- .1 Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ULC.
- .2 STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.
- .3 Load and Deflection Criteria: Interior gypsum board walls are designed to withstand a lateral loading of 240 Pa positive and negative pressure, and maximum deflection not to exceed 1/240 of the wall height. If more stringent requirements are required notify Consultant for direction.

1.4 Definitions

- .1 Levels of Finish: Standard levels of finish defined by NWCB Manual apply to products of this Section as follows:
 - .1 Level 0: No tape or joint compound in joints.
 - .2 Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, unless a higher level of finish is required for fire resistance rated assemblies and sound rated assemblies.
 - .3 Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile.
 - .4 Level 3: Embed tape and apply separate first and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will receive [heavy gauge wall coverings specified in Section 09 72 00 – Wall Coverings as final decoration.
 - .5 Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view.
 - .6 Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat over entire surface for corridors, long hallways, ceilings / bulkheads and walls longer than 7500 mm or walls higher than 3600 mm, and for all curved or angled wall surfaces. And where called for on Drawings.
- .2 Refer to ASTM C11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.5 Submittals

- .1 Product Data: Submit for Consultant's action product data for each type of product indicated.
- .2 Shop Drawings: Submit for Consultant's action shop drawings to show the proposed locations of items that are required, but not shown on the Drawings, including access doors, control joints, and details for isolation of framing from structure. Prepare details at not less than 1:5 minimum scale
- .3 Samples: Submit for Consultant's action samples for trim accessories, full-size sample 300 mm long for each trim accessory indicated.
- .4 Submit for Consultant's action ULC Assembly Listings and Materials cut sheets for fire rated assemblies as follows:
 - .1 Not later than 30 working days following Award of Contract, submit copies of ULC Assembly and Materials Listing for indicating ULC Number and how assembly meets the rating criteria for assemblies listed on drawings.
 - .2 Use the same system and material as would be required for a tested assembly for the project; ULC Listings are tested with the specific materials indicated; substitutions will not be permitted unless evidence of equivalency is confirmed.
 - .3 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

1.6 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-Construction Conference, provide a field sample for each type of gypsum board construction and special conditions in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- .3 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of National, Provincial and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1.7 Delivery, Storage and Handling

- .1 Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

1.8 Project/Site Conditions

- .1 Environmental Requirements: Do not start installation of gypsum board unless building is enclosed and interior spaces are continuously maintained at a uniform temperature not less than 13 degrees C from 1 week before start of gypsum board joint treatment until after the completed treatment is cured dry. Temperature requirements may be waived only on recommendation by gypsum board materials manufacturer. Provide ventilation to remove excess moisture from the air during joint treatment.

2. PRODUCTS

2.1 Performance Requirements

- .1 Fire Test Response Characteristics: use materials identical to those listed for ULC assemblies submitted to Consultant.
- .2 Sound Transmission Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency for STC ratings of specific assemblies indicated on Drawings.
- .3 Design ceiling suspension system in accordance with manufacturer's printed directions and conforming to ASTM C754 requirements. Do not suspend any items from structural steel deck. Do not support the Work of this Section from, nor make attachments to, ducts, pipes, conduits or support framing of other Subcontractors.
- .4 Design suspended ceiling system for adequate support of electrical fixtures as required by current bulletin of Electrical Inspection Department of Ontario Hydro.
- .5 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.
- .6 Design suspension system to support weight of mechanical and electrical items such as air grilles, lighting fixtures, drapery track, drapes and with adequate support to allow rotation.

2.2 Materials

- .1 Interior Gypsum Panels: Provide in maximum lengths and widths available that minimize joints in each area and correspond with support system as indicated on drawings, in thicknesses as indicated and as follows:
 - .1 Regular Type Gypsum Board: Meeting requirements of ASTM C1396M with long edges tapered, and as follows:
 - .1 Location: Vertical surfaces, unless otherwise indicated.
 - .2 Acceptable Materials:
 - CertainTeed, Easi-Lite
 - CGC Inc., Sheetrock
 - Georgia-Pacific Canada, Inc., ToughRock® Fireguard® 45 Gypsum Board
 - .2 Fire Resistant Type (Type X) Gypsum Board: Meeting requirements of ASTM C1396M with long edges tapered, and as follows:
 - .1 Location: Where required for fire resistance rated assembly.
 - .2 Acceptable Materials:
 - CGC Inc., Sheetrock Firecode. [EcoSmart FireCode 3.0]
 - CertainTeed Inc., Type X Gypsum Board
 - Georgia Pacific Canada, Inc., ToughRock® Fireguard® X Gypsum Board
 - National Gypsum, Gold Bond XP Fire Shield C
 - .3 Sag Resistant Gypsum Board: Meeting requirements of ASTM C1396M, ceiling board manufactured to have more sag resistance than regular type gypsum board with long edges tapered, and as follows:
 - .1 Location: Ceiling surfaces.
 - .2 Acceptable Materials:
 - CGC Sheetrock Interior Ceiling Board
 - CertainTeed Interior Ceiling Gypsum Board
 - Georgia Pacific ToughRock® Fireguard 45™ Gypsum Board or ToughRock® Span 24® Ceiling Board

- .4 Water Resistant Gypsum Board: To ASTM C1396; maximum permissible length and width; ends square cut; water repellent face paper; fire rated as indicated:
 - .1 Thickness: As indicated, minimum 16 mm thickness for walls.
 - .2 Long Edges: Tapered.
 - .3 Location: Walls in washroom and housekeeping areas
 - .4 Acceptable materials:
 - CertainTeed M2Tech Moisture and Mold Resistant Gypsum Board
 - CGC Sheetrock Mold Tough
 - Georgia Pacific Tough Rock Moisture-Guard
 - National Gypsum, Gold Bond eXP
- .2 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:
 - .1 Joint Tape:
 - .1 Interior Gypsum Board: Paper.
 - .2 Joint Compound for Interior Gypsum Board: Vinyl based, non-asbestos, low dusting type compatible with other compounds applied on previous or for successive coats, and as follows:
 - .1 Pre-filling: Setting type taping compound.
 - .2 Embedding and First Coat: Drying type compound.
 - .3 Fill Coat: Drying type compound.
 - .4 Finish Coat: Drying type, sandable topping compound.
 - .5 Skim Coat: Drying type, sandable topping compound.
- .3 Steel Suspended Ceiling Framing: Provide components and materials in accordance with ASTM C754 for interior conditions as indicated on Drawings, and as follows:
 - .1 Tie Wire: ASTM A641 Class 1 zinc coating, soft temper, No. 18 gauge wire.
 - .2 Hangers:
 - .1 Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, No. 8 gauge.
 - .3 Carrying Channels: Cold rolled, commercial steel sheet with a base metal thickness of 1.2 mm x 13 mm minimum wide flange, with ASTM A653, Z180, hot dip galvanized zinc coating; 38 mm minimum depth.
 - .4 Furring Channels: Commercial steel sheet with ASTM A653, Z180, hot dip galvanized zinc coating, as follows:
 - .1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.46 mm thickness x 22 mm deep.
- .4 Steel Partition Framing: Provide components and materials in accordance with ASTM C645 for conditions indicated on Drawings.
- .5 Steel Sheet Components, Steel Studs and Runners: In accordance with ASTM C645 requirements for metal and with ASTM A653, Z120, hot dip galvanized zinc coating and as follows:
 - .1 Steel Studs: Nominal 25 ga. (0.46 mm) base metal thickness, except use 20 ga. (0.75 mm) heavy weight framing to support fire rated door frames; depth as indicated on drawings, spaced at 406 mm O/c, unless noted otherwise. Z180 is required for load bearing framing.
 - .2 Runners: Width, thickness and galvanizing to match steel studs, and as follows:
 - .1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm O/c along length of runner; tested and certified for use in fire rated wall construction:
 - Acceptable Materials:

- Brady Construction Innovations, SliptrackSystems
- Dietrich Metal Framing, SLP-TRK
- .2 Double Runner Deflection Track: Outside runner using 50 mm flanges; inner runner 33 mm; maintaining 25 mm minimum deflection space.
- .3 Base Runner: Bottom track with 33 mm upstanding legs.
- .3 Flat Strap and Backing Plate, strapping: Steel sheet for blocking and bracing in length and width indicated; 1.2 mm nominal base metal thickness x 406 mm wide.
- .4 Horizontal Cross Bracing: 1.2 mm nominal base metal thickness; 13 mm minimum width flange x 38 mm minimum depth.
- .5 Clip Angle: 38 mm x 38 mm x 1.8 mm nominal base metal thickness.
- .6 Furring Channels: Commercial steel sheet with ASTM A653, Z120, hot dip galvanized zinc coating, as follows:
 - .1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep.
 - .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .7 Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- .6 Interior Heavy Gauge Partition Framing: Steel stud framing for walls exceeding 5000 mm in height, walls that require metal plates, at openings, where indicated on Drawings and as follows:
 - .1 Cold Formed Sheet Steel: Commercial steel sheet Interior members not forming a part of the exterior building envelope shall have a minimum ASTM A653, Z180, hot dip galvanized zinc coating, thickness of framing members exclusive of galvanized coating.
 - .2 Studs: to CAN/CSA-S136 and shall be identified as to specification, type grade and mechanical properties; minimum 65 mm deep x 38mm wide x metal core thickness 0.75 mm spaced at 305 mm (unless noted otherwise) on centre, hot dipped galvanized steel; roll formed with knurled flanges, services and bracing cut outs.
 - .3 Sill tracks: To CAN/CSA-S136, top track shall be a single track system with minimum metal core thickness 0.75 mm, hot dipped galvanized steel. Top track flanges of depth to suit vertical deflection; do not fix top of studs to track, minimum depth 38 mm and width to suit studs. Floor track to suit stud width, with 33 mm flanges.
 - .4 Channel stiffener: 19 mm cold rolled channel of 1.2 mm, electro-galvanized steel.
 - .5 Fasteners:
 - .1 Stud to stud: Steel, self drilling, self threading, case hardened. Material: stainless steel or steel with minimum 0.008mm cadmium or zinc coating. Head Profile: hex, pan, and low profile type. Length: adequate to penetrate not less than 3 fully exposed threads beyond joined materials.
 - .2 Track to concrete: Hilti drilled insert, sizes as specified. Do not use Powder Actuated Fasteners.
 - .3 Track to steel: Secure track to structural steel over 8 mm thickness with Hilti "DX fastening system" with "X-EDNI" nails as specified. Provide additional steel back up above interstitial steel deck for wall support.
 - .4 Drilled Inserts: Steel, cadmium plated or hot dip galvanized, sizes as indicated on drawings.
 - .6 Bolts and Nuts: Meeting requirements of ASTM A307, with large flat type steel washers, sized to suit fasteners, hot dip galvanized, 413.68 MPa Tensile Strength
 - .7 Welding Electrodes: Minimum tensile strength series of 480 MPa, suitable for material being welded.
 - .8 Touch up Paint for galvanized surfaces: MPI #18, inorganic or SSPC-Paint 20, Type 1 Inorganic; zinc-rich primer.

2.3 Accessories

- .1 Joint Tapes: ASTM C475, plain or perforated type.

- .2 Joint Compounds: ASTM C475, in dry powder form, or pre-mixed ready for application, as especially recommended by gypsum board manufacturer for conditions of the application.
- .3 Adhesive: As recommended by the gypsum board manufacturer for adhering of gypsum board to backing material.
- .4 Acoustical Sealant: ASTM C834. Non-sag emulsion sealant. Specifically recommended by manufacturer as an acoustical sealant.
 - .1 CertainTeed Silent FX Noiseproofing Sealant
 - .2 Pecora Corporation "AC-20 FTR"
 - .3 Serious Energy, Inc. "Quiet Seal ProAC-20 + Silicone"
 - .4 Specified Technologies, Inc. "Smoke and Sound"
 - .5 Tremco Mfg. Co. "Acoustical Sealant"
- .5 Vinyl Foam Isolation Tape: Compressible, self-adhesive, non-exuding, closed cell, vinyl foam glazing tape of approximately 30 Shore 00 hardness. Nominal 6 mm thickness.
 - .1 Saint Gobain "Norseal V-980" (adhesive two sides)
 - .2 Saint Gobain "Norseal" V-780 (adhesive one side)
- .6 Trim Accessories:
 - .1 Interior Trim: Galvanized coated steel sheet or rolled zinc meeting the requirements of ASTM C1047, in the following shapes:
 - .1 CB Corner Bead: Standard 0.40 mm thickness, corrosion resistant outside corner reinforcements, angle to suit installation.
 - .2 Reinforced Corner Bead: Heavy duty 0.46 mm thickness, corrosion resistant outside corner reinforcements for use at high exposure corners, angle to suit installation.
 - .3 LC Edge Bead: U-shaped trim 0.40 thickness to provide a clean finished edge; exposed long flange receives joint compound; use at exposed panel edges, and returns to adjacent materials.
 - .4 Expansion Joints: Back-to-back edge beads at joints spanning building expansion and movement joints.
 - .5 Control Joints: V-shaped trim having strippable joint protection specifically manufactured to provide thermal stress relief to large ceiling and wall areas; confirm locations with Consultant before installation.
 - .6 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.
 - .7 Acceptable Materials:
 - Dietrich Industries, Metal Trims and Finishing Products
 - Other materials may be acceptable provided information is sent to and accepted by the Consultant before installing products required by this Section.
 - .2 No Coat drywall corner: severe impact resistant, high strength tapered copolymer core, ASTM C1047, ASTM C475 and ASTM C840. Basis-of-Design: CertainTeed NO COAT Drywall Corners.
 - .3 Aluminum Trim: Extruded accessories of profiles and dimensions indicated:
 - .1 Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 alloy 6063-T5.
 - .2 Finish: Clear anodized compatible with joint compound and finish materials.

