SW311 AND BV355 RETROFITS

FOR

UNIVERSITY OF TORONTO SCARBOROUGH
1265 MILITARY TRAIL

ISSUED FOR TENDER
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Section 01010
General Instructions

1.1 Work Under This Contract

.1 It is intended that Work supplied under this Specification shall be complete in every detail for purpose required. This Contract shall include by Contractor, materials not herein mentioned, but which may be found necessary to complete or perfect any portion of Work in accordance with requirements of this Specification.

1.2 Use of Premises and Site

.1 Confine Work to the area of the Project only.

1.3 Specifications

.1 Each Section of Division 1 is complementary to other Sections of Division 1 and shall be read together with other Sections.

.2 This Section co-ordinates, relates and governs Work of other Sections of the Specification.

.3 The Specifications are apportioned into Divisions and Sections for convenience but shall be read as a whole and neither such apportionment nor anything else contained in the Contract Documents places responsibility upon the Consultant to settle disputes among Subcontractors in respect thereof.

1.4 Examination of Site, Documents, Surfaces and Conditions

.1 Carefully examine Place of the Work and investigate, at no cost or risk to Owner, matters relating to nature of Work, means of access and egress, obstacles, rights and interests of other parties which may be interfered with during the execution of Work, conditions and limitations including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of the Project, and any other consideration which may affect performance of the Work.

.2 Carefully examine extent of Work to be performed and matters which are referred to in the Contract Documents prior to start of Work.

.3 Examine Work to which Work is to be applied, anchored or connected, and relevant as-built conditions.

.4 Do not Work until unsatisfactory conditions are corrected to acceptance of Consultant, Contractor and concerned Subcontractors. Commencement of Work implies acceptance of surfaces and conditions.

1.5 Quantity of Items

.1 Where a component, device, item or part of materials or equipment is referred to in the singular number, such reference shall require the provision of as many components, devices, items or parts of material or equipment necessary to complete the Work.

1.6 Standards and Codes

.1 Contract Forms, codes, Specifications, standards, manuals and installation, application and maintenance instructions referred to in these Specifications, unless otherwise specified, amended or date suffixed, shall be latest published editions at Bid Closing Date.

1.7 Discrepancies

.1 Advise Consultant of any contradictions, discrepancies or errors that are found or noted.

.2 Advise Consultant if there is any doubt as to meaning or intent thereof in Contract Documents.

.3 Do not proceed until instructions/clarifications have been confirmed by Consultant. A failure to notify Consultant shall result in Contractor incurring responsibility for any resulting circumstances, conditions, expenses or cost.

1.8 Additional Definitions

Also refer to Definitions in CCDC 2 2008.

.1 Wherever words "approved", "review", "acceptance", "acceptable", "satisfactory', "selected", "directed", "required", "submit", or similar words or phrases are used in standards or elsewhere in Contract Documents, it shall be understood, that words "by (to) the Consultant" follow, unless context Provides otherwise.

.2 "Others" Defined: Others in Contract Documents refers to other trades within framework of this Contract. Any Work or material executed outside Contract is designated "NIC" (Not in Contract), "By Owner', or "By Other Contractors".

1.9 Setting Out the Work

1 Assume full responsibility for and execute complete layout of Work to required locations, lines and elevations.

1.10 Documents On Site

.1 Maintain at job site, one copy of each of following:

.1 Contract Documents including Drawings, Specifications, Addenda, and other modifications to the Contract.

.2 'Reviewed' or Reviewed as Modified Shop Drawings.

.3 Project Construction and Shop Drawing Schedules.

.4 Site Instructions, Change Orders, and Change Directives.

.5 Field Test Reports.

.6 Reports by Authorities having Jurisdiction.

.7 Building and other applicable permits.

.8 Material Safety Data Sheet pursuant to WHMIS (Occupational Health & Safety Act).

.9 As-built Drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing and Divisions 15 and 16, prior to being concealed.

.10 Copies of applicable codes and standards.

.2 Make above material available to Consultant at their request.

1.11 Overloading

.1 Take precautions and preclude overloading of any part of structure, falsework, formwork or scaffolding during progress of the Work, and make good damage resulting from such overloading.

1.12 Inserts, Anchors and Fasteners

.1 Use only factory made, threaded or toggle type inserts as required for supports and anchors, properly sized for load to be carded. Place inserts only in members of main structure and not in any finishing material.

.2 Where inserts cannot be placed, use factory made expansion shields for light weights only.

.3 Fasteners stressed in withdrawal are not acceptable, except where otherwise specifically shown.

.4 Ensure that metal fastenings are of same materials as metal components being anchored or of a metal which will not set up a galvanic action causing damage to the fastening or metal component under moist conditions.

.5 Fastenings for prefinished materials shall be of concealed type unless otherwise indicated.

.6 Metal fastenings and accessories shall be same texture, colour and finish as material on which they occur.

1.13 Trademark and Labels

.1 Trademarks and labels, including applied labels, shall not be visible in finished Work in finished areas.

.2 Remove trademarks or labels by grinding, if necessary, paint out where particular surface is being painted or, if on plated parts, replace with new plain plated or non-ferrous metal parts.

.3 The exceptions to this requirement are trademarks and labels which are essential to obtain identification of mechanical, electrical or other equipment for maintenance and replacement purposes and for mandatory fire ratings.

1.14 Powder Actuated Fasteners

.1 The use of Powder Actuated Fasteners is not acceptable without prior consent from the Owner.

1.15 Use of Premises Prior to Substantial Performance

.1 Owner shall have right to enter and occupy building, in whole or in part, for purpose of placing fittings and equipment, or for other use, prior to Substantial Performance if, in opinion of the Consultant, such entry and occupancy does not prevent or interfere with the Contractor in performance of the Work. Such entry shall in no way be considered as an acceptance of Work in whole, or in part, nor shall it imply acknowledgement that terms of Agreement are fulfilled.

1.16 Interferences

.1 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces Provided prior to commencement of Work.

.2 Take complete responsibility for remedial Work that results from failure to coordinate any aspect of Work prior to its fabrication/installation.

.3 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are Provided in layout of equipment and services.

END OF SECTION

Section 01040
Coordination

1.0 General

.1 Erect Work in compliance with Contract Documents and be responsible for delays or costs resulting from failure to inspect or co-ordinate, and for any replacement or corrective work required.

1.1 Superintendence

.1 Provide full time on site superintendent personnel and supporting staff with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

.2 Site superintendent shall have overall authority to speak for Contractor and represent Contractor.

1.2 Dimensions

.1 Verify dimensions on Site before commencing shop drawings. Before fabrication commences report discrepancies to Consultant in writing. Incorporate accepted variances on shop drawings and As-Built records.

1.3 Coordination

.1 Coordinate and co-operate with work forces to ensure that Work will be carried out expeditiously and in proper sequence.