- .7 Adaptor for back section to Gypsum Board wall framing: extruded aluminum with finish to match curtain wall system, sound deadening composite, compressible gasket and snap cover to conceal fasteners. Black anodized finish to match curtain wall. Double sided installation with STC 55 sound rating.
- .1 Basis-of-Design: Mull-it-Over, 55 Flush Mullion Cap Trim.
- .8 Acoustic Materials: Coordinate placement of acoustic materials with wall assembly types. Use only fire rated materials in fire and smoke rated assemblies. Acoustic sealants shall be applied prior application of fire and smoke seals specified in Section 07 84 00 and as follows:
- .1 Acoustic Sealant for Exposed Joints: Non-sag, paintable, non-staining, latex sealant in accordance with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction:
- .1 Basis-of-Design Materials: Pecora Corp., AC-20 FTR Acoustic and Insulation Sealant.
- .2 Acoustic Sealant for Concealed Joints: Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission:
- .1 Acceptable Materials:
- CertainTeed Silent FX Noiseproofing Sealant
 - Pecora Corp., BA-98.
 - Tremco, Acoustical Sealant
- .9 Acoustic Insulation for Assemblies: Meeting the requirements of ULC S702 mineral fibre acoustic sound batts, Type 1 for all properties except thermal performance, width to friction fit steel studs; un-faced, thickness minimum 89 mm to fill a minimum of 90% of the cavity thickness, nominal density 40 kg/m³ minimum; STC ratings as indicated on drawings; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114:
- .1 Acceptable Materials:
- .1 Owens-Corning Canada Inc., Quietzone Fire Batts
- .2 Rockwool, Rockwool AFB (Acoustical Fire Batt) (steel studs application)
- .3 Rockwool, Rockwool AFB evo (formaldehyde free) (steel studs application)
- .10 Acoustic Insulation for Non-Rated Assemblies: Meeting the requirements of ASTM C423, ASTM E90 and ASTM E413, and ULC S702 mineral fibre acoustic sound batts, Type 1 for all properties other than thermal, width to friction fit steel studs; un-faced, thickness to fill a minimum of 90% of the cavity thickness, nominal density 12.2 kg/m³ minimum; STC ratings as indicated on drawings:
- .1 Acceptable Materials:
- .1 CertainTeed Noise Reducer
- .2 Owens-Corning Canada Inc., Quietzone Acoustical Batts
- .3 Johns-Manville Sound Shield Glass Fibre Batts
- .11 Auxiliary Materials: Provide auxiliary materials in accordance with referenced installation standards and manufacturer's written recommendations, and as follows:
- .1 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- .2 Steel Drill Screws: ASTM C1002, unless otherwise indicated, except use screws in accordance with ASTM C954 for fastening panels to steel members from 0.75 mm to 2.67 mm thickness, and as follows:
- .1 Type S: Shallow pitch screw; used for single layer gypsum board application
- .2 Type G: Steep pitch screw; used for double layer gypsum board application

- .3 Isolation Strip at Exterior Walls: Adhesive backed, closed cell vinyl foam strips that allow fastener penetration without foam displacement, 3 mm thick, in width to suit steel stud size.
- .4 Access Panels: Refer to Section 08 31 00, rated to suit wall or ceiling fire rating.

3. EXECUTION

3.1 Examination

- .1 Examine areas and substrates, with Installer present, and including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Suspended Ceilings:
 - .1 Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
 - .2 Furnish inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction where concrete inserts are required.
- .2 Foam Deck Inserts:
 - .1 Coordinate with fire resistive foam deck inserts, firestopping and smoke seal materials specified in Section 07 84 00.
 - .2 Install specified materials in accordance with material manufacturer's written instructions.
- .3 Access Panels and Doors:
 - .1 Coordinate access panels and wall types with materials specified in Section 08 31 00.
 - .2 Coordinate with Mechanical and Electrical for locations and size requirements of access panels.
 - .3 Coordinate and confirm location of access panels before installation with Consultant.
 - .4 Install specified materials in accordance with material manufacturer's written instructions.
- .4 Fire Rated Construction:
 - .1 Install materials forming a part of fire rated construction in accordance with manufacturer's instructions and as required to meet specific ULC listed construction requirements submitted by Subcontractor.
 - .2 Install fire rated gypsum wall panels vertically; horizontal installation does not meet testing standard unless horizontal blocking is installed behind horizontal joints.
- .5 Cold Weather Application of Gypsum Board:
 - .1 Install gypsum board and joint compound in accordance with ASTM C840 requirements and manufacturer's instructions.
 - .2 Provide temporary heat and moisture control for a period sufficiently in advance of gypsum board and joint compound application to allow building and substrates to acclimate to installation temperature and moisture range required by manufacturer.
 - .3 Maintain temporary heat until permanent building heating system is started and continuously running.
 - .4 Provide suitable ventilation to allow materials to dry properly; prevent excessive air movement that could dry materials too quickly and that could cause shrinkage cracking.

3.3 Installing Steel Framing

- .1 Installation Standards: ASTM C754, and ASTM C840 requirements that apply to framing installation.
- .2 Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. In accordance with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with NWCB, Specification Standards Manual.
- .3 Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement, and as follows:
 - .1 Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - .2 Isolate partition framing and wall furring where it abuts structure, except at floor.
 - .3 Install double runner deflection track at head of assemblies that avoid axial loading of assembly and laterally support assembly.
- .4 Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.
- .5 Installing Steel Suspended Ceiling and Soffit Framing: Suspend ceiling hangers from building structure as follows:
 - .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 - .2 Install supplemental suspension members and hangers in form of trapezes or equivalent devices where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members.
 - .3 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 - .4 Secure wire hangers by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 - .5 Secure rod, flat or angle hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail:
 - .1 Do not attach hangers to steel deck tabs.
 - .2 Do not attach hangers to steel roof deck. Attach hangers to structural members. Provide additional carrier channels between structural elements where structure does not align with hangers.
 - .3 Do not connect or suspend steel framing from ducts, pipes, or conduit.
 - .6 Install steel framing components for suspended ceilings so members for panel attachment are level to within 3 mm in 3600 mm measured lengthwise on each member and transversely between parallel members.
 - .7 For exterior soffits, install bracing and framing to resist wind uplift.
 - .8 Wire-tie furring channels to supports, as required in accordance with requirements for assemblies indicated. Clips will not be acceptable.
 - .9 Install suspended steel framing components in sizes and spacing indicated, but not less than that required by the referenced steel framing and installation standards:
 - .1 Hangers: 1220 mm O/c.
 - .2 Carrying Channels (Main Runners): 1220 mm O/c.
 - .3 Furring Channels (Furring Members): 406 mm O/c.

- .6 Installing Steel Partition Framing: Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction:
 - .1 Install foam gasket isolation strip between studs where studs are installed directly against exterior walls.
 - .2 Install each steel framing and furring member so fastening surfaces vary not more than 3 mm from the plane formed by the faces of adjacent framing.
 - .3 Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board:
 - .1 Cut studs 13 mm short of full height to provide perimeter relief.
 - .2 For fire resistance rated and STC rated partitions that extend to the underside of floor slabs and roof decks or other continuous solid structure surfaces: Install framing around structural and other members extending below floor slabs and roof decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
 - .3 Terminate partition framing at suspended ceilings where indicated.
 - .4 Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
 - .5 Install horizontal cross bracing to steel studs at 1220 mm O/C vertically for the entire length of wall for unbraced walls exceeding 3660 mm in length.
 - .6 Frame door openings using 0.75 mm steel studs and in accordance with gypsum board manufacturer's applicable written recommendations:
 - .1 Screw vertical studs at jambs to jamb anchor clips on door frame; install runner track section (for cripple studs) at head and secure to jamb studs.
 - .2 Install two studs at each jamb, connected for entire length.
 - .3 Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
 - .7 Frame openings other than door openings the same as required for door openings. Install framing below sills of openings to match framing required above door heads.
- 3.4 Access Panels
 - .1 Install access panels in wall assemblies to maintain fire rating of assembly.
 - .2 Confirm location of access panels with the Consultant before installation.
 - .3 Minor adjustments to location within wall system may be required where panel interferes with architectural appearance.
- 3.5 Applying and Finishing Panels
 - .1 Gypsum Board Application and Finishing Standards: ASTM C840.
 - .2 Panel Application Methods:
 - .1 Single Layer Application:
 - .1 On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing.
 - .2 On partitions, apply gypsum panels vertically (parallel to framing), unless horizontal application is indicated or otherwise required by fire resistance rated assembly, and to minimize end joints.
 - .3 Stagger abutting end joints not less than one framing member in alternate courses of board.
 - .4 At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire resistance rated assembly.

- .5 Apply gypsum panels to supports using Type S screws fastened 10 mm from edges of board.
- .6 Apply gypsum board to assemblies having resilient channels using Type S screws fastened 38 mm from edges of boards.
- .2 Double Layer Application:
 - .1 Apply first layer with enough screws to hold panel in place.
 - .2 Stagger and offset joints of second layer from first layer.
 - .3 Apply second layer over first layer and secure as specified for single layer application using screws long enough to penetrate both layers and penetrate 10 mm into metal framing.
- .3 Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- .4 Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling; stagger abutting end joints of adjacent panels not less than one framing member spacing.
- .5 Install gypsum panels with face side out; butt panels together for a light contact at edges and ends with not more than 1.5 mm of open space between panels; do not force into place.
- .6 Locate edge and end joints over supports:
- .7 Do not place tapered edges against cut edges or ends.
- .8 Stagger vertical joints on opposite sides of partitions.
- .9 Do not make joints other than control joints at corners of framed openings.
- .10 Stop gypsum board away from underside of floor above and roof deck to allow for deflection of structure.
- .11 Attach gypsum board to vertical studs, not to ceiling track, to allow for deflection.
- .12 Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- .13 Attach gypsum panels to framing provided at openings and cut outs.
- .14 Form control joints to account for thermal movements, to account for movement where direction of framing changes direction, and movements arising differing substrate materials using V-Shaped trims by framing back-to-back framing members and a break in gypsum panel at a maximum of 7.5 metres O/C, as follows:
 - .1 Install control joints in wall and ceiling construction in accordance with ASTM C840 so that gross area enclosed by joints does not exceed 80 m² between joints using limiting distances as follows:

Partition Type	Maximum Single Dimension
Interior Partitions	9 metres
Interior Ceilings with Perimeter Relief	15 metres
Interior Ceilings without Perimeter Relief	9 metres
Exterior Ceilings	9 metres
Exterior Walls	9 metres

- .2 Lay out control joints to coincide as far as possible with door, window or screen frames, but not necessarily to occur at every individual frame; install control joints vertically and horizontally from corners of openings.
 - .3 Provide continuous dust barrier behind joints.
 - .4 Install joints straight and true.
 - .5 Form control joints to meet sound rated construction and fire ratings required for remainder of wall or ceiling construction.
 - .6 Obtain Consultant's acceptance of control joint layout before starting installation of materials specified in this Section.
- .15 Form expansion joints to account for building movements using back-to-back framing members and edge trims, and a break in gypsum panel over structural movement joints and floor slab control joints as follows:
- .1 Install expansion joints incorporating continuous air and vapour membranes and with sufficient gap to allow for projected building movements.
 - .2 Seal back-to-back edge bead control joints with clear silicone sealant as specified in Section 07 92 00.
 - .3 Provide continuous dust barrier behind joints.
 - .4 Install joints straight and true.
 - .5 Form expansion joints to meet sound rated construction and fire ratings required for remainder of wall or ceiling construction.
- .16 Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally:
- .1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 m² in area.
 - .2 Fit gypsum panels around ducts, pipes, and conduits.
 - .3 Cut gypsum panels to fit profile formed by coffers, joists, and other structural members where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks; allow 6 mm to 10 mm wide joints to install sealant.
- .17 Isolate perimeter of non-load bearing gypsum board partitions at structural abutments, except floors. Provide 6 mm to 13 mm wide spaces at these locations, and trim edges with J-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustic sealant.
- .18 Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations, and as follows:
- .1 Space screws a maximum of 300 mm O/c for vertical applications.
 - .2 Space fasteners in panels that are tile substrates a maximum of 200 mm O/c.
- .19 Install fire rated and labelled gypsum board at all locations indicated on Drawings; continue fire and smoke rated wall construction behind and around fire hose cabinet recesses and other recessed items larger than a double gang switch box to maintain wall fire rating.
- .20 Install sheet metal backing where required for mounting of items. Spot glue sheet in place before applying surface layer of gypsum board.
- .21 Exterior Soffits and Ceilings: Apply exterior soffit board perpendicular to supports, with end joints staggered and located over supports:
- .1 Install with 6 mm open space where panels abut other construction or structural penetrations.
 - .2 Fasten with corrosion resistant screws.
- .22 Tile Backing Panels:

- .1 Install standard gypsum board panels in areas not subject to wetting to produce a flat surface.
 - .2 Install water resistant gypsum board in all washrooms and housekeeping rooms.
 - .3 Shim surfaces to produce a uniform plane across panel surfaces where tile backing panels abut other types of panels in the same plane.
- .23 Finishing Gypsum Board Assemblies:
- .1 Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
 - .2 Pre-fill open joints, rounded or bevelled edges, and damaged surface areas.
 - .3 Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
 - .4 Provide the finish level, specified in ASTM C840, for the following surfaces:
 - .1 Level 1: plenum areas above ceilings and other concealed areas.
 - .2 Level 2: surfaces that are to receive ceramic tile.
 - .3 Level 3: surfaces that are to receive heavy spray or trowel applied finishes.
 - .4 Level 4: surfaces to satin gloss level paint, flat paints or light textures. Provide level 4 finish unless noted otherwise.
 - .5 Level 5: surfaces to receive vinyl wall coverings, long walls as noted above, gypsum board ceilings and bulkheads. Coordinate with Consultant for bulkhead finishing requirements.
 - .5 Water Resistant Gypsum Board: Do not tape or fill joints in water resistant gypsum board used as a substrate for ceramic tile.
- 3.6 Acoustic Installation
- .1 STC Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustic sealant. Install acoustic sealant at both faces of partitions at perimeters and through penetrations. In accordance with ASTM C919 and manufacturer's written recommendations for locating edge trim and closing off sound flanking paths around or through gypsum board assemblies, including sealing partitions above acoustic ceilings.
 - .2 Acoustic Sealants:
 - .1 Seal sound rated partitions in strict in accordance with gypsum board manufacturer's instructions for the specific sound rating requirements. Provide two (2) beads of sealant where no sealants are indicated; one under each inner and outer layer of gypsum board.
 - .2 Locate sealant to ensure it is covered at completion of partition when finishes applied; use appropriate sealant for exposed locations.
 - .3 Seal around mechanical and electrical work and other work in walls to ensure proper sound ratings.
 - .4 Provide gaskets where partitions abut a finished surface or material and where partitions meet exterior wall furring.
 - .5 Build in all door and borrowed light frames and equipment to provide a neat, cleanly finished system.
 - .6 In fire rated partitions use firestopping sealant instead of acoustic sealant to maintain required sound ratings. Zero rated smoke separations shall be constructed the same as for fire rated partitions.
 - .3 Acoustic Sound Batts:
 - .1 Install acoustic sound batts within metal stud space and above suspended gypsum board ceilings as indicated for sound or fire rating.
 - .2 Acoustic sound batts to extend full height of partitions.

- .3 Fill behind electrical outlet boxes, fire hose cabinets, washroom accessories and other openings with at least 150 mm lap around perimeter of opening; do not compress acoustic sound batts as this could cause the gypsum board finish to bulge or push outward.
- .4 Coordinate with Electrical and Mechanical Subcontractors and verify that no back-to-back openings are formed, whether or not so indicated on drawings.
- .5 Installation in accordance with manufacturer's current written recommendations.

3.7 Fire Rating Sealant Installation

- .1 Seal fire rated partitions strictly in accordance with fire sealant manufacturer's instructions for specific fire rating requirements listed; coordinate with Section 07 84 00.
- .2 Locate sealant to ensure it is covered at completion of partition when finishes applied.
- .3 Seal around mechanical and electrical work and other work in wall to ensure proper fire rating.

3.8 Applying Texture Finishes

- .1 Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes.
- .2 Apply primer to surfaces that are clean, dry, and smooth in accordance with manufacturers written instructions.
- .3 Mix and apply finish using powered spray equipment, to produce a uniform texture matching accepted mock-up and free of starved spots or other evidence of thin application or of application patterns.
- .4 Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means.
- .5 Immediately remove droppings and over spray to prevent damage according to texture finish manufacturer's written recommendations if texture finishes contact other finished surfaces.

3.9 Installing Trim Accessories

- .1 For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- .2 Control Joints: Install control joints at locations indicated on Drawings, confirm locations of joints with Consultant before construction, and in accordance with ASTM C840 and in specific locations approved by Consultant for visual effect where joints are not otherwise indicated.
- .3 Reveals: Cut vertical trims and casing beads at horizontal reveal locations, and install horizontal reveals continuous around corners and edges.

3.10 Site Quality Control

- .1 Above Ceiling Observation: Before installing gypsum board ceilings, Consultant will conduct an above ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected:
 - .1 Notify Consultant seven (7) working days in advance of date and time when Project, or part of Project, will be ready for above ceiling observation.
 - .2 Before notifying Consultant, complete the following in areas to receive gypsum board ceilings:
 - .1 Installation of 80% of lighting fixtures, powered for operation.
 - .2 Installation, insulation, and leak and pressure testing of water piping systems.
 - .3 Installation of air duct systems.
 - .4 Installation of air devices.
 - .5 Installation of mechanical system control air tubing.
 - .6 Installation of acoustic isolation system.
 - .7 Installation of ceiling support framing.

END OF SECTION

1 GENERAL

1.1 Summary

- .1 Provide tiling in accordance with requirements of the Contract Documents.

1.2 References

- .1 American National Standards Institute/Ceramic Tile Institute (ANSI/CTI):
 - .1 ANSI A108/A118/A136.1, American National Specifications for the Installation of Ceramic Tile.
 - .2 ANSI A137.1, Standard specification for ceramic tile
- .2 ASTM International (ASTM):
 - .1 ASTM C627, Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
 - .2 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .3 Terrazzo, Tile and Marble Association of Canada (TTMAC):
 - .1 Specification Guide 09 30 00, Tile Installation Manual.
 - .2 Hard Surface Maintenance Guide

1.3 Administrative Requirements

- .1 Pre-Construction Meeting: Arrange a pre-construction meeting, to discuss installation techniques, confirm compatibility of materials, identify any concerns arising from site conditions and identify any concerns of the installer or supplier, attended by Contractor, tile installer and tile supplier, mortar and grout representative and crack control membrane representative.

1.4 Submittals

- .1 Product Data: Submit manufacturer's product data for each type of product specified. Data shall indicate compliance with specification and installation recommendations of manufacturer of products being used.
- .2 Samples for Verification: Submit for Consultant's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for colour and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples of each type and color of tile, not less than 300 x 300 mm on plywood or hardboard backing, and grouted as required.
- .3 Closeout Submittals: Submit for Owner's documentation:
 - .1 Furnish specified warranty.
 - .2 Furnish specified maintenance data.

1.5 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-Construction Conference, provide a field sample for each type ceramic tile in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary

adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.

- .3 Mock-up: Provide mock-up of tile area indicated on drawings. Provide Consultant 72 hours notice prior to mock-up being completed; provide 10 days to Consultant of mock-up intended location and submit shop drawings of mock-up for review prior to starting mock-up on site. Mock-up shall be complete with mortar, grout and tile. Mock-up shall remain in place on site after Consultant's review and become the standard which tile installations will be reviewed.
- .4 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of National, Provincial and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- .5 Qualifications:
 - .1 Standard of the work of this Section: Provide materials and workmanship in accordance with recommendations of Terrazzo, Tile and Marble Association of Canada (TTMAC) and the requirements of the ANSI A108.1 Series of Standards.
 - .2 Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties.
 - .3 Materials: Tile that does not meet a Grade 1 Standard, or is marked as a factory second or discount will be rejected, immediately removed from the site and replaced with specified materials.
 - .4 Installers: Execute Work of this Section using qualified personnel skilled in ceramic tile installation, having a minimum of five (5) years proven experience and have completed tile installations similar in material, design, and extent to that indicated for this Project.

1.6 Delivery, Storage, and Handling

- .1 Delivery and Acceptance Requirements: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use in accordance with ANSI A108.1 for labelling sealed tile packages.
- .2 Storage and Handling Requirements: Store materials to prevent damage or contamination to materials by water, freezing, foreign matter, and other causes; store cementitious materials in a dry area, and blocked off floor and ground surfaces.

1.7 Site Conditions

- .1 Environmental Requirements: Do not install tile materials unless temperature and humidity conditions closely approximate the interior conditions which will exist when the building is occupied. Maintain proper temperature/humidity conditions before, during, and after installation.

1.8 Warranty

- .1 Special Warranty: Submit for Owner's documentation. Furnish 2 year written warranty in form stipulated by Consultant, signed by the Contractor and Installer, agreeing to repair or replace Work which has failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other guarantees or warranties may not be substituted by the Contractor for the terms of this special warranty.

1.9 Maintenance

- .1 Maintenance Manuals: Submit for Owner's documentation. Furnish complete manuals describing the materials and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures and instruction sheets describing the actual products used in the Work, including tile, adhesive, mortar, grout, sealer, and related components.

- .2 Extra Materials: Furnish 1 box of extra tile for each size, pattern and colour of tile installed in the Work. Deliver to the Owner in manufacturer's original packaging and store at the project site where directed.

2. PRODUCTS

2.1 Materials

- .1 Provide tile products manufactured in accordance with ANSI 137.1 or ANSI A108.1 as appropriate to the Basis-of-Design Materials.
- .2 Factory blend tile that exhibits colour variations within the ranges selected and package so tile units taken from one package show the same range in colours as those taken from other packages.

2.2 Wall Tile

- .1 Tile Quality: ANSI A137.1, Standard Grade, and matching the accepted samples in every respect. Obtain each type and color of tile from a single source to prevent variations in appearance and quality.
- .2 Wall Tile: Non-vitreous body with minimum absorption of 7%, cushion edged. in accordance with ANSI A137.1. Provide trim shapes as required to make a complete installation, and matched to the type, size, and color of adjoining field units.
 - .1 Indicated as TL-1, on Drawing ID0.04.

2.3 Trims

- .1 Provide tile trim shapes and profiles to match colour and finish of adjoining site tile.
- .2 Transitions: Refer to ID0.04 for TR-1.

2.4 Accessory Materials

- .1 Temporary Protective Coating: Provide material formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile:
 - .1 Petroleum paraffin wax, fully refined and odourless; containing at least 0.5% oil with a melting point of 49°C to 60°C.
 - .2 Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

- .2 Glass Mat Water Resistant Gypsum Backer Board: Manufactured in accordance with ASTM C1178 to produce greater resistance to water penetration and to provide improved surface bonding characteristics for ceramic tile than standard gypsum board:

- .1 Location: Substrate for tile where indicated
- .2 Acceptable Materials:
 - .1 CertainTeed Diamondback Tile Backer
 - .2 Georgia Pacific Canada, Inc., DensShield® Tile Backer

2.5 Mortar Setting Materials

- .1 Manufacturers: Mortar and grout materials listed in this Section shall be of a uniform quality for each mortar, and grout component from a single manufacturer and each aggregate from one source or producer as follows:
 - .1 ARDEX Engineered Cement
 - .2 Custom Building Products Ltd.
 - .3 Flextile Ltd.
 - .4 Laticrete International Inc.
 - .5 MAPEI Inc.
- .2 Interior Wall System: Polymer modified, dry set mortar meeting or exceeding the requirements of ANSI A118.4 and ANSI A118.11 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of portland cement, sand and additives requiring only potable water to be added for installation:
 - .1 Acceptable materials:
 - .1 Custom Building Products Premium Blend Thinset
 - .2 Custom Building Products VersaBond
 - .3 Flextile Ltd., #51 Floor and Wall Mix
 - .4 Laticrete International Inc. 317 Thinset Mortar
 - .5 MAPEI Inc. Ultralite Mortar

2.6 Grout

- .1 Single Component Acrylic Grout: stain and chemical resistant, no sealing required, for joints 1.5 mm to 12 mm; meeting requirements of ANSI A118.3; Colour refer to interior finish schedule; use in washroom walls, light commercial floors:
 - .1 Acceptable Materials:
 - .1 Custom Building Products Fusion Pro
 - .2 Flextile Ltd., Flextile ColourMax Plus
 - .3 Laticrete Plasma
 - .4 MAPEI Inc. Flexcolor CQ

2.7 Mixing Mortars and Grout

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

3. EXECUTION

3.1 Examination

- .1 Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- .2 Verify that concrete substrates have been allowed to cure for a minimum of 90 days in accordance with TTMAC requirements.
- .3 Verify vapour emissions meet manufacturers recommended emission levels prior to installation of crack suppression and waterproofing membrane.

3.2 Preparation

- .1 Substrates: Clean the substrates to remove dirt, loose particles, coatings and deleterious matter which would impair the Work. Concrete surfaces shall be free from curing compounds or form release oils. Where necessary, use chemical cleaners, blast cleaning or other suitable methods. Dry the substrates as required to make completely free of moisture detrimental to installation of the Work.

3.3 Preparation New Installations

- .1 Make backing surfaces level and true to a tolerance in plane of ± 3 mm in 2440 mm for walls.
- .2 Use trowelable levelling and patching compounds in accordance with tile setting material manufacturer's written instructions to fill cracks, holes, and depressions.
- .3 Remove protrusions, bumps, and ridges by sanding or grinding.

3.4 Installation

- .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 setting and grouting materials, and to methods required for complete ceramic tile installation.
- .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 Cut edges smooth, even and free from chipping.
 - .3 Do not split tile.
- .3 Accurately form intersections and returns; perform cutting and drilling of tile without marring visible surfaces:
 - .1 Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints.
 - .2 Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.
- .4 Lay tile in pattern indicated on Drawings and as follows:
 - .1 Align joints when adjoining tiles on floor, base, walls, and trim are the same size.
 - .2 Lay out tile Work and centre tile sites in both directions in each space or on each wall area.
 - .3 Centre tile patterns between control and movement joints. Notify the Consultant for further instructions where tile patterns do not align with control or movement joints.

- .4 Cut tile accurately and without damage.
- .5 Smooth exposed cut edges with abrasive stone, where exposed.
- .6 Chipped or split edges are not acceptable.
- .7 Minimum tile width: 1/2 unit unless specifically indicated otherwise on Drawings.
- .8 Adjust tile layout to minimize tile cutting.
- .9 Provide uniform joint widths.
- .10 Lay out tile wainscots to next full tile beyond dimensions indicated.
- .5 Press setting material into the back of tile having raised or textured backs to provide a minimum of 95% coverage:
 - .1 Set tile in place while bond coat is wet and tacky before it has skinned over.
 - .2 Notch bond coat in horizontal straight lines and set on freshly set setting material while moving tile back and forth at 90° to the notches.
 - .3 Fully support corners and edges of tile with setting material.
 - .4 Set tile with, maximum lippage of 1 mm over a 3 mm wide joint.
- .6 Prevent rapid drying of setting material:
 - .1 Do not set tile on dry bed.
 - .2 Sound tile after setting and replace any hollow sounding units to obtain full bond.
- .7 Provide additional ventilation as required.
- .8 Clean excess setting materials from surface of tiles before final set.
- .9 Sound tiles after setting material have cured and replace hollow sounding tile before grouting.
- .10 Joint Widths: Install tile with joint widths as detailed on Drawings, or as follows:
 - .1 Wall Tile: 1.5 mm
 - .2 Porcelain Tile: 3 mm
 - .3 Make joints consistent width and alignment within tile area.
 - .4 Maintain 2/3 of grout joint depth free of setting material.
- .11 Install prefabricated edge strips and control at locations indicated or where exposed edge of floor tile meets different flooring materials and exposed substrates.
- .12 Install edge strip on exposed edges of tile wall base.
- .13 Protect exposed edges of floor tile with properly sized transition strips, use sloped reducer strips where uneven transitions between 6 mm and 13 mm occur.
- .14 Do not saw-cut joints after installing tiles:
 - .1 Locate joints in tile surfaces directly above joints in concrete substrates.
 - .2 Provide floor control joints over structural control joints.
 - .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.
- .15 Form an open joint for sealant in tile Work wherever a change in the backing wall material occurs, at all vertical interior corners, around penetrating pipes and fixtures, and where tile abuts other materials or fixtures.

3.5 Grout

- .1 Site Applied Temporary Protective Coating: Protect exposed surfaces of tile against adherence of mortar and grout by pre-coating them with a continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces where required by tile manufacturer to prevent adhesion or staining of exposed tile surfaces by grout:
 - .1 Petroleum paraffin wax, applied hot.
 - .2 Grout release.
 - .3 Petroleum paraffin wax or grout release.
- .2 Install grout in accordance with manufacturer's written instructions, the requirements of the Terrazzo, Tile and Marble Association of Canada (TTMAC), and as follows:
 - .1 Allow proper setting time before application of grout.
 - .2 Force grout into joints to a smooth, dense finish.
 - .3 Remove excess grout in accordance with manufacturer's written instructions and polish tile with clean cloths.
- .3 Install chemical-resistant epoxy grouts in accordance with ANSI A108.1; clean from tile surfaces as work proceeds in accordance with manufacturer's written instructions using clean water.

3.6 Adjusting

- .1 Upon completion of the Work repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace tiles which are damaged or cannot be adequately cleaned as directed.

3.7 Cleaning

- .1 Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site. In addition to the initial cleaning procedure required, clean the tile Work not more than 2 days before occupancy or acceptance by the Owner.

3.8 Protection

- .1 Protect tile Work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

3.9 Installation Schedule

- .1 Install tile Over Gypsum Board – Thin-Set Method Dry Areas Only to TTMAC Details 304W
- .2 Install tile on Coated Glass Mat Backer Board to TTMAC details 305W.

END OF SECTION

1 GENERAL

1.1 Summary

- .1 Provide acoustic panel ceilings in accordance with requirements of the Contract Documents.

1.2 References

- .1 Acoustic Materials Association (AMA):

- .1 AMA-1, Ceiling Sound Transmission Test by the Two-Room Method.

- .2 ASTM International (ASTM):

- .1 ASTM A580/A580M, Standard Specification for Stainless Steel Wire
.2 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.3 ASTM C635/C635M, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
.4 ASTM C636/C636M, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
.5 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
.6 ASTM E1264, Standard Classification for Acoustical Ceiling Products.

- .3 Ceilings and Interior Systems Construction Association (CISCA):

- .1 CISCA Ceiling Systems Handbook

- .4 Underwriters Laboratories of Canada (ULC):

- .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 Administrative Requirements

- .1 Coordination: Coordinate layout and installation of acoustic panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, and partition assemblies, and as follows:

- .1 Schedule and coordinate installation of ceiling to occur subsequent to completion of overhead mechanical and electrical work.
.2 Schedule and coordinate ceiling installation with mechanical and electrical trades building in components into ceiling finish panels.

1.4 Submittals

- .1 Product Data: Submit for Consultant's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
.2 Shop Drawings: Submit for Consultant's action. Furnish shop drawings for the fabrication and installation of the Work. Show typical details of the conditions for each type of acoustical ceiling, joint, anchorage and support in the system. Include reflected ceiling plans, and items which are to be coordinated with the acoustical ceiling system.

- .3 Samples: Submit for Consultant's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for colour and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples of each type and colour of ceiling panel or tile in not less than 150 x 150 mm size. Furnish samples of exposed grid system components in 300 mm lengths and required finish.

1.5 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-construction Conference, provide a field sample for each type acoustical ceiling in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- .3 Regulatory Requirements: Provide acoustic panel ceilings that meet requirements of ASTM E84 and ULC S102; labelled and listed by Underwriters Laboratories Inc. (UL), Underwriters Laboratories of Canada (ULC) or Warnock Hersey-Intertek (WHI), or another testing and inspecting agency acceptable to Authorities Having Jurisdiction.

1.6 Project Closeout Submissions

- .1 Operation and Maintenance Data: Submit copies of manufacturer's written maintenance information for inclusion in the operations manual; provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
- .2 Spare Parts: Extra Acoustical Materials: Furnish extra stock of each type acoustical tile and panel in a quantity equal to 1% of the amount installed in the Work, but not less than 1 standard carton. Deliver to the Owner and store at the project site where directed.

1.7 Delivery, Storage and Handling

- .1 Delivery and Acceptance Requirements: Deliver acoustic panels and suspension system components to Project site in original, unopened packages and store in a fully enclosed space, protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .2 Storage and Handling Requirements: Permit acoustic panels to reach room temperature and stabilized moisture content before installing; handle acoustic panels to avoid chipping edges or damaging units; replace damaged units as directed by Consultant.

1.8 Site Conditions

- .1 Ambient Conditions: Install acoustic unit ceilings only when building is enclosed, has sufficient heat, when overhead mechanical and electrical work is complete, and dust and moisture producing activities are complete; maintain uniform temperatures and relative humidity within range recommended by material manufacturer from the time of installation until Substantial Performance for the project; make adjustments to temperature and humidity gradually within tolerances indicated by manufacturer.

2. PRODUCTS

2.1 Manufacturers

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:

.1 Acoustic Panels and Suspension Systems:

- .1 Armstrong World Industries Canada Ltd.
- .2 CertainTeed
- .3 CGC Interiors, a USG Company
- .4 Rockfon

2.2 Design Criteria

- .1 Superimposed Loads: Determine superimposed loads applied to suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:
- .1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635 deflection test.
 - .2 Seismic Restraints: Design system to withstand seismic forces outlined in Building Code for normal facilities, based on a full uniform ceiling load acceleration of 0.246 g and velocity of 0.133 m/s in accordance with ASTM A580; ceilings areas less than 13 m² and surrounded by walls connected to structure above do not require seismic restraints.

2.3 Materials

- .1 Acoustic Panels: Provide manufacturer's standard metric panels of configuration indicated in accordance with ASTM E1264 classifications as designated by the nominal values for types, patterns, acoustic ratings, and light reflectance class listed in this Section; with flame spread rating of 25 or less and smoke developed rating of 50 or less when tested in accordance with CAN/ULC S102 and as follows:
- .1 C1 - NEW CUSTOM CUT 2'x4' T-BAR GRID AND TILE EXPOSED GRID.
 - .2 ACT: Armstrong CALLA SQUARE LAY-IN #2821, WHITE.
- .2 Metal Suspension System – Acoustical Panel Ceilings: Manufacturer's standard direct hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements and as supplied by same materials supplier as acoustic panels for intermediate duty, exposed tee bar. : Basis-of-Design: Armstrong PRELUDE 15/16" EXPOSED GRID.
- .1 Tee Bar Grid Face Width: as appropriate for materials specified.
 - .2 Hangers, Braces and Ties: Nominal 1.98 mm (14 ga.) Ø steel wire, galvanized
 - .3 Exposed Finish: Manufacturer's standard satin, white finish
 - .4 Corrosion Resistance: Hot-dip galvanized or stainless steel components.
 - .5 Acceptable materials: materials to match products specified, use only materials from same manufacturers of panel products.
- .3 Attachment Devices: Size for five (5) times design load indicated in ASTM C635, Table 1, Direct Hung, having corrosion protection for mild service conditions, and as follows:
- .1 Concrete Anchors: Anchors of type to option of Contractor, with holes or loops for attaching hangers having capacity to sustain ceiling loads as indicated in above, selected from one of the following types:
 - .1 Cast-in-place anchors
 - .2 Post Installed expansion anchors
 - .3 Chemical anchors

- .4 Powder actuated fasteners, except that design load is sized for ten (10) times that indicated above.
- .2 Rod and Flat Hangers: Mild steel, zinc coated.
- .3 Angle Hangers: Minimum 22 mm x 22 mm x 1 mm thick angles, Z275 (G90) galvanized steel sheet in accordance with ASTM A653/A653M; bolted connections using 8 mm Ø bolts.
- .4 Edge Mouldings and Trim: Sheet metal edge mouldings and trim selected from manufacturer's standard mouldings for edges and penetrations that fit specified acoustic panel edge and suspension system, and as follows:
 - .1 Provide edge mouldings and trims that match width and configuration of exposed runners including the following configurations:
 - .1 Sheet Metal Fillers: Light zinc coated sheet steel finished to match T-bar
 - .2 Radiant Panel Shadow Mould: Rolled sheet metal, one piece with pre-punched and slotted mounting holes, and expansion joints to coincide with radiant panel joints, having 22 mm x 19 mm flange and reveal, to fit manufacturer's suspension grid
 - .3 Radiant Panel Wall Mould: Angle shape 0.759 mm metal core thickness, 38 mm vertical leg and 25 mm exposed face with pre-punched and slotted mounting holes, and 1.5 mm expansion joints to coincide with radiant panel joints, to fit manufacturer's suspension grid.

3. EXECUTION

3.1 Examination

- .1 Verification of Conditions: Verify that substrates and structural framing are in accordance with manufacturer's requirements specified in this and other Sections that affect ceiling installation, anchorage, and other conditions affecting performance of acoustic panel ceilings.
 - .1 Installation of ceiling system indicates denotes acceptance of site conditions.

3.2 Preparation

- .1 Measure each ceiling area and establish layout of acoustic panels to balance border widths at opposite edges of each ceiling:
 - .1 Install acoustic panel ceilings in accordance with layout indicated on reflected ceiling plans
 - .2 Layout acoustic panel ceilings to avoid use of panels less than half the width of full sized panels at borders

3.3 Installation

- .1 Install acoustic panel ceilings in accordance with manufacturers written instructions and as follows:
 - .1 Install ceiling suspension system in accordance with ASTM C636/C636M.
- .2 Suspend ceiling hangers from building's structural members and as follows:
 - .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system:
 - .1 Do not support ceilings directly from permanent metal forms, floor deck or other non-structural framing.
 - .2 Do not attach hangers to steel deck tabs.
 - .3 Do not attach hangers to steel roof deck.
 - .4 Attach hangers to structural members or intermediate supports.

- .2 Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other means that does not create a kink in the suspension wires
- .3 Install supplemental suspension members and hangers in form of trapezes or similar devices 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
- .4 Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns
- .5 Connect hangers directly to structure or to flat, angle, channel or rods securely fastened to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are:
 - .1 Secure
 - .2 Appropriate for substrate
 - .3 Will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures
- .6 Space hangers at 1220 mm maximum along each member supported directly from hangers, and provide hangers not more than 200 mm from ends of each member.
- .7 Provide additional hangers where lay-in electrical or mechanical fixtures are installed in suspension system; one at each corner with stabilizer bars to prevent overloading or rotation of the suspension members where required.
- .8 Do not level ceilings by putting kinks in the suspension wires.
- .3 Install edge mouldings and trim of type indicated at perimeter of acoustic ceiling area and where necessary to conceal edges of acoustic panels.
 - .1 Fasten mouldings to substrate at 406 mm O/C, not more than 75 mm from ends, levelling with ceiling suspension system to a tolerance of 3 mm in 3600 mm.
 - .2 Mitre corners accurately and connect securely.
 - .3 Do not use exposed fasteners, including pop rivets, on mouldings and trim, unless specifically allowed by the Consultant.
- .4 Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- .5 Accurately fit and install acoustic panels into suspension system runners and edge mouldings; scribe and cut panels at borders and penetrations to provide a neat, precise fit; replace damaged panels at no expense to the Owner.
- .6 Arrange directionally patterned acoustic panels as follows:
 - .1 As indicated on reflected ceiling plans.
- .7 Install acoustic panels as follows:
 - .1 Square Edged Panels: Install panels with edges fully hidden from view by flanges of suspension system runners and mouldings; use sheet metal filler coloured to match suspension system where any face dimension of a piece of acoustic panel, measured from centre of Tee to face of wall or column is less than 75 mm.
 - .2 Protect lighting fixtures and air ducts in accordance with requirements indicated for fire resistance rated assembly.
- 3.4 Closeout Activities
 - .1 Cleaning: Clean exposed surfaces of acoustic panel ceilings, including trim, edge mouldings, and suspension system members in accordance with manufacturer's instructions.