.2 Make adjustments to allow adjustable work fit to fixed Work.

1.4 Dimension and Coordination

.1 Take necessary job dimensions for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.

.2 Verify that work, as it proceeds, is executed in accordance with dimensions and positions indicated and maintain levels and clearances to adjacent work, as set out by requirements of Drawings, and ensure that work installed in error is rectified before construction resumes.

.3 Check and verify dimensions referring to work and interfacing of services. Verify with trade concerned such dimensions, when pertaining to work of other trades.

.4 **DO NOT SCALE** directly from Drawings. Obtain clarification from Consultant if there is ambiguity or lack of information on Drawings.

.5 Details and measurements of any work which is to fit or to conform with work installed shall be taken at Place of Work.

.6 Advise Consultant of discrepancies and omissions on Drawings and specifications which affect aesthetics, or which interfere with services, equipment or surfaces. Do not proceed with work affected by such items without clarification from Consultant.

END OF SECTION

Section 01060
Regulatory Requirements

1.1 Laws, Notices, Permits and Fees

.1 Refer to GC 10.2.

.2 The Building Code including amendments, shall govern the construction of the Work.

.3 Comply with Codes, By-Laws, and Regulations of authorities having jurisdiction. Codes and regulations constitute an integral part of the Contract Documents.

.4 Owner will apply and pay for Municipal Building Permit. Contractor shall apply and pay for other permits, licenses, deposits and certificates of inspection as part of the Contract Price.

.5 Arrange for inspection, testing of Work and acceptance required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay costs.

.6 Obtain permit required to work on Municipal eights of way. Obtain damage deposits for sidewalks, roads and services work at Contractor's expense.

END OF SECTION

Section 01250
Product Substitution Procedures

PART 1 - GENERAL

1.1 Approved Alternates and Approved Equals

.1 Named Product alternates or equals, indicated by the phrases “or approved alternate by XYZ Manufacturing” or “or approved equal by XYZ Manufacturing”, shall be interpreted to mean that named Product alternate or equal, if selected for use in lieu of indicated or specified Product, meets or exceeds performance, appearance, general arrangement, dimensions, availability, code and standards compliance, and colour of specified Product. Be responsible for costs and modifications associated with the inclusion of named Product alternate or equal at no additional cost to the Owner.

.2 The process for proposing and approving alternates or equals shall be the same process as for proposing and approving substitutions (refer to paragraph 1.2 below)

.3 Confirm delivery of specified items prior to proposing alternates or equals.

1.2 Substitutions

.1 Submission of substitutes

.1 Proposal for substitutions of Products and materials must be submitted in accordance with procedures specified in this section.

.2 Consultant may review submissions, if directed by Owner, but in any case with the understanding that the Contract Time will not be altered due to the time required by the Consultant to review the submission and by the Contractor to implement the substitution in the Work.

.3 Consultant’s services to review substitutions will be performed on an additional services basis to their contract with the Owner. Costs of these services will be discounted from any reductions in the Contract Price that might be forthcoming form the substitution. Therefore, to be acceptable, a substitution must present a reduction in the construction cost at least equal to the cost to the Owner of the Consultant’s additional services to review the substitution. Contractor shall cover directly costs and administration associated with courier services, reproduction costs, and other direct costs associated with these substitution reviews.

.2 Submission requirements

.1 Description of proposed substitution, including detailed comparative specification of proposed substitution with the specified Product.

.2 Manufacturer’s Product data sheets for proposed Products.

.3 Respective costs of items originally specified and the proposed substitution.

.4 Confirmation of proposed substitution delivery, in writing by Product manufacturer.

.5 Compliance with the building codes and requirements of authorities having jurisdiction.

.6 Affect concerning compatibility and interface with adjacent building materials and components.

.7 Compliance with the intent of the Contract Documents

.8 Effect on Contract Time

.9 Reasons for the request

.3 Substitutions submitted on shop drawings without following requirements of this section prior to submission of the affected shop drawings will cause the shop drawings to be rejected.

.4 Proposed substitutions shall include costs associated with modifications necessary to other adjacent and connecting portions of the Work.

.5 Consultant’s decision concerning acceptance or rejection of proposed substitutions is final. Should it appear to the Consultant that the value of services required to evaluate the substitution exceeds

the potential reduction, the Consultant will advise the Owner that the substitution does not merit consideration before proceeding with a full evaluation. If the substitution will produce a reduction commensurate with or exceeding the value of Consultant's services to evaluate the substitution, the Consultant will request the Owner's direction to proceed with evaluation.

END OF SECTION

Section 01330
Submittal Procedures

PART 1 - GENERAL

1.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals. Make submittals specified in this Section to Consultant unless otherwise specified.

.1 Verify accuracy and completeness of submittals prior to submission.

.2 Verify field measurements, field construction criteria, catalogue numbers and similar data.

.3 Co-ordinate each submittal with requirements of the Work and the Contract Documents.

.4 Notify Consultant in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

1.2 Prepare a schedule identifying all submittals requested within the Contract Documents and corresponding issued dates for review by the Consultant.

1.3 Submit in accordance with dates established under Schedule of Submittals, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

1.4 Accompany each submittal with a letter of transmittal containing all pertinent information required for identification and checking of submittals including but not limited to the following:

.1 Date of initial submission and date of each subsequent submission if required.

.2 Project title and Consultant’s project number.

.3 Names of:

.1 Contractor.

.2 Subcontractor.

.3 Supplier/manufacturer as applicable.

.4 Specification section numbers to which submission is related.

.5 Countersigned stamp of Contractor certifying that they have reviewed and accepted the submission.

PART 2 - PRODUCT DATA

2.1 Before delivery of Products to the Site, submit Product data for approval as specified in each section or as requested by the Consultant.

2.2 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable standards.

PART 3 - SAMPLES

3.1 Before delivery of Products to the Site, submit samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.

3.2 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:

.1 The quality and functional characteristics of Products, with integrally related parts and attachment devices.

.2 Full range of colours available.

3.3 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reasons for such deviations.

3.4 Identify samples with Project name, Contract number, date, Contractor's name, number and description.

3.5 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Be responsible for the cost of samples that are not accepted and for resubmission of samples.

3.6 Acceptable samples shall serve as a model against which the products incorporated in the work shall be judged.

3.7 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.

3.8 Should there be any change to the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.

3.9 When samples are very large, require assembly, or require evaluation at the Site, they may be delivered to the Site, but only with approval and as directed by Consultant.

PART 4 - SHOP DRAWINGS

4.1 Arrange for the preparation of shop drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all shop drawings and samples shall conform to the requirements of the Contract Documents.

4.2 The term “shop drawings” means drawings, diagrams, schematics, illustrations, schedules, performance charts, brochures and other data which are required to illustrate details of the Work.