- .2 Repairs: Touch-up minor damage to finishes in accordance with manufacturer's instructions; remove and replace ceiling components that cannot be successfully cleaned and repaired.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide floor repair and levelling in accordance with requirements of Contract Documents.
- .2 Include supply and installation of "Standard" floor repair as noted in the Contract Documents. Include in base bid floor repair for core fills, floating of floors, sloping to drains etc.
- .3 Floor repair, levelling and surface preparation is the responsibility of the General Contractor or floor repair / levelling subcontractor. Coordinate requirements with floor installers or each flooring material specified.

1.2 Floor Repair Intent

- .1 Remove residue, previous surface treatments, including any adhesives, from slabs prior to installation of topping, or new floor finish by sanding using a floor sanding machine.
- .2 Apply skim coat or leveling and sand to ensure a smooth substrate for new flooring. In particular, ensure there are no ridges which will telegraph through new flooring. Vacuum and remove all debris from preparation process.
- .3 Plug existing core holes in existing slabs with non-shrink cement grout as required.
- .4 Slope to drains and form other transitions as noted on the drawings.
- .5 Removal of existing flooring residue, including flooring material and adhesives which requires scraping and track blasting (shot blasting) or grinding as confirmed by the Consultant.
- .6 Application of self-leveling underlayment as directed by the Consultant.
- .7 Laser scan floors to verify floor flatness. Provide Consultant with measurements at 3 day mark, and 28 day mark for new construction; and provide laser scan of existing floors after demolition and after levelling is installed.

1.3 Definitions

- .1 Finishing: Methods, tools and equipment employed to achieve levelness or surface flatness concrete floors, and durability indicated and as follows:
 - .1 F3-Finishing: Floors having a straightedge value of ± 5 mm over 3050 mm; similar to CSA A23.1 Class C Slab Finishing. Locations; Flat Institutional or Commercial Floors: Slabs having thin set tile and resilient tile floor finish for Institutional or Commercial floors.

1.4 References

- .1 American Concrete Institute (ACI):
 - .1 ACI 302.1R, Guide for Concrete Floor Slab and Construction
- .2 American National Standards Institute (ANSI):
 - .1 ANSI 108.1, General Requirements: Subsurfaces and Preparations by Other Trades
- .3 CSA Group (CSA):
 - .1 CSA A23.1/A23.2, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

- .4 International Concrete Repair Institute (ICRI):
 - .1 ICRI 310.2, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays
- 1.5 Administrative Requirements
 - .1 Coordination: Coordinate a meeting between Contractor, Subcontractor responsible for concrete placement, and the Consultant to determine Site Quality Control testing section borders and sample measurement line locations, method of measurement, and accuracy requirements of the measuring devices.
 - .2 Pre-Construction Meetings: Arrange meeting with Contractor, Subcontractor for work of this Section and other Subcontractors affected by work of this Section to discuss effects and issues governing installation of concrete finishing materials; prepare an outline agenda for meeting.
- 1.6 Submittals
 - .1 Product Data: Submit for Consultant's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory used in the work.
 - .1 Furnish information for each type of cement, aggregate, admixture, curing, finishing, levelling and densifying material.
 - .2 Submit manufacturer's product data for each materials specified including recommended application rates and methods of installation.
 - .2 Shop Drawings: Submit for Consultant's action. Furnish shop drawings for the fabrication and installation of the Work. Show the location of construction joints, and the locations of Work required by other trades with details and templates for placement and spacing, including openings, penetrations, depressions, slopes, curbs, equipment pads, sleeves, embedments, inserts and blockouts.
 - .3 Repair Procedures: Submit for Consultant's information. Procedural outline of proposed repair work including a description of materials, preparation, and protection.
- 1.7 Quality Assurance
 - .1 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Installers: Use skilled workmen experienced in concrete finishing methods similar in complexity and extent to that required for the Work of the Contract.
- 1.8 Project Closeout Submissions
 - .1 Operation and Maintenance Data: Submit detailed cleaning and maintenance instructions for concrete densifier products, and instruct Owner in proper care and maintenance of specified floor finishes, including a complete list of floor care products that will be required for on-going maintenance.
 - .2 Maintenance Materials: Leave a minimum of one (1) 18.9 L container of maintenance coating, and remaining portion of coating from first treatment, stored on site at location directed by Owner.
- 1.9 Quality Assurance
 - .1 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Installers: Use skilled workmen experienced in concrete finishing methods similar in complexity and extent to that required for the Work of the Contract.

2. PRODUCTS

2.1 Materials

- .1 Skim coating: cementitious based, gypsum based products are NOT acceptable. Acceptable Materials:
 - .1 ARDEX Feather Finish
 - .2 CustomTech Silk Patching & Finishing Component
 - .3 TEC Perfect Finish
 - .4 UZIN NC 150
- .2 Feather edging: polymer-modified, cementitious, 2 component, fast setting, trowel applied. Acceptable Materials:
 - .1 ARDEX SD-P
 - .2 CustomTech TechPatch-MP Multipurpose RS Skim Coat & Floor Patch
 - .3 MAPEI Planitop 21
 - .4 SikaTop 121 Plus
 - .5 UZIN NC 170
- .3 Self-leveling and smoothing underlayment: Performance standard to ASTM C349 (and CGSB 71-GP-30M), Type 2, minimum compressive strength 30 MPa (4400 psi) after 28 days. Acceptable Materials:
 - .1 Ardex K-15.
 - .2 CustomTech TechLevel 150 Self Leveling Underlayment
 - .3 Geistlich International, Inc. - "Teck 2800".
 - .4 Mapei Canada - "Ultra/Plan".
 - .5 Target Products, "Floor Leveller C26 UL".
 - .6 Thoro Products, "Thoro Underlayment".
 - .7 UZIN NC 170
- .4 Grout for filling core holes: Acceptable Materials:
 - .1 CG-86 Construction Grout by WR Meadows.
 - .2 Custom Building Products SpeedSlope RS Sloping Mortar
 - .3 MAPEI Planigrout 712
 - .4 Sika Grout 212 by Sika Canada.
 - .5 UZIN NC 182
- .5 Self-leveling and smoothing underlayment: Performance standard to ASTM C349 (and CGSB 71-GP-30M), Type 2, minimum compressive strength 30 MPa (4400 psi) after 28 days.
 - .1 Ardex K-15.
 - .2 CustomTech TechLevel 150 Self Leveling Underlayment
 - .3 Mapei Canada - "Ultra/Plan 1 Plus.
 - .4 SIKA Canada Sikafloor Level 125 CA
 - .5 WR Meadows, Sure-Flo FT 100.
 - .6 UZIN NC 150

3. EXECUTION

3.1 Floor Preparation

- .1 Remove existing flooring as applicable.
- .2 Sand floor using power floor sanding machine. Vacuum up residue from preparation.

- .3 Apply primer to all gypsum based surfaces and other surfaces as recommended by skim coat manufacturer.
- .4 Trowel apply skim coat.
- .5 Sand skim coat to ensure there are no ridges or trowel marks or other imperfections which could telegraph through applied flooring. Vacuum residue from preparation.
- .6 Fill minor imperfections using skim coating material in accordance with manufacturer=s installation instructions.
- .7 Use feather edging compound to make transitions of 19 mm or less in floor levels. Install specified product in accordance with manufacturer=s installation instructions.
- .8 Chip floor as noted on the drawings. Clean floor of all residue and loose material. Prime floor. Apply primer in compliance with manufacturer's application instructions. Install topping to achieve floor slopes and finishes noted on the drawings. Comply with manufacturer's installation instructions.
- .9 Patch all core holes using specified grout.
- .10 Ensure any residue on slabs has been removed by track blast (shot-blast) treatment or grinding.
- .11 Prepare substrate including priming and constructing dams and apply self-leveling underlayment.

3.2 Installation of Rehabilitation Materials

.1 Basic Treatment

- .1 The basic treatment to all formed concrete surfaces, exposed or unexposed, is to be to CSA-A23.1/A23.2.
- .2 Do not repair honeycomb areas until inspected by Consultant. Fill honeycomb in non-structural elements with mortar; repair honeycomb in structural elements in accordance with CSA Standards.

.2 Filling

- .1 Apply self-leveling and smoothing underlayment working into all nooks, cracks and spaces to fill flush with top of floor slab. Trowel to a smooth surface.
- .2 Use feathering edging to fill and level depressions up to 19 mm in thickness, to fill cracks, holes, chips etc. where topping must be finished to a feather edge. Apply in strict accordance to manufacturer's instructions.
 - .1 At juncture of resilient flooring and exposed concrete to provide feather edging for a distance of 150 mm from ± 3 mm to 0 mm, as indicated.
 - .2 Prepare substrate and install as per manufacturers recommendations, smooth finish.

.3 Slab Finishes

- .1 The tops of all floor slabs, are to be brought to an even, level or sloping surface as indicated on the drawings, ready to receive the specified finish, in accordance with CSA-A23.1/A23.2.
- .2 Depress floor slabs as required for floor finishes.
- .3 All surfaces shall be true and level to a tolerance in plane of 3 mm in 3 m.
- .4 Let the leveling coat harden and cure sufficiently before laying specified flooring.

.4 Expansion and Control Joints

- .1 Expansion control to areas as indicated on drawings.

3.3 Site Quality Control

.1 Testing and Measurements:

- .1 Straightedge Measurement: Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 3050 mm long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed values indicated in item 1.3.1 above.
- .2 CSA A23.1 has no measurement standard for unshored suspended slabs on steel structure; make straightedge measurements in accordance with CSA A23.1 with the following additional requirements:
 - .1 Layout measurement lines at 45° to the framing direction; to avoid taking measurements at points where anticipated deflections are similar.
 - .2 Offset measurement lines a minimum of 600 mm from column locations, and no portion of the measurement line shall fall within 600 mm of the boundary line, except where 25% of test section would be excluded from this measurement criteria.
 - .3 Measurement of F_L for suspended slab tolerances shall be within 80% of the values for slabs-on-grade.
 - .4 Measure and record elevation points at every 600 mm along length of test line.

.2 Non-Conforming Work: Repair concrete floor slabs where they exceed the tolerances listed in this Section as follows:

- .1 Floor Level Excess (High Spots): Grind and smooth surface areas that are higher than listed tolerances.
- .2 Floor Level Deficiency (Bird Baths):
 - .1 Saw-cut perimeter of surface areas that are lower than listed tolerances to a minimum depth of 6 mm.
 - .2 Grind perimeter to a minimum of 6 mm to allow for flush flash patching.
 - .3 Roughen surface of flash patch area to a minimum ICRI CSP 5 – Medium Shotblast.
 - .4 Clean flash patch area and trowel in floor levelling mortar in accordance with manufacturers written instructions.
 - .5 Smooth and level surface of flash patch to match adjacent floor surfaces.
- .3 Leave floors in ready for floor finishes supplied and installed by other sections.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide Resilient Flooring and Accessories in accordance with requirements of Contract Documents.

1.2 References

- .1 ASTM International (ASTM):
- .1 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
 - .2 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - .3 ASTM F1066, Standard Specification for Vinyl Composition Floor Tile.
 - .4 ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing.
 - .5 ASTM F1516, Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
 - .6 ASTM F3111,
 - .7 ASTM F1861, Standard Specification for Resilient Wall Base.
 - .8 ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - .9 ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- .2 American National Standards Institute (ANSI):
- .1 ANSI/ESD S7.1, Resistive Characterization of Materials- Floor Materials
- .3 Underwriters Laboratories of Canada (ULC):
- .1 CAN/ULC S102.2, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials

1.3 Administrative Requirements

- .1 Coordination:
- .1 Coordinate floor flatness and levelling requirements of this section; work of this Section includes floor levelling and patching required to meet resilient flooring manufacturer's installation requirements; notify Consultant where differences occur between specified tolerances and actual conditions.
 - .2 Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer.
 - .3 Install flooring and accessories after other finishing operations, including painting and ceiling construction, have been completed.

1.4 Submittals

- .1 Product Data: Submit for Consultant's action one copy of product data for each type of product specified.
- .2 Samples for Verification: Submit for Consultant's action the following:
- .1 Resilient Flooring: Submit samples of each different specified product for verification of colour and pattern in manufacturer's standard size, but not less than 150 mm x 200 mm in size for tile or sheet material, or 150 mm long for resilient accessories.

- .3 Site Quality Control Test Results: Submit for Consultant's action results or moisture emission testing of concrete subfloors prior to installation of flooring. Results shall include comparison of manufacturer's recommended moisture content to actual moisture vapour emission rate.