4.3 In addition to shop drawings specified in the specification sections, submit shop drawings required by jurisdictional authorities in accordance with their requirements.

4.4 Shop drawings for openings, sleeving and conduit

.1 Prior to preparation of shop drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.

.2 Prior to detailing structural reinforcement on shop drawings, arrange for the Engineer of structure to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to suitable grid lines and elevation.

.3 Prior to forming of the structure, arrange for the preparation of shop drawings for review by the Consultant showing embedded conduit to be cast within the structure. Shop drawings shall include conduit from all sources.

4.5 Shop drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring shop drawings:

.1 Clear and obvious notes of any proposed changes from the Contract Documents.

.2 Fabrication and erection dimension.

.3 Provisions for allowable construction tolerances and deflections provided for live loading.

.4 Details to indicate construction arrangements of the parts and their connections, and interconnections with other work.

.5 Location and type of anchors and exposed fastenings.

.6 Materials, physical dimensions including thicknesses, and finishes.

.7 Descriptive names of equipment.

.8 Mechanical and electrical characteristics when applicable.

.9 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.

.10 Assumed design loadings, and dimensions and material specifications for load-bearing members.

4.6 Include in shop drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.

4.7 Before submitting to the Consultant, review all shop drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a qualified and responsible person possessing the appropriate authorization.

4.8 Be responsible for dimensions to be confirmed and correlated at the Site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the Work of all subtrades.

4.9 Submit shop drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the shop drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission.

4.10 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.

4.11 Submit shop drawings, as indicated in each section of the Work, signed and sealed by a licensed Professional Engineer registered in the place of the Work.

4.12 Shop drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints and also facilitate microfilming and reduced reproduction.

4.13 Submissions shall be on 8.5" x 11" or 11" x 17" page format. However, in instances where catalogue items are specified, three clean copies of the manufacturer's catalogue may be submitted.

4.14 Shop drawings shall contain the following identification:

.1 Project name and Contract number.

.2 Applicable 5-digit Contract Specification number describing the item.

.3 Location (unit, level, room number, etc.).

.4 Name of equipment or Product.

.5 Name of Subcontractor or supplier.

.6 Signature of Contractor certifying that Shop drawing is in conformance with Contract Documents.

.7 On submissions subsequent to the first, the following additional identification:

.1 The revision number.

.2 Identification of the item(s) revised.

4.15 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.

4.16 The Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.

4.17 The Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Consultant.

4.18 The Contractor shall make any changes in shop drawings which the Consultant may require consistent with the Contract Documents and re-submit unless otherwise directed by the

Consultant. **When re-submitting the shop drawings, the Contractor shall notify the Consultant in writing of any revisions other than those requested by the Consultant.**

4.19 Only drawings noted for revision and resubmission need be resubmitted.

4.20 File one copy of each submitted shop drawing at the Site.

4.21 Shop drawings submitted to Consultant that do not bear a stamp or are incomplete will not be reviewed and will be returned to Contractor, any delay in Construction Schedule as a result will be the full responsibility of the Contractor.

PART 5 - CERTIFICATES

5.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the specification sections.

5.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.

5.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of acceptable testing laboratories to validate certificates.

5.4 Submit certificates in duplicate and signed by an authorized representative of the certifying company.

PART 6 - CERTIFICATION OF TRADESMEN

6.1 Provide certificates, at the request of the Consultant, to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

END OF SECTION

Section 01350
Special Project Procedures

PART 1 GENERAL

.1 GENERAL INSTRUCTIONS

.1 Read and be governed by Conditions of the Contract and other Sections of Division 1.

.2 The purposes of the special project procedures are as follows:

.1 Special project procedures shall ensure the Contractor provides full accessibility to the existing building(s) under renovation or alteration forming the Work of the Contract to the patrons, staff suppliers, other contractors, visitors and the Public.

.2 RULES AND REGULATIONS FOR CONSTRUCTION PERSONNEL

.1 Fundamental to any and/or all rules and regulations, whether written and/or unwritten, is the fact that the Owner is the guardian of, and has full responsibility for the welfare and well-being of the patrons and staff.

.2 The following rules and regulations shall be construed as being general in nature and designed a guide for behavior of all construction personnel, including suppliers and their employees while performing the Work of this Contract in and/or on the properties of the Owner.

.3 Communication with the Owner's personnel and staff shall all be routed through the Consultant

.4 Where the Work of this Contract causes results which are detrimental to the operations of the Owner, or is distressing or disturbing to patrons, staff and personnel, to the point where the Project Manager feels that such work should stop until conditions change, then such work shall stop on order of the Project Manager.

.5 Where construction personnel perform Work of this Contract in more than one area of the building(s), such work shall be scheduled so that occupied areas are avoided during scheduled class times and activities. Where the aforementioned regulation is not possible, the Contractor shall have a frank discussion with the Project Manager and Consultant, and amicable arrangements shall be made.

.6 Objectionable work as deemed by the Owner must cease upon notification by the Owner. Said work must be rescheduled to after hours and/or weekends as approved by the City or actions are taken by the contractor to control/eliminate the deemed objectionable work. Objectionable work includes but is not limited to the following: chipping, hammer drilling, coring, grinding of steel/concrete, torquing, or any other activities that disturb the normal function of the building.

.3 RESTRICTIONS

.1 The Work shall be confined to the Place of the Work (Site) limits indicated on 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 Assume responsibility for care, custody and control of the Place of the Work (Site) and perform the Work to extent covered in Contract Documents. Make good damage to the existing Site and existing building(s) (if any) due to the Work of this Contract.

.3 Bring the following restrictions to the attention of the construction personnel and workers on the Work and enforce them;

.4 Restrict construction personnel and workers to Place of the Work and necessary access routes to it. Restrict non-construction personnel from the Place of the Work (Site), except for Contractor authorized visitors.

.5 Restrict construction activities in public, in Owner occupied areas, in locations designated to off-hours agreed in Preconstruction Meeting without additional cost to the Owner, and return these areas to normal operations as soon as possible.

4 OCCUPANCY OF THE EXISTING BUILDING(S)

.1 The existing building(s) will remain in full use and occupancy throughout the duration of construction of the Work of this Contract. Contractor shall schedule and perform the Work of this Contract so that conflict is minimized. The approximate extent of the building that will be made available to the Contractor is identified within the Contract Documents.

.2 Contractor shall perform the Work of this Contract in and around the existing building(s) at approved times and as mutually agreeable to the Owner, so not to inconvenience or hinder the occupation of the building(s) by the Owner, the Owner's personnel/staff and patrons.

.3 Give the Owner a minimum of seven (7) working days written notice of intention to commence work in a room, or area(s) of existing building outside of the areas identified for Contractor us so that he may prepare the space(s). Any disruption to the operation of the facility must be requested at least 48 hours in advance of the proposed work being carried out.