1.5 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-construction Conference, provide a field sample for each type resilient flooring in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- .3 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of National, Provincial and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- .4 Qualifications: Provide proof of qualifications:
 - .1 Resilient Flooring Installer: Use an installer who is competent in heat welding and have a minimum of five (5) years documented experience in the installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program:
 - .2 Source Limitations: Obtain each type, colour, and pattern of flooring or accessories specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.6 Project Closeout Submissions

- .1 Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include list of manufacturer recommended cleaning and maintenance products, and name of original installer and contact information.
- .2 Extra Materials: Provide one unopened box of each colour of VCT used on project; packaged with protective covering for storage, and identified with labels describing contents.

1.7 Delivery, Storage, and Handling

- .1 Delivery and Acceptance Requirements: Deliver flooring and installation accessories to site in manufacturer's original, unopened cartons and containers, bearing names of product and manufacturer, project identification, and shipping and handling instructions.
- .2 Storage and Handling Requirements: Store products in dry spaces protected from the weather, with ambient conditions maintained between manufacturer's recommended temperature range, and as follows:
 - .1 Do not stack tile goods over four cartons high, and distribute cartons evenly over floor area to prevent overloading of structure.
 - .2 Keep water based adhesives from freezing.
 - .3 Store rolls upright in accordance with manufacturer's instructions.

1.8 Project Conditions

- .1 Ambient Conditions: Maintain air and substrate temperature of between 21°C and 30°C in spaces receiving resilient flooring for a minimum of 72 hours before installation, during installation, and 48 hours after installation, or longer as recommended by manufacturer's written instructions, and as follows:
 - .1 Move flooring and installation accessories into spaces where they will be installed a minimum of 72 hours before installation.
 - .2 Maintain a minimum temperature of 15°C after installation to prevent damage to flooring materials.
 - .3 Do not install flooring materials on substrates colder than ambient air temperature.
 - .4 Do not install flooring materials and accessories until they are at the same temperature as the space where they are installed.

2. **PRODUCTS**

2.1 Tile Flooring

- .1 RS-1: plank flooring, refer to RS-1 on Drawing ID0.05

2.2 Resilient Accessories

- .1 B-1: Resilient Wall Base: Smooth, buffed exposed face and ribbed or grooved bonding surface supplied in maximum practical length, conforming to ASTM F1861 and as follows:
 - .1 Type: TS
 - .2 Group: 1 – Homogeneous
 - .3 Style: B
 - .4 Height: 4.25"
 - .5 Thickness: 3 mm
 - .6 Colour: Refer to Drawing ID0.05.
 - .7 Length: Manufacturers standard maximum length
- .2 Resilient Transition and Edge Strips: Extruded vinyl shapes meeting or exceeding ADA Recommendations for change of level transitions for transition between floors finishes having different levels, i.e.: between resilient flooring on underlayment to carpet with no cushion or underlayment; acceptable materials as listed on Drawing.
- .3 Transition Leveller: Johnsonite LS-40 Leveller system – cut to length to suit height of lift required between dissimilar heights of floor finishes.

2.3 Installation Accessories

- .1 Trowellable Levelling and Patching Compounds: Latex modified, portland cement based formulation provided or approved by resilient product manufacturer for applications indicated; Gypsum based materials will not be accepted for use on this project.
- .2 Adhesives: Solvent free, water resistant primer and adhesive as recommended by flooring or resilient accessory manufacturer to suit resilient products specified and substrate materials and conditions, and as follows:
 - .1 Flooring Adhesive: Light bodied adhesive recommended by flooring manufacturer
 - .2 Coved Flooring Base Adhesive: Heavy bodied adhesive recommended by flooring manufacturer.
 - .3 Rubber Base Adhesive: Contact adhesive recommended by base manufacturer.

3. EXECUTION

3.1 Examination

- .1 Testing and Inspections: Test moisture emission rate of concrete subfloor prior to installing flooring, using the calcium chloride test method in accordance with ASTM F1869, and as follows:
 - .1 Provide 72 hours' notice to the Consultant of commencement of the Work
 - .2 Include cost of testing as a part of the price for work of this section.
 - .3 Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test, and as follows:
 - .1 Resilient flooring manufacturers generally set the maximum safe moisture emission level of concrete slabs at $0.170 \mu\text{g/s.m}^2$; confirm manufacturer's recommended emission rate before starting testing.
 - .2 Moisture tests must be conducted on all concrete slabs and is especially critical where low VOC or water based adhesives are specified.
 - .3 Carefully monitor test conditions to ensure that tampering or disturbance of the test packs does not affect the results.
 - .4 Maintain a minimum temperature of 13°C for substrates during testing operations.
- .2 Examine substrates, areas, and conditions affecting work are in accordance with manufacturer's requirements, and as follows:
 - .1 Verify that floor surfaces are smooth and flat to plus or minus 3 mm over 3000 mm; notify Consultant in writing where floor tolerances are not within acceptable values.
 - .2 Verify that concrete slabs comply with ASTM F710 and the following:
 - .1 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
 - .2 Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by flooring manufacturer.
 - .3 Verify that concrete slabs exhibit normal alkalinity of between 5 and 9 and that they are free of carbonization or dusting deleterious to flooring installation or adhesive bond.
 - .4 Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits that could interfere with flooring installation.

3.2 Preparation

- .1 Comply with resilient flooring manufacturer's written installation instructions for preparing substrates indicated to receive flooring.
- .2 Fill cracks, holes, and depressions in substrates using trowellable levelling and patching compounds in accordance with manufacturers written instructions and as follows:
 - .1 Levelling and patching shall be restricted to correcting minor deviations or imperfections to bring floor surface finish to within flooring manufacturers tolerances for flatness.
- .3 Broom and vacuum clean substrates immediately before installing flooring.
- .4 After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 Installation

- .1 If required: Install vapour emission control floor sealer in accordance with manufacturer's instructions.
- .2 Comply with resilient flooring manufacturer's written installation instructions.

- .3 Unroll flooring and allow stabilizing before cutting and fitting in accordance with manufacturer's installation instructions.
- .4 Layout tile flooring as follows:
 - .1 Lay tile with joints parallel to building lines or as indicated on drawings to produce a symmetrical tile pattern.
 - .2 Install tile flooring so that perimeter tile width is minimum 1/2 full size.
 - .3 Install to pattern and direction indicated on Drawings.
- .5 Layout sheet flooring as follows:
 - .1 Maintain uniformity of resilient flooring direction.
 - .2 Do not bridge building expansion joints with sheet flooring.
 - .3 Arrange for a minimum number of seams, where seams are necessary place them in inconspicuous and low traffic areas, and not less than 150 mm away from parallel joints in flooring substrates.
 - .4 Match edges of flooring for colour shading and pattern at seams in accordance with manufacturer's written recommendations.
 - .5 Obtain Consultant's acceptance in writing before installing materials having cross seams; make adjustments to seaming plan as directed by Consultant to minimize or eliminate cross seams.
 - .6 Weld seams with welding rod where optional with manufacturer in accordance with written instructions for treatment of flooring adjacent to seams:
 - .7 Route joints of sheet flooring, leaving recommended joint profile for welding rod and permanently weld seams in accordance with ASTM F1516
 - .8 Install flooring flush with adjoining floor covering surfaces.
 - .9 Roll sheet flooring in both directions in accordance with manufacturer's instructions:
 - .10 Use flat bladed tool adjacent to walls and door casings, and where access by roller is not practicable.
- .6 Layout resilient base as follows:
 - .1 Fit joints tight and vertical.
 - .2 Joints along one plane shall be at minimum 7000 mm spacing, at inconspicuous locations.
 - .3 Mitre internal corners, groove and shape back side of base to fit around external corners and exposed ends.
 - .4 Install base on solid backing. Adhere tightly to wall and floor surfaces.
 - .5 Scribe and fit to door frames and other obstructions.
 - .6 Install outside corners prior to installation of straight sections.
 - .7 Install straight and level to variation of plus or minus 3 mm over 3000 mm straight edge.
 - .8 Do not stretch base during installation.
 - .9 Shave back of base where necessary to produce snug fit to substrate.
 - .10 Fill voids along top edge of resilient base with manufacturers recommended adhesive filler material where base is installed on masonry walls.
- .7 Layout resilient accessories as follows:
 - .1 Install edge strips at unprotected and exposed edges where flooring terminates.
- .8 Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- .9 Extend flooring and base materials into toe spaces, door reveals, closets, and similar openings.
- .10 Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor using chalk or other non-permanent, non-staining marking device.

3.4 Cleaning and Protecting

- .1 Perform the following operations immediately after installing flooring:
 - .1 Remove adhesive and other surface blemishes using cleaner recommended by flooring manufacturer
 - .2 Sweep or vacuum floor thoroughly
 - .3 Do not wash flooring until after time period recommended by flooring manufacturer
 - .4 Damp mop floor to remove marks and soil
- .2 Protect flooring against mars, marks, indentations, and other damage arising from construction operations and placement of equipment and fixtures during the remainder of construction period using protection methods recommended in writing by flooring manufacturer, and as follows:
 - .1 Apply protective floor finish or sealer, as appropriate to the specified materials; coordinate selection of floor polish or sealer with Owner's long term maintenance service.
 - .2 Use only commercially available product acceptable to flooring manufacturer, and provide list of products used as a part of maintenance instructions specified for this Section.
 - .3 Confirm with manufacturer that Owners preferred floor polish or sealer is compatible with manufacturers recommended commercial flooring installation maintenance procedures; notify Consultant where Owner's preferred products are not compatible with manufacturers recommendations.
- .3 Cover flooring with un-dyed, untreated building paper until inspection for Substantial Performance.
- .4 Do not move heavy and sharp objects directly over flooring. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- .5 Provide final cleaning not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Performance, and as follows:
 - .1 Clean flooring in accordance with manufacturers written recommendations.
 - .2 Clean and strip protective floor finish applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer.
 - .3 Reapply polish to floor surfaces to restore protective floor finish in accordance with flooring manufacturer's written recommendations.
 - .4 Coordinate with Owner's maintenance program and provide listing of materials required to maintain resilient flooring.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide tile carpeting in accordance with requirements of Contract Documents.

1.2 References

- .1 ASTM International (ASTM):
- .1 ASTM E648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - .2 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - .3 ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.3 Administrative Requirements

- .1 Coordination: Install carpeting before installing items indicated for installation on top of carpet and after other finishing operations, including painting and ceiling construction, has been completed.

1.4 System Description

- .1 Fire Hazard Classification: Provide carpeting materials tested in accordance with ASTM E648 and certified to have critical radiant flux not less than 0.45 W/cm².
- .2 VOC Emission Limits: Provide carpeting materials certified to meet the requirements for chemical emission levels in accordance with the CRI "Green Label Plus" indoor air quality testing program for carpet and adhesive products, and the CRI "Green Label" program for carpet cushion.

1.5 Submittals

- .1 Product Data: Submit for Consultant's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- .2 Shop Drawings: Submit for Consultant's action. Furnish shop drawings for the fabrication and installation of the Work. Show the proposed cross-joints, seam locations and lengths, and pile direction, details of seaming and installation of carpeting and accessories, and provisions for Work of other trades.
- .3 Samples: Submit for Consultant's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for colour and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples of each type and colour of carpet, showing the seaming, binding, and edging required in the Work.
- .1 Furnish full-size samples of carpet tile.
- .4 Certifications: Submit for Consultant's information.
- .1 Fire Hazard Classification: Furnish certified test reports verifying that the carpeting materials meet the specified fire hazard rating.
 - .2 VOC Emission Limits: Furnish certified test reports verifying that the carpeting materials meet the specified VOC Emission Limits.

1.6 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-Construction Conference, provide a field sample for each type carpet in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
 - .1 Adhesive Test Sample: Remove adhesive-installed carpet from sample area, while Owner's personnel are present, to demonstrate removal procedures that will minimize damage to carpet and floor.
- .3 Mock-Ups: In area designated by the Consultant, provide sample installation of each colour of at least 9 m2 (100 sq ft) showing colour matching. Make changes as required until approved by Consultant. When approved, sample area represents minimum acceptable standard for work. Remove sample installation when directed unless sample area can be satisfactorily incorporated into Work.
- .4 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of National, Provincial and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1.7 Delivery and Storage

- .1 Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Furnish carpet with registered number tags attached intact. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

1.8 Warranty

- .1 Submit for Owner's documentation. Furnish 2 year written warranty in form stipulated by Consultant, signed by the Contractor and Installer, agreeing to repair or replace Work which has failed as a result of defects in materials or workmanship. Failure shall include excessive wear, fading, tearing, cracking, separation, deterioration or loosening from substrate, seam failure, ripples, scallops, pilling or puckering. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other guarantees or warranties may not be substituted by the Contractor for the terms of this special warranty.

1.9 Maintenance

- .1 Maintenance Manuals: Submit for Owner's documentation. Furnish complete manuals describing the materials, devices and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures describing the actual materials used in the Work, including information needed for the removal of common stains.
- .2 Extra Carpet Tile: Furnish 2 boxes of extra carpet tile for each size, pattern and colour installed in the Work. Deliver to the Owner in manufacturer's original packaging and store at the project site where directed.

1.10 Site Conditions

- .1 Ambient Conditions: Maintain temperature and ventilation in work area using permanent heating system, and portable supply and exhaust fans in accordance with manufacturer's requirements; provide 72 hours notification to the Owner before starting installation in occupied spaces.

2. PRODUCTS

2.1 Materials

- .1 Tile Carpeting: CP-1, CP-2, CP-3 on Drawing ID0.05.

2.2 Accessories

- .1 Trowellable Levelling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the Tile Carpeting manufacturer.
- .2 Adhesive: Water resistant, mildew resistant, non-staining type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet as recommended by the carpet manufacturer.
- .3 Resilient Accessories and Base: Refer to Section 09 65 00 and types indicated on Drawings and as required to protect exposed edge of carpet; maximum lengths to minimize running joints.

3. EXECUTION

3.1 Examination

- .1 Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- .2 Verification of Conditions (Concrete Substrates): Verify that concrete substrates and conditions are satisfactory for carpet installation and comply with the following specified requirements:
 - .1 Concrete subfloor complies with ASTM F710 and moisture emissions are within manufacturer's recommendations in accordance with ASTM F1869.
 - .2 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
 - .3 Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer.
 - .4 Slabs are free of cracks, ridges, depressions, scale, and foreign deposits that could affect the quality of the carpet installation.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Subfloor Treatment: Remove dust, dirt, sealer and wax from existing surfaces; remove ridges and bumps; seal porous and powdery surfaces with concrete floor sealer and apply sub-floor filler to low spots and cracks to achieve level floor to a tolerance of 1:500 in accordance with manufacturer's written requirements.
- .2 Test Layout: Dry lay 10 m² area of tile carpeting with required seam and nap direction and obtain acceptance from Consultant before commencing with installation.

3.3 Installation

- .1 Install in accordance with manufacturer's printed instructions using material from same dye lot; mix materials to obtain consistent colour, pattern and texture match within any one visual area.
- .2 Layout tile carpeting as with joints parallel to building lines or as indicated on Drawings to produce a symmetrical tile pattern so that perimeter tile width is minimum half of full size and as follows:
 - .1 As noted on Drawings.
- .3 Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses and around projections:
 - .1 Cut tile carpeting to fit accurately around perimeter of rooms into all recesses and around fixtures.
 - .2 Make cut outs for floor mounted service boxes, receptacles, switches, hardware where they occur on tile carpeting.
 - .3 Cut holes as close as possible to allow services to pass through and that trim will completely hide hole when installed.
 - .4 Cooperate and coordinate with electrical trade to ensure correct location of outlets is obtained.
- .4 Install edging strips at all openings or doorways and where tile carpeting abuts other floor covering.

3.4 Closeout Activities

- .1 Clean-Up: Remove tile carpeting waste and debris from premises and leave installation clean after completion of carpeting operations in an area; protect finished areas from work following installation in accordance with manufacturer's written instructions.
- .2 Repairs: Replace damaged or defective tile carpeting at no cost to Owner.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide acoustic wall panels in accordance with requirements of the Contract Documents.

1.2 Reference Standards

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .2 ASTM D6207, Standard Test Method for Dimensional Stability of Fabrics to Changes in Humidity and Temperature
 - .3 ASTM E795, Standard Practices for Mounting Test Specimens During Sound Absorption Tests
 - .4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- .2 Underwriters Laboratories Canada (ULC):
 - .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.3 Submittals

- .1 Product Data: Submit for Consultant's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- .2 Shop Drawings: Submit for Consultant's action. Furnish shop drawings for the fabrication and installation of the Work. Show typical details of the conditions for each type, joint, anchorage and support in the system.
- .3 Samples: Submit for Consultant's action. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for colour and appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Furnish samples of each type and colour in not less than 200 mm x 280 mm size.

1.4 Quality Assurance

- .1 Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- .2 Field Samples: Prior to the Pre-construction Conference, provide a field sample for each type acoustical ceiling in the building at areas to be designated by the Consultant. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- .3 Regulatory Requirements: Provide acoustic panel ceilings that meet requirements of ASTM E84 and ULC S102; labelled and listed by Underwriters Laboratories Inc. (UL), Underwriters Laboratories of Canada (ULC) or Warnock Hersey-Intertek (WHI), or another testing and inspecting agency acceptable to Authorities Having Jurisdiction.

1.5 Project Closeout Submissions

- .1 Operation and Maintenance Data: Submit copies of manufacturer's written maintenance information for inclusion in the operations manual; provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
- .2 Spare Parts: Extra Acoustical Materials: Furnish extra stock of each type acoustical panel in a quantity equal to 1% of the amount installed in the Work. Deliver to the Owner and store at the project site where directed.

1.6 Delivery, Storage, And Handling

- .1 Delivery and Acceptance Requirements: Deliver system components to Project site in original, unopened packages and store in a fully enclosed space, protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .2 Storage and Handling Requirements: Permit system components to reach room temperature and stabilized moisture content before installing; handle system components to avoid damaging units; replace damaged units as directed by Consultant.

1.7 Site Conditions

- .1 Ambient Conditions: Install system components only when building is enclosed, has sufficient heat, when overhead mechanical and electrical work is complete, and dust and moisture producing activities are complete; maintain uniform temperatures and relative humidity within range recommended by material manufacturer from the time of installation until Substantial Performance for the project; make adjustments to temperature and humidity gradually within tolerances indicated by manufacturer.

2. PRODUCTS

2.1 Acoustic Panel

- .1 AF-1 and AF-2 on Drawing ID0.05.

2.2 Accessories

- .1 Fasteners: as recommended by manufacturer for installation.
- .2 Attachment: Slide and engage clips, magnetic mount, or hook and loop mount, as detailed on Drawings and as recommended by manufacturer for installation type.

3. EXECUTION

3.1 Verification Of Conditions

- .1 Do not begin installation until:
 - .1 Dust generating activities are completed.
 - .2 Other overhead work has been completed.

- .2 Verify the following:
 - .1 Substrate for hanger anchorage is structurally adequate.
 - .2 Existing conditions conform with drawings.
 - .3 Baffles will not interfere with air supply, lighting, sprinkler and sound reinforcement system operation.
- .3 Report nonconforming conditions to Consultant before beginning installation.

3.2 Installation

- .1 Install in accordance with manufacturers written instructions for attachment types.
- .2 Installation in accordance with requirements of the Authority Having Jurisdiction, manufacturers' instructions, and as shown on approved shop drawings. Provide for shimming and adjustments as required to maintain consistent alignment of joints and of finished panel faces, and to ensure unstressed clip locations.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide painting in accordance with requirements of Contract Documents.

1.2 References

- .1 The Master Painters Institute (MPI):
.1 Architectural Painting Specification Manual.

1.3 Definitions

- .1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows to designate required gloss levels for indicated areas:
- .1 G1 – Matte or Flat: Lustreless or matte finish with a gloss range below 10 when measured at 85° to meter and 0 to 5 when measured at 60°.
 - .2 G2 – Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
 - .3 G3 – Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
 - .4 G4 – Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.
 - .5 G5 – Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.
 - .6 G6 – Gloss: High sheen finish with a gloss range of 70 to 85 when measured at 60° to meter.
 - .7 G7 – High Gloss: Reflective sheen having a gloss range in excess of 85 when measured at 60° to meter.

1.4 Submittals

- .1 Submit consent of surety with Bid Submission as proof of ability to supply a 100% two (2) year Maintenance Bond, where local MPI Accredited Quality Assurance Association's guaranty option is not used.
- .2 Drawdown Samples:
- .1 Prior to ordering paint materials, provide to consultant the following for verification purposes: three drawdown sample charts (cards) for each type, texture and colour of finish specified.
 - .1 Apply paint sample in layers to Opacity Charts, by The Leneta Company, or similar, until the paint colour appearance over the black and white areas is identical, or the specified level of opacity has been achieved.
 - .2 Apply paint to Opacity Charts (cards) in an even coat as soon as possible after mixing. Apply enough layers to make the painted area completely opaque, or to the required level of opacity for translucent products.
 - .2 Order paint only for approved Drawdown cards.
 - .3 Final colour selection is by Consultant.
 - .4 Resubmit until approved by Consultant.
 - .5 Consultant will furnish colour chips if alternate colours are to be selected for rejected cards.

- .3 Submit for Consultants action two sets of Safety Data Sheets (SDS) prior to commencement of work for review and for posting at job site as required.
- .4 Submit for Consultants action an itemized list complete with manufacturer, paint type and colour coding for all colours used for Owner's later use in maintenance.

1.5 Quality Assurance

- .1 Conform to the standards contained in the MPI Manual.
- .2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:
 - .1 Have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work.
 - .2 When requested provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work.
 - .3 Only qualified journeymen who have a Tradesman Qualification Certificate of Proficiency shall be engaged in painting and decorating work.
 - .4 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:
 - .1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.
 - .2 Use only paint from manufacturers that offer a minimum of five (5) base tints (White/Pastel; Medium; Dark; and a minimum of two additional coloured bases) requiring no more than 90 grams/L of colourant to achieve the scheduled colours, and as follows:
 - .1 Clear or neutral tint base paints will not be acceptable for use on this project.
 - .2 Paints that readily scuff, varnish or oxidize on contact after manufacturer's recommended curing period will not be acceptable for use on this project.

1.6 Environmental Requirements

- .1 Conform to MPI Manual and manufacturer's requirements.
- .2 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.
- .3 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .4 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.
- .5 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.
- .6 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.

- .7 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.
- 1.7 Maintenance Materials
 - .1 Leave on the premises not less than 4 liters each of all colours selected.
 - .2 Ensure all containers are tightly sealed and clearly labeled.
 - .3 Store as directed by the Consultant.
- 1.8 Guarantee and Inspection
 - .1 Furnish either the provincial MPI Accredited Quality Assurance Association's (MPI AQA) two (2) year guarantee from the Ontario Painting Contractors Association (OPCA) or, alternatively, non OPCA members must supply a 100% two (2) year Maintenance Bond - both in accordance with MPI Painting Manual requirements. The Maintenance Bond shall warrant that all painting work has been performed in accordance with MPI Painting Manual requirements.
 - .2 All painting and decorating work shall be in accordance with MPI Painting Manual requirements and shall be inspected by the provincial MPI Accredited Quality Assurance Association (MPI AQA) from the Ontario Painting Contractors Association (OPCA) whether using either the MPI Accredited Quality Assurance Association's guarantee, or the Maintenance Bond option. The cost for such inspections, and for either the local MPI Accredited Quality Assurance Association's Guarantee, or the Maintenance Bond, shall be included in the Base Bid Price.
 - .3 Comply with all recommendations of the inspection reports, and remedy all deficiencies and defects in painting workmanship and materials to the requirement of the MPI AQA reports.
 - .4 Painting and decorating Subcontractors choosing the Maintenance Bond option shall provide maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified check are not acceptable in lieu of surety consent.
- 2. **PRODUCTS**
 - 2.1 Manufacturers
 - .1 Subject to compliance with requirements, manufacturers that have attained the prerequisites for ecologically sustainable labelling mark on their products and may be incorporated into the Work include; but are not limited to, the following:
 - .1 Benjamin Moore and Co. Limited
 - .2 Dulux.
 - .3 Para Paints
 - .4 PPG Canada Inc - Architectural Finishes
 - .5 SICO Inc.
 - .6 Sherwin-Williams LLC
 - 2.2 Regulatory requirements
 - .1 Provide a Pre-Start Health and Safety Review in accordance with Occupational Health and Safety Act, R.S.O. 1990, c. O.1), Regulation 851, Industrial Establishments, as amended. Refer to Section 01 40 00 – Quality Requirements for further requirements.
 - .2 Conform to latest edition of Industrial Health and Safety Regulations issued by applicable Authorities Having Jurisdiction in regard to Site safety (ladders, scaffolding, ventilation, etc.)

- .3 Comply with more stringent of applicable laws, bylaws, codes, fire regulations, health and safety regulations of Authorities Having Jurisdiction or requirements of this Specification. Ensure standards used for Work of this Section is considered a minimum.
- .4 Where required, ensure paints and coatings meet flame spread and smoke developed ratings designated by local code requirements and/or Authorities Having Jurisdiction.
- .5 Comply with toxic trace limitations stipulated by Authorities Having Jurisdiction as tested in accordance with CAN/CGSB-1.500.
- .6 Conform to requirements of local Authorities Having Jurisdiction in regard to storage, mixing, application and disposal of paint and related waste materials. Refer to requirements in Section 01 50 00 – Temporary Facilities and Controls.

2.3 Materials

- .1 Paint Materials:
 - .1 To the requirements of the MPI Architectural Painting Specification Manual and conforming to applicable CGSB standards.
 - .2 All Paints: ready mix, pigments fully ground to maintain a soft paste consistency capable of ready and uniform dispersal to a complete and homogeneous mixture.
 - .3 Paints shall have good flowing and brushing properties and be capable of drying or curing free of streaks or sags.
 - .4 All materials and paints shall be lead and mercury free and shall have low VOC content.
- .2 Patching Compound: spackling compound or oil base putty for surfaces receiving an opaque finish. Oil base putty, tinted to match substrate for surfaces receiving a transparent finish.

2.4 Schedule

- .1 Refer to Painting Schedule at the end of this specification section for numbers and types of paint coatings according to MPI recommendations.
- .2 Refer to Drawing ID0.05 for paint colours. PT-1 to PT-8.

3. EXECUTION

3.1 Preparation of Surfaces:

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

3.2 Application

- .1 Apply paint according to manufacturer's written instructions, use applicators and techniques best suited for substrate and type of material being applied, and in accordance with MPI Manual Premium Grade finish requirements, except where additional requirements have been specified.
- .2 Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- .3 Provide finish coats that are compatible with primers used.