.4 Before the Work of this Contract begins and on a routine basis, construction personnel shall be thoroughly informed of the necessity to exercise **extreme** caution in any of their activities, which may interrupt an essential service serving the "occupied areas" for which an alternate supply, service or facility has not been provided.

.5 The Owner and/or his separate contractors reserve the right to enter the area(s) of Work of this Contract for the purpose of placing and/or fitting equipment before completion of the Work of this Contract. Such entry shall not interfere with or prevent the Contractor from performing the Work of this Contract. Also, such entry shall not in any way be considered as acceptance of the Work of this Contract by the Owner, or in any way relieve the Contractor from responsibilities under Work of this Contract.

.6 Any interruption(s) of mechanical and electrical services to "occupied areas" **must** be pre-arranged with the Consultant. Where any such interruption(s) is impossible to avoid, it shall be of the shortest duration possible and restricted to times acceptable to the Project Manager in writing. Contractor shall apply in writing to the Consultant well in *advance* of any contemplated and/or intended interruption(s).

.7 Construction personnel shall be confined to the enclosed construction areas except when absolutely necessary to perform work and duties directly connected to the Work of this Contract. Contractor shall make arrangements with the Consultant well in advance of work and/or duties required outside the enclosed construction areas.

.8 In order to reduce to a minimum the period of time required for Work of this Contract within the existing building(s), each area of Work of this Contract shall be pre-planned in complete detail and all materials for the entire work within the area shall be on hand or readily available. Before work in each area of the work of this Contract begins, the Contractor shall well in advance make arrangements to measure and review the areas to be *renovated* for the purposes of pre-planning.

5 RELOCATED COMPONENTS

.1 Disconnect services on items for relocation forms part of the work of Divisions 15 and 16.

.2 Disconnect fastening and anchorage of items to be relocated. Patch abandoned fastening and anchorage holes to match with and flush with adjacent surfaces.

.3 Carefully relocate items indicated and repair any damage received as a result of relocation in accordance with the Owner's written directions. Install relocated items level, plumb, square and in accordance with manufacturer's instructions. Re-fasten and anchor securely in place. Services re-connection of relocated items shall form part of the work of Divisions 15 and 16.

.4 Take delivery of existing components from the Owners storage to be incorporated in locations indicated. Modify existing items to suit new design requirements. Where modifications of the existing components is not possible to suit new locations, then augment and supply new components matching existing in every respect. Contract Price shall include for such conditions.

6 DUST FREE ENVIRONMENT

.1 It is imperative that the Owner's operational areas remain clean and dust free. It will be the Contractors responsibility to insure this. If the Contractor fails to maintain these conditions, the Owner reserves the right to retain the services of a professional maintenance company to fine clean the areas in question, and the invoiced costs for the cleaning services of the professional maintenance company shall be deducted from the Contractor's next progress payment.

.2 Be responsible to keep operational areas clean and dust free. Prevent contamination of and nuisance to adjacent areas and properties near the Work from dust by taking appropriate dust control measures. Take measures to prevent dust and dirt rising and migrating to occupied areas including return air systems and/or adjacent properties. Respond immediately to complaints of dust received from the Public, authorities having jurisdiction and the Owner.

.3 Adjacent work areas remaining in use by the Owner during construction period shall have furnishings and equipment covered and protected from dust under this Contract. Completely install the dust covers and prior to commencement of each of the Contractor's working periods and shall be also be removed upon the end of the Contractor’s work period. If required by the Owner, the Contractor shall also provide additional dust covers and keep them in clean and usable conditions.

.4 Before the Work proceeds, the Contractor shall provide temporary dust-proof partitions and screens constructed as specified in this Section, sealed at the floor, walls, ceilings, or intersecting members in a manner to prevent dust and dirt infiltration into adjacent areas of the building(s).

.5 Contractor shall leave work area(s) remaining in use by the Owner clean and ready for use between each work period.

7 Temporary Rigid Dust Tight Partitions and Screens

.1 Provide temporary dust tight partitions and screens where nature of Work requires access to floor areas above or below the floor being worked on to control dust migration and/or as specified herein and noted on Drawings. Maintain area of Work under negative pressure to prohibit migration of dust into other areas of the building. Refer also to Division 15 requirements for isolation of existing mechanical systems.

.2 Separate construction areas from occupied areas. Construct dust tight and wind proof screens as required to completely enclose the Work areas and the access passages to the Work areas from the other areas of the existing building(s). Maintain passage for Fire Department if required.

.3 Coordinate location of dust tight partitions, screens, weather barriers and doors with the Owner. Obtain the Owner’s approval of installed dust tight partitions, screens, weather barriers, protective coverings and protection methods before proceeding with the renovation/alteration work.

.4 Protective coverings shall be fire retardant coated, dust-proof fabric of premium grade, weighing minimum of 4.3 oz/sq.yd. (145 g/m 2), Polyweave® Flame -Retardant Fabric by Polytrap Products, or P9M Fire Retardant Fabric by Inland Plastics Ltd., or other manufacturer acceptable to the Owner.

.5 Fabricate and erect screens of 3-5/8" (92mm) metal studs at 16" (450mm) O.C., with 1/2" (13mm) gypsum board on both sides with closed joints.

.6 Tape or seal between adjacent boards and provide painted finish.

.7 Seal perimeter of cutouts around fixtures, fittings and penetrations.

8 Extend screens from floor to underside of structure above unless otherwise shown, noted or approved otherwise.

.9 Where applicable, construct screen partitions to provide required fire resistance ratings and smoke-tight separation to the approval of the authorities having jurisdiction.

.10 Where exposed to the weather, fully cover the temporary screens with a heavy waterproof and dust proof fabric or polyethylene with lapped and sealed joints. Where required to have sound attenuation, fill spaces between studs with 4" (100mm) thick, glass fibre or mineral fibre insulation batts to deaden sound.

.11 Thoroughly pack framing at junctions of screens with floors, walls and underside of structure with batt insulation and seal in a manner to prevent infiltration of dust, dirt, etc. Ensure that rooms within closed off areas which are not being altered are kept dust free.

.12 Install temporary packing at bottom of doors through screens and to elevator entrances not being used during demolition and construction. Prevent dust seepage into existing adjacent spaces and occupied areas.

.13 Remove screens and other temporary protection and make good damaged or blemished adjoining work when directed by the Owner and/or Consultant.

.14 Provide daily vacuuming of construction dust from corridors and connecting areas as the Work progresses. This shall be considered a minimum requirement; increase vacuuming as necessary.

8 Protection

.1 Protect existing services, structures, landscaping and other items required to remain and newly installed Work during construction with secure and durable coverings, barricades, hoardings or guards suitable for the various conditions and as specified herein. Protect adjacent surfaces and structures against damage which may occur from falling debris or other causes. Perform the Work in a manner to avoid damage.

.2 The Owner's patrons, staff, personnel shall be occupying the existing building(s) during the Performance of the Work. Provide for the safety of the existing building occupants and for the security of occupied areas. Provide protection and keep clear areas that are required for access to, and exit from, occupied areas. Maintain free, safe, protected, clear passage to and from the building(s) and the work area(s), refer to the Drawings for any specific hoarding or temporary partition locations. Maintain clear and safe fire exit routes as specified herein.

.3 Particular attention will be paid to the prevention of fire and the elimination of fire hazards which would endanger the work or adjacent building and premises. Contractor will provide and maintain all necessary fire extinguishers during the Work at all times, located at convenient and accessible points, and meeting the approval of the Owner.

.4 Where construction operations must be executed or traffic routed over finished floors, lay minimum ¼" (6mm) thick plywood coverings tightly fitted over surface in such areas. Secure plywood to prevent movement in a manner which will not damage finished surfaces.

.5 Where construction operations must be performed over finished roofs and waterproofed areas lay minimum ½" (13mm) thick plywood covering. Secure plywood to prevent damage and penetration of roof and waterproofed surfaces. Provide means to prevent wind uplift.

.6 Protect, relocate and maintain active building services to adjoining areas of building(s) without interruptions, except those required for connection for the Work which shall be coordinated with the Owner as specified herein. Make good all damage.

.7 It is essential that the existing building(s) be both water and weather-tight at all times. Therefore, the Contractor shall furnish all temporary protective enclosures, tarpaulins, etc… as may be required to protect openings made by the Work of this Contract.

.8 Protect the existing work to remain. Provide coverings and other protection materials.

.9 Where hoarding is required, as indicated on drawings, it shall consist of minimum 12mm plywood on temporary framing to minimum 2400mm above finished floor. Refer also to section 7.

.10 Cover openings in equipment, ducts and pipes until final connections are made.

.11 Protect exposed live electrical equipment during construction for personal safety.

.12 Shield and mark live electrical parts with appropriate warnings.

.13 Provide temporary doors for rooms containing electrical distribution equipment. Keep doors locked except when under the direct supervision of a qualified electrician.

.14 Wherever practical lock or barricade finished areas.

.15 As soon as construction is sufficiently advanced, enclose accessible openings to provide security. Provide temporary doors with security hardware.

.16 Ensure continuous security of the Work and construction equipment.

.17 Provide protection against the elements to maintain products and installations from damage and deterioration.

.18 Remove snow and ice immediately from parts of the Work except finished roofs. Do not use salt and avoid mechanical damage.

9 Design and Safety Requirements for Temporary Facilities

.1 Be responsible for design, erection, operation, maintenance and removal of temporary structural and other temporary facilities.

.2 Engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform these functions where required by law or by the Contract Documents, and in all cases where such temporary facilities and methods of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.

.3 Submit shop drawings bearing the seal and signature of registered professional engineering personnel skilled in the appropriate disciplines, indicating and showing temporary structural and other temporary facilities and methods of construction intended for the Work.

10 HOURS OF WORK

.1 No loud work may take place from 9am-10pm, Monday to Friday.

.2 Work outside of the hours outlined above may be requested in advance by the Contractor for review/acceptance by the Owner.

11 Waste Containers and Bins

.1 Provide waste containers and bins for the disposal of demolition waste and construction materials waste in compliance with the Owner’s waste management requirements.

.2 Waste containers and bins shall be “closed box” type to prevent the waste materials from being wind blown and contaminating the Owner’s property, adjacent private and Public properties.

.3 Sizes of the waste containers and bins shall be to fit the location(s) at the Place of the Work to the acceptance of the Project Manager and/or Consultant.

.4 The location(s) of the waste containers and bins shall be to the acceptance of the Owner. The Owner reserves the right to have the location(s) of the waste containers and bins re-located as required to suit the operations of the Owner and the building(s) at no additional cost to the Owner.

.5 Contractor and/or his subcontractors shall not use the Owner's and or the existing building's waste containers and bins for disposal of demolition waste and/or construction waste. If after investigation by the Owner, it is discovered that the Contractor and/or his subcontractors have used the Owner's and or the existing building(s) waste containers and bins for disposal of demolition waste and/or construction waste, the Owner reserves the right to back charge the said Contractor, deduct the equivalent costs from the Contractor's next progress payment for the use of the said waste containers and bins.

.6 If waste containers must be located on Municipal property, the Contractor shall be responsible for obtaining all necessary permissions/permits and bearing all associated costs.

END OF SECTION

Section 01400
Quality Control

PART 1- GENERAL

1.1 General Instructions

.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.

.2 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections. Preserve all original labels, containers and packaging of products for review by Consultant.

.3 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

1.2 Inspection and Testing by the Owner

.1 The Owner may appoint an independent inspection and testing company to carry out inspection and testing of the Work for conformance to the Contract Documents. Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

.2 Inspections and testing by the Owner will be promptly made. Uncover for examination any Work covered up prior to inspection or without approval of the Consultant. Make good such Work at no cost to the Owner.

.3 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.

1.3 Inspection and Testing

.1 Source and Field Quality Control specified in Other Sections:

.1 This Section includes requirements for performance of inspection and testing specified under Source Quality Control and Field Quality Control in other Sections of the specifications.

.2 Do not include in work of this Section responsibilities and procedures that relate solely to an inspection and testing company's functions that are specified in another Section which is paid for directly by the Owner.

.2 Do not limit responsibility for ensuring that products and execution of the work meet Contract requirements, and inspection and testing required to this end, to specified inspection and testing.

1.4 Qualifications of Inspection and Testing Companies

.1 Inspection and testing companies to be certified by the Standards Council of Canada.

.2 Companies engaged for inspection and testing shall provide equipment, methods of recoding and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.

.3 If requested, submit affidavits and copies of certificates of calibration made by an accredited calibrator to verify that testing equipment was calibrated and its accuracy ensured within the previous twelve months.

1.5 Tolerances for Installation of Work

.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.

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

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

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

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

.4 "Flush" shall mean within:

.1 6 mm for exterior concrete, masonry, and paving materials.

.2 1 mm for interior concrete, masonry, tile and similar surfaces.

.3 0.05 mm for other interior surfaces.

.3 Allowable tolerances shall not be cumulative.

1.6 Reference Standards

.1 Perform inspection and testing in accordance with Standards quoted and as required by procedures described in specified reference standards that are applicable to the work being inspected and tested.

1.7 Responsibilities of the Contractor

.1 Be responsible for quality control methods and procedures to ensure performance of the work in accordance with the Contract Documents.

1.8 Responsibilities of Inspection and Testing Companies

.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.

.2 Perform applicable inspection and testing described in the Specifications and as maybe additionally directed.

.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.

.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.

.5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:

.1 Performance of work that is not in strict accordance with the Contract Documents.