- .4 The term exposed surfaces includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place; extend coatings in these areas as required, to maintain system integrity and provide desired protection, and as follows:
 - .1 Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
 - .2 Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 - .3 Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 - .4 Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - .5 Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 - .6 Sand lightly between each succeeding enamel or varnish coat.
- .5 Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration, and as follows:
 - .1 Apply paint and coatings within an appropriate time frame after cleaning where environmental conditions encourage flash rusting, rusting, contamination or the manufacturer's paint specifications require earlier applications.
 - .2 The number of coats and film thickness required are the same regardless of application method, except that dark tinted colours will require a minimum of four (4) coats with an additional clear urethane or water based light industrial coating type of coating applied in high traffic areas.
 - .3 Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - .4 If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - .5 Omit primer over metal surfaces that have been shop primed and touch-up painted.
 - .6 Apply additional coats until paint film is of uniform finish, colour, and appearance if undercoats, stains, or other conditions show through final coat of paint, giving special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - .7 Allow sufficient time between successive coats to permit proper drying.
 - .8 Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- .6 Apply paints and coatings by brush, roller, spray, or other application methods according to manufacturer's written instructions and as follows:
 - .1 Application methods:
 - .1 Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 - .2 Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 - .3 Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required and as follows:
 - Generally, all paint shall be applied by brush or roller, unless Consultant has given written acceptance for use of spray equipment and methods.
 - The Consultant may at any time prohibit the use of spray painting for such reasons as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a dense, even, opaque finish.
 - Back roll sprayed surface progressively.

- .2 Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness recommended by the manufacturer.
- .3 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1220 mm.
- .7 Block Filler:
 - .1 Apply block filler at a rate sufficient to fill all voids.
 - .2 Tint as required to match succeeding colour coats.
 - .3 Apply one full coat of block filler to interior face of all exterior concrete block walls regardless of subsequent finish, including block behind gypsum board but not above ceilings.
 - .4 Work block filler well into the surface of the wall, leaving no pinholes or unsealed void in the surface.
- .8 Wood Doors: Painting requirements and precautions for wood doors are specified in Section 08 14 00 – Wood Veneer Faced Wood Doors:
 - .1 Seal tops, bottoms, and cut-outs of un-primed wood doors with a heavy coat of varnish or moisture resistant sealer immediately on delivery; sanding sealer is not acceptable.
 - .2 Fill open end grain and expansion spaces in plywood core.
 - .3 Retouch, hand clean, and spot sand doors as required.
 - .4 Door guaranty condition specified in Section 08 14 00 requires top, bottom and side edges, and cut-outs painted immediately after cutting or trimming of doors; unfinished doors shall be listed as deficiencies.
- 3.3 Mechanical and Electrical Paint Application
 - .1 Remove grilles, covers and access panels and paint separately. Reinstall after paint is dry.
 - .2 Finish paint primed equipment.
 - .3 Prime and paint insulated and bare pipes, ducts, conduit, boxes, hangers, brackets, collars and other supports, except where items are plated with a prefinished cladding.
 - .4 Replace identification markings on mechanical and electrical equipment when painted over or splattered.
 - .5 Paint interior surfaces of air ducts, convectors and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, convectors and baseboard cabinets to match face panels.
 - .6 Paint exposed conduit in finished areas to match adjacent surfaces.
 - .7 Paint both faces and all edges of wood backboards for electrical equipment before installing backboards and mounting equipment.
 - .8 Paint exposed surfaces of mechanical diffusers white colour.
- 3.4 Finishing
 - .1 Generally and unless otherwise specifically listed in Room Finish Schedule, the following paint gloss levels shall prevail:
 - .1 Paint walls and ceiling surfaces using an eggshell finish
 - .2 Paint doors, frames and trim using a semi-gloss finish.
 - .3 Paint walls and ceilings to Premium rating in accordance with MPI Manual Specifications Manual.

- .4 Paint walls and ceilings in facility laundries, public washrooms, shower and bathrooms, using a minimum of one two (2) coats of washable alkyd over appropriate prime/sealer coat.
- .5 Paint walls and ceilings in public change rooms, washrooms, shower rooms, and institutional facility bathing and shower rooms using a tile-like finish for wettable surfaces.
- .6 Paint walls and ceilings in public and institutional facility food preparation and sanitary areas using a tile like finish for dry and wettable surfaces.

3.5 Interior Surfaces

- .1 Paint interior surfaces in accordance with the MPI Manual painting systems listed in this section.
- .2 INT 3.1 – CONCRETE VERTICAL SURFACES (including Ceilings and Undersides of mezzanines and stairs etc.)
 - .1 INT 3.1M INSTITUTIONAL LOW ODOR / VOC (over w.b. primer sealer, low VOC)
- .3 INT 5.1 – STRUCTURAL STEEL and METAL FABRICATIONS (Columns, beams, Joists)
 - .1 INT 5.1RR HIGH PERFORMANCE ARCHITECTURAL LATEX (over alkyd primer)
- .4 INT 5.2 – STEEL – HIGH HEAT (Boilers, Furnaces, Heat exchangers, breeching, pipes, flues, stack)
 - .1 INT 5.2A HEAT RESISTANT ENAMEL - MAXIMUM 400° F (205° C)
 - .2 INT 5.2B HEAT RESISTANT ENAMEL, ALUMINUM - MAXIMUM 800° F (427° C)
 - .3 INT 5.2C INORGANIC ZINC RICH COATING - MAXIMUM 750° F (400° C)
 - .4 INT 5.2D HIGH HEAT RESISTANT COATING - MAXIMUM 1100° F (593° C)
- .5 INT 5.3 – GALVANIZED METAL (Not Chromate passivated) High contact / high traffic areas (Doors, frames, railings, pipes etc); Low contact / low traffic areas (overhead decking, pipes, ducts etc).
 - .1 INT 5.3N INSTITUTIONAL LOW ODOR / VOC (over w.b. galvanized primer)
- .6 INT 6.4 – WOOD PANELING (partitions, panels, plywood, veneer, millwork, handrail)
 - .1 INT 6.4F LACQUER (over s.b. stain) G4
 - .2 INT 6.4M W.B. VARNISH, CLEAR G3
- .7 INT 9.2 – PLASTER AND GYPSUM BOARD (gypsum board, drywall, “sheet rock” type material and textured finishes)
 - .1 INT 9.2M INSTITUTIONAL LOW ODOR / VOC (over primer sealer, low odor low VOC) G2 for walls, G1 for ceilings.
- .8 INT 10.1 – CANVAS AND COTTON COVERINGS (pipe and duct coverings)
 - .1 INT 10.1A LATEX (over Latex Wood Primer sealer)
 - .2 INT 10.1B ALKYD (over Latex Wood Primer sealer)
 - .3 INT 10.1C ALUMINUM PAINT (over Latex Wood Primer sealer)
 - .4 INT 10.1D INSTITUTIONAL LOW ODOR / VOC (over Latex Wood Primer sealer)
- .9 INT 10.2 – BITUMINOUS COATED SURFACES (including cast iron pipe, concrete)
 - .1 INT 10.2A LATEX (over w.b. rust-inhibitive primer)
 - .2 INT 10.2B ALKYD (over w.b. rust-inhibitive primer)
 - .3 INT 10.2C ALUMINUM PAINT (over w.b. rust-inhibitive primer)

3.6 Maintenance Repainting

- .1 Paint existing exterior and interior previously finished surfaces in accordance with the MPI Manual painting systems listed in this section.

3.7 Mechanical and Electrical Equipment

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

3.8 Field Quality Control

- .1 Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent at time of field review when viewed from a distance of 1220 mm (48”) from the painted surface:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
- .2 Painted surfaces will be considered as deficient if any of the following defects are apparent at time of field review, regardless of viewing distance.
 - .1 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .2 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .3 Damage or contamination of paint due to wind blown contaminants (dust, sand blast materials, salt spray, etcetera).
- .3 Painted surfaces found as unacceptable shall be replaced or repaired at no cost to the Owner or Consultant.
 - .1 Small affected areas may be touched up
 - .2 Large affected areas or areas without sufficient dry film thickness of paint shall be repainted.
 - .3 Runs, sags or damaged paint shall be removed by scraper or by sanding before application of new paint coats.

3.9 Protection

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

3.10 Restoration

- .1 Clean and re-install all hardware items that were removed before painting operations were undertaken, ensuring that tagged or labelled items are returned to the exact position from which they were removed.
- .2 Clean, prime and re-paint all bolts, nuts and fasteners after torqueing or re-tightening following specified paint finish.
- .3 Remove protective coverings and warning signs as soon as possible after operations cease.
- .4 Protect freshly painted surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

3.11 Clean-up

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

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide residential appliances in accordance with requirements of the Contract Documents.
- .2 Information contained on Drawings and in this Section establishes requirements for product's aesthetic effects and performance characteristics:
 - .1 Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - .2 Performance characteristics are indicated by criteria subject to verification by one or more methods including pre-construction testing, field testing, and in-service performance.

1.2 Submittals

- .1 Submit product data for each appliance indicated including operating characteristics, dimensions of individual appliances, and finishes for each appliance.
- .2 Submit appliance schedule using same designations indicated on Drawings for all appliances used on the project listing manufacturer's name and product number, and location within Project.

1.3 Quality Assurance

- .1 Use installers having workers trained and approved by manufacturer for installation and maintenance of appliances required for this Project.
- .2 Obtain products from a qualified manufacturer having a service centre capable of providing training, parts, and emergency maintenance repairs within 50 km of project site.
- .3 Appliances shall be labelled in accordance with requirements of CSA, ULC, CGA and other standards acceptable to the Authorities Having Jurisdiction.
- .4 Provide residential appliances that carry labels indicating energy cost analysis (estimated annual operating costs) and efficiency information qualifying for labelling under the Energy Star Program.

1.4 Warranty

- .1 Provide manufacturer's standard form of warranty stating that each appliance specified will repaired or replaced that fail in materials or workmanship within specified warranty periods .

2. PRODUCTS

2.1 Appliances

- .1 Refer to Drawing ID0.06: tag EQ1, EQ2 and EQ3 for appliances.

3. EXECUTION

3.1 Examination

- .1 Examine conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- .2 Examine roughing-in for electrical systems to verify actual locations of electrical connections before equipment installation.

- .3 Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 Installation, General
 - .1 Install in accordance with manufacturer's written instructions.
 - .2 Securely anchor built-in units to supporting cabinets or countertops with concealed fasteners; verify that clearances are adequate for proper functioning and rough openings are completely concealed.
 - .3 Place free-standing units in final locations after finishes have been completed in each area; verify that clearances are adequate to properly operate equipment.
- 3.3 Cleaning and Protection
 - .1 Test each residential appliance specified in this Section to verify proper operation; make necessary adjustments.
 - .2 Verify that accessories required have been furnished and installed.
 - .3 Remove packing material from residential appliances and leave units in clean condition, ready for operation.
- 3.4 Demonstration
 - .1 Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

1. GENERAL

1.1 Summary

- .1 Provide Entrance floor mats in accordance with requirements of the Contract Documents.

1.2 References

- .1 ASTM International (ASTM):
 - .1 ASTM B221, Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
 - .2 ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - .3 ASTM E648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

1.3 Submittals

- .1 Product Data: Submit for Consultant's action. Furnish each type of product and accessories to be used in the Work; before starting work of this section.
 - .1 Submit manufacturer's product data for each type of floor mat and frame specified including; but not limited to, installation instructions.

1.4 Project Closeout Submissions

- .1 Provide operations and maintenance information, and a list of cleaning materials required for maintenance, indicating specific cleaning and maintenance requirements.

1.5 Performance Requirements

- .1 Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux, minimum 0.45 watts/m².
- .2 Slip resistance in accordance with ASTM D2047, Coefficient of Friction, minimum 0.60 for accessible routes tested in wet conditions.
- .3 Standard rolling load performance is 350 lb./wheel with larger loading requirements as specified (load applied to a solid 5" x 2" wide polyurethane wheel, 1000 passes without damage).

1.6 Quality Assurance

- .1 Obtain floor mats and frames from single source by single manufacturer installed by personnel experienced in similar projects and complexity to that specified.

2. PRODUCTS

2.1 Materials

- .1 This heavy-duty needle-punched mat is ideal for both indoor and outdoor. Constructed with 100% ASOTA® solution dyed polypropylene fibers, it's permanently anti-static and able to hold up to 7 litres of water per square metre. Spike and skate resistant and impervious to many chemicals, ice melters, and salt.
- .2 Indicated as WM-1 on ID 0.05.

3. EXECUTION

3.1 Examination

- .1 Examine areas and conditions where entrance mats and frames are being installed and confirm that conditions detrimental to installation are corrected before starting work of this Section.

3.2 Preparation

- .1 Install levelling grout to screed level required for accurate recessed installation.
- .2 Fill prepared mat and frame recesses with plywood filler until entrance mats are installed.

3.3 Installation

- .1 Install entrance mat system in accordance with manufacturers written instructions.
- .2 Install entrance mats immediately before declaration of Substantial Performance for the project and after construction traffic is completed.

3.4 Maintenance Demonstration

- .1 Train Owner's designated maintenance personnel in the care and upkeep of entrance mats.
- .2 Demonstrate cleaning methods required to maintain entrance mat, based on estimated foot traffic requirements for the completed project.
- .3 It is important to the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

END OF SECTION