.2 Approval or acceptance of any part of the Work.

1.9 Inspection and Testing Procedures

.1 Perform specified inspection and testing only in accordance with specified reference standards, or as otherwise approved.

.2 Observe and report on compliance of the Work to requirements of Contract Documents.

.3 Ensure that inspectors are on site or at fabricator's operations for full duration of critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.

.4 Identify samples and sources of materials.

.5 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.

.6 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:

.1 Time and date of inspection.

.2 Temperature of air, materials, and adjacent surfaces.

.3 Humidity of air, and moisture content of materials and adjacent materials.

.4 Presence of sunlight, wind, rain, snow and other weather conditions.

.7 Include in reports all information critical to inspection and testing.

.8 Ensure that only materials from the work and intended for use therein are tested.

.9 Determine locations for work to be tested.

1.10 Defects

.1 Defective products, materials and workmanship found at any time prior to Contract Completion will be rejected regardless of previous inspections, testing, and reviews of the Work. Inspections, testing, and reviews shall not relieve the Contractor from their responsibility, but are a precaution against oversight or error. Remove and replace defective and rejected products, materials, systems, and workmanship. Be responsible for delays and expenses caused by rejection.

END OF SECTION

Section 01500
Temporary Facilities & Controls

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 REQUIREMENTS INCLUDED

.1 Barriers.

.2 Environmental Controls.

.3 Construction Aids.

.4 Use of the work.

.5 Traffic controls.

.6 Utilities.

.7 Protection.

.8 Office and sheds.

.9 Signs.

1.3 REMOVAL OF TEMPORARY CONSTRUCTION

.1 Temporary office facilities, toilets, barricades, storage sheds, utilities and other construction of temporary nature erected by the Trade Contractor shall be removed from the site by the Trade Contractor as soon as the progress of the Work will permit.

1.4 BARRIERS

.1 Exterior Hoarding: The Contractor will -

.1 Erect and maintain hoarding around perimeter of work site as required by governing authorities to protect the public, workers, public and private property from injury or damage.

.2 Provide barricades and covered walkways required by governing authorities for public rights-of-way.

.3 Provide barriers around trees and plants designated to remain. Protect from damage.

.2 Guard Rails & Barricades:

.1 The Contractor will administer and maintain a health and safety program. Contractor shall provide all perimeter guard rails and/or barricades to the building and at all floor openings, shafts and stairwells, etc. within the building as required by the Work. Such protection will be to the requirements of the Workers' Safety Insurance Board (WSIB).

.2 Trade Contractor shall remove and replace such guard rails and barricades, to accommodate the Work.

.3 Trade Contractor shall provide, maintain and adjust any other guard rails, barricades or safety platforms required by law and authorities having jurisdiction for protection of the Work and the workmen and for protection of the public.

1.5 ENVIRONMENTAL CONTROLS

.1 Weather Enclosures: The Contractor will provide weathertight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs as necessary to expedite the work.

.2 Dust Tight Screens:

.1 The Contractor will provide dust tight screens or partitions as necessary to localize dust generating activities, and for the protection of workers and finished areas of Work and the public.

.2 Trade Contractor shall relocate and maintain to accommodate the Work.

.3 Dust Prevention: Trade Contractor, where necessary, shall effectively water-sprinkle and dampen the workings, and roads used in the operation, and involved portions of the site with such frequency as will satisfactorily allay any dust during all hours that work is being performed.

.4 Noise Abatement: Trade Contractor shall comply with the requirements of Municipal and/or Provincial by-laws regarding noise abatement and shall take all necessary steps to ensure the generation and transmission of noise and vibration due to the work is kept to a minimum. Any such noise or vibration which is found to be objectionable shall be corrected at no additional cost to the Owner and to the satisfaction of the Contractor and the Consultant.

.5 Refer to specification 01350 for assembly requirements for dust proof screens.

1.6 USE OF THE WORK

.1 Site Storage/Loading:

.1 Contractor shall confine the Work and the operations of employees to limits indicated by the Contract Documents and as directed by the Owner and shall not unreasonably encumber the premises with products and materials.

.2 Contractor shall confine activities relevant to the work to areas within the designated working area. No fires, explosions or similar dangerous activities permitted on the site.

.3 Contractor shall conduct construction operations with minimum interference to adjacent roadways, sidewalks and access facilities in general and shall keep such areas free from materials, debris and equipment at all times.

.4 Contractor shall not load or permit to be loaded any part of the Work and existing structure with a weight or force that will endanger the Work and existing structure.

1.7 TRAFFIC CONTROL

.1 Access to Site:

.1 The Contractor will provide and maintain access road, sidewalk crossings, ramps and construction runways as may be required for access to the Work.

.2 Contractor shall co-operate and co-ordinate his operations with the Owner.

.2 Public Traffic Flow:

.1 Contractor shall provide and maintain flagpersons, traffic signals, barricades and flares/lights/lanterns as required to perform the Work and protect the public.

.3 Construction Parking:

.1 Contractor shall be responsible for arranging their own parking requirements; parking shall not be provided by Owner.

1.8 TEMPORARY UTILITIES

.1 Sanitary Facilities:

.1 Contractor is permitted to use Owner’s sanitary facilities.

.2 Temporary Water

.1 Use of existing building water service shall be made available to the Contractor and shall be coordinated with the Owner prior to commencing work.

.3 Temporary Heating & Enclosure:

.1 Provide for the proper heating and drying out of the building until completion by the use of appropriate heating equipment. Do not use “salamanders’. Use forced hot air type heaters operated in well-ventilated locations. Protect the floors, walls and ceilings around the heating units. Ensure that no damage by staining result to finished floors during operation, servicing and refueling.

.2 Maintain the heated parts of the building(s) or temporary enclosures at not less than 50°F (10°C), or at such temperature specifically stated in the sections of the Specifications, for the proper installation of the various Products.

.3 Provide at the Place of the Work and ready for operation between at least October 15th and April 30th, temporary plant and equipment for heating materials and forms and for maintaining the proper temperature and humidity of the concrete during curing. Refer to and comply with the requirements of CSA A23.1/A23.2-00.

.4 Duct carbon dioxide gas (CO2) or other noxious or harmful gases from heaters to the exterior of the building(s).

.4 Temporary Power & Light:

.1 Use of existing electrical power shall be made available to the Contractor by the Owner.

.2 Comply with the requirements of codes, by-laws and regulations governing temporary power and lighting at the location of the Work.

.3 Contractor will provide a power source on each floor in a central location. Each Subcontractor shall provide required extension cords from location where power is provided to location where it is needed.

.4 Contractor will arrange for general temporary lighting throughout Work areas. Each Subcontractor shall provide special task lighting required in the execution of the Work.

.5 Provide sufficient lighting to ensure sufficient visibility for the proper execution, safety and inspection of the Work.

.6 Comply with Construction Safety Association's "Temporary Wiring Standards on Job Sites", the Ontario Electrical Code, and other authorities having jurisdiction.

.5 Temporary first Aid Facilities

.1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Worker’s Compensation Act.

1.9 PROTECTION

.1 Protection for Off-Site & Public Property:

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

.2 Be responsible for damage incurred.

.2 Fire Protection:

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

.2 Open fires and burning of rubbish are not permitted on the site.

.3 Contractor shall take all necessary precautions to eliminate fire hazards and instruct Superintendent to make periodic inspections to ensure proper preventative measures are being complied with by all personnel working on the site.

.4 Paint and/or oil covered rags shall be stored in covered metal containers. Rubbish shall be removed daily, from building and site.

.5 Contractor shall comply with Provincial and Municipal fire safety requirements during the period of construction and other regulations pertaining to fire protection during construction work.

.6 Where torch cutting and electric welding are required by the Work, the trade concerned shall provide additional fire safety measures considered necessary to protect existing facilities from fire. A suitable fire extinguisher shall be provided by the applicable Trade Contractor adjacent to all welding operations.

.7 Precautions shall be taken at all times to prevent fire by spontaneous combustion.

.3 Protection of Building Finishes & Equipment:

.1 Contractor shall adequately protect his work at all stages of the operations and shall maintain the protection until his work is completed. Contractor shall remove and replace at his own expense any work and materials damaged, that cannot be repaired or restored to the Consultant's approval, due to inadequate protection being provided.

.2 Contractor shall be responsible for protection of existing work. If during the work, any existing work is damaged by the Trade Contractor, it shall be replaced without cost to the Owner and to the approval of the Consultant.

.3 Contractor shall provide, erect, and maintain adequate temporary barricades, warning signs, and lights for the protection of the public at all excavations, closures, detours, and points of danger where his work occurs outside the hoarding area.

.4 Security:

.1 Security for buildings and grounds will be provided by the Contractor.

1.10 OFFICES & SHEDS

.1 Offices & Sheds:

.1 Any temporary buildings, or other structures required by the Contractor, shall be provided by him in a condition and location acceptable to Owner. Contractor shall provide at his own expense, his own equipment for heating, lighting, plumbing and telephone for such buildings, subject to the approval of the Owner. Contractor may be required, at his own expense, to relocate his temporary building or buildings as often as required by the Owner to facilitate the efficient prosecution of the Work.

.2 First Aid: First aid facilities, including attendant, will be provided on the site by the Construction Manager, completely equipped in accordance with the requirements of the Workplace Safety Insurance Board (WSIB).

1.11 SIGNS & PUBLICITY

.1 Signs:

.1 Contractor will control the use of signs. Signs or advertising shall not be placed on site without the written prior approval of Owner.

.2 Trade signage shall not be erected or applied prior to approval of design and placement.

.2 Publicity: All publicity relating to this project is subject to the approval of the Owner and no mention of the project in advertising or articles in any publication will be permitted unless cleared through the Owner. Publicity or advertising implying endorsement of a product by the Owner will not be permitted.

END OF SECTION

Section 01610
Basic Product Requirements

PART 1 - GENERAL

1.1 Section Includes

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 Reference Standards

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

.2 Within text of specifications, reference may be made to additional reference standards.

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

.4 If there is question as to whether any product or system is in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

.5 The cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.6 Conform to latest date of issue of referenced standards in effect on date of submission of Bids except where specific date or issue is specifically noted.

1.3 Quality

.1 Refer to CCDC 2, GC 3.9.

1.4 Availability

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 Storage, Handling and Protection

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

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

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

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

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Consultant.

.9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 Transportation

.1 Pay costs of transportation of products required in performance of Work.

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

1.7 Manufacturer's Instructions

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

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 Quality of Work

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.

1.9 Co-Ordination

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 Concealment

1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.11 Remedial Work

.1 Refer to CCDC 2, GC 3.13.

1.12 Protection of Work in Progress

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

1.13 Existing Utilities

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

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

END OF SECTION

Section 01740
Cleaning

PART 1 - GENERAL

1.1 Section Includes

.1 Progressive cleaning.

.2 Final cleaning

1.2 Related Section

.1 Section 01770 - Closeout Procedures.

1.3 Reference Standards

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC2 2008, Stipulated Price Contract

.2 Additional references as per documents/contract.

1.4 Project Cleanliness

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

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

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

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use clearly marked separate bins for recycling.

.6 Remove waste material and debris from site and deposit in waste container at end of each working day.

.7 Dispose of waste materials and debris off site.

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

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

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

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

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

1.5 Final Cleaning

.1 Refer to CCDC2, GC 3.14.

END OF SECTION

Section 01770
Closeout Procedures

PART 1 - GENERAL

1.1 Section Includes

1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 Related Sections

.1 Section 01780 - Closeout Submittals

1.3 References

.1 Canadian Construction Documents Committee (CCDC)

.1 As per documents CCDC 2-2008, Stipulated Price Contract.

.2 Additional references as per documents/contract.

1.4 Inspection and Declaration

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

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

.2 Request Consultant's Inspection.

.2 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

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

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

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

.4 Certificates required by Boiler Inspection Branch Fire Commissioner Utility companies have been submitted.

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

.6 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner, Consultant, and Contractor. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article GC 5.4 - Substantial Performance of Work for specifics to application.

.6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment: When Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to documents CCDC 2, General Conditions Article GC 5.7 and terms of the documents/contract for specifics to application. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request re-inspection.

.8 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount as per documents CCDC 2, General Conditions Article 5.5 and per the terms of the documents/contract.

END OF SECTION

Section 01780
Closeout Submittals

PART 1 – GENERAL

1.1 Hand over to the Consultant comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.

1.2 Submit draft of the operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment, or as outlined as per documents. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft before Turnover.

1.3 Submit final version of operation and maintenance manuals prior to Contract Completion.

1.4 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to the Consultant.

1.5 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.

1.6 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.

1.7 Submit all material in English.

PART 2 – FORMAT

2.1 Organize data in the form of an instructional manual.

2.2 Provide both digital copy and hard copy as follows:

.1 Hard copy (1): Commercial quality, 219 x 279 mm, black 3-ring binder (thickness to suit).

.2 Digital copies (3): CD/DVD with jewel case

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

2.4 Cover: Identify each Manual with type or printed title "Contract Record Documents"; list title of Contract, identify subject matter of contents.

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

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

2.7 Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

2.8 Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

PART 3 - CONTENTS

3.1 Operation and maintenance manuals shall contain the following minimum information and data:

.1 Table of contents: Provide title of Contract; names, addresses, and telephone numbers of Consultants and Contractor with name of responsible parties; schedule of Products and systems, indexed to content of the volume.

.2 For each Product or system: List names, addresses and telephone numbers of Subcontractors, suppliers and service representatives, including local source of replacement supplies and parts including telephone numbers.

.3 Warranties: Warranties are between the Contractor and Owner. Warranties shall include, as a minimum:

.1 Description of warranty coverage.

.2 Date warranty starts.

.3 Date warranty expires.

.4 Contact name, address and phone number (the Contractor shall also be responsible for advising the Owner of changes in contact information during the warranty period).

.5 Equipment and components performance curves.

.6 Hydro certificates.

.4 Reports: For each Product or system provide the following:

.1 Manufacturer's certified reports

.2 Factory test reports.

.3 Field testing reports.

.5 Details of design, construction and/or fabrication features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.

.6 Technical data, Product data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.

.7 Schematics, interconnection lists: Manuals shall be complete with schematic and wiring diagrams, wiring interconnection lists and diagrams fully cross referenced and coordinated, printed circuit board layouts including the component identification, component parts list with electronic substitution equivalent. Provide cross referenced components lists and sequence of operations.

.8 Trouble shooting and fault location guide: Instructions to facilitate quick return of malfunctioning equipment to operation.

.9 Routine servicing and preventative maintenance schedule for Products and/or estimated hours required for routine servicing and preventative maintenance tasks.

.10 List of recommended spare parts and recommended quantity of each item to be stocked based on spare part availability and re-order time.

.11 Complete set of all reviewed shop drawings.

.12 Product data: Mark each sheet to clearly identify specific Products and component parts, and data applicable to installation; delete inapplicable information.

.13 Drawings: Supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams and as required in the Specifications.

.14 Typed text: As required to supplement Product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions and as required in the Specification.

PART 4 - DRAWINGS

4.1 Prepare all required drawings on CAD, using Autocad Version 2006 or higher.

4.2 Prepare CAD drawings to meet the requirements of the Owners or Consultant's CAD Standards and Procedures.

4.3 Supply and hand over to the Consultant, one full sized, original whiteprint, for each final drawing prepared under this Contract. These drawings are to incorporate all addenda and changes made during the construction period.

4.4 Prior to Contract Completion, supply and hand over to the Consultant, one complete set of CAD Drawing Files in Autocad format on storage media acceptable to Consultant for each final drawing prepared under this Contract, including but not limited to circuit drawings, equipment layout drawings, and shop drawings.

4.5 Refer also to specific requirements for Divisions 15 & 16.

4.6 If requested, the Consultant shall provide to the Contractor for a fee, a CD containing electronic representation of the drawings. Complete and return the "Standard License Agreement" in order to receive and use the electronic files. (To be provided by Consultant upon request).

END OF SECTION

Section 02061
Demolition & Removals

PART 1- GENERAL

Work Included in Section

.1 Various demolition and removals of existing and for provision of new work, as shown on architectural drawings.

.2 Restoration of damaged or disturbed Work.

.3 Removal of surplus materials from the site.

1.2 Related Sections

.1 Architectural demolition requirements for existing and new work - Divisions 2 through 16.

1.3 Qualifications

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

1.4 Examination

.1 Examine existing property. Determine nature and extent of materials to be removed.

.2 Examine adjacent properties. Determine extent of protection required.

1.5 Salvage

.1 Unless otherwise noted, materials from demolition shall become property of Contractor who shall promptly remove all salvageable material and debris from Site.

.2 Do not sell material on Site.

.3 The Owner will review Site prior to commencement of demolition and instruct the Contractor, in writing, as to the items to be retained for re-use or be turned over to the Owner.

.4 Store material to be salvaged, neatly on wooden pallets, where directed by Owner.

.5 Remove and store indicated items for future use by Owner. Remove, handle andtransport such items to storage area designated on Drawings or to an area within the site designated by Owner. Perform such work carefully and with diligence to prevent any damage to the items during removal and in storage.

1.6 Maintaining Traffic Hauling Operations

.1 Maintain and preserve Owner's access requirements within, to and from existing building in areas where demolition and removal work is being carried out.

.2 Do not close, obstruct, place or store material in Owner's driveways and passageways. Conduct operations with minimum interference with roads, streets, driveways, user traffic and passageways.

1.7 Hauling Operations

.1 Maintain roadways and paving in the hauling areas clean on a daily basis and as required by Municipal authorities.

1.8 Safety Requirements

.1 Undertake Work and effect arrangements required by authorities having jurisdiction for protection of public.

.2 Coordinate posting of danger signs conspicuously around property. Close doorways and thoroughfares giving access to area of demolition with barricades.

.3 Provide a competent, experienced supervisor in charge of the Work and on Site while Work is in progress.

.4 Demolition of spray or trowel-applied asbestos can be hazardous to health. Stop work and notify the Construction Manager immediately should material resembling spray or trowel-applied asbestos be encountered in the course of demolition work, which has not already been identified. Do not proceed until written instructions have been received from the Owner.

.5 Should any suspect designated substance not already identified, be encountered, cease work in the immediate area and immediately report, to the Owner. Owner is responsible for removal of designated substances.

1.9 Life and Fire Safety

.1 Provide fire extinguishers in acceptable locations to fire prevention authorities and of type suitable to enable personnel to cope with fire occurring during progress of Work.

1.10 Demolition Drawings

.1 Submit for approval; drawings, diagrams or details showing sequence of disassembly work and supporting structures.

.2 Submissions, if required, are to bear stamp of qualified professional engineer registered in Province of Ontario.

1.11 Protection

.1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, parts of existing building to remain. Make good damage caused by demolition.

.2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify Owner.

.3 Provide temporary weather enclosures to requirements of Division 1.

.4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.5 Provide and maintain necessary fire extinguishers throughout the work to the approval of the Fire Marshal, and located at convenient and accessible points.

.6 Protect work to remain against damage of any kind.

.7 Protect building floors and roofing against damage from operations under this Section, including lifting, moving, rolling, etc., of materials. Use 12.7 mm (1/2”) thick plywood covers with ends mechanically joined, over floor for any such handling. Over roof, provide 19 mm (3/4”) thick plywood under laid with 1” thick polystyrene insulation board adhered to same. Provide same when working from, or over roof surfaces. Be responsible for repairs to flooring or roofing for any damage caused. Execute such repairs to the satisfaction of, and at no cost to Owner.

PART 2 - PRODUCTS

Not applicable

PART 3 – EXECUTION

3.1 INSPECTION

.1 Visit and examine the site and note all characteristics and features affecting the Work of this Section.

.2 Ensure all services, whether buried; built-in or exposed are properly identified as to position, type of service, size, direction of flow.

.3 Inspect materials, equipment, components to be re-used or turned over to the Owner. Note their condition and advise the Consultant in writing of any defects or conditions which would affect their removal and re-use.

3.2 PREPARATION

.1 Prevent movement, settlement or damage of elements of the existing building which are to remain. Provide bracing, shoring and supports as required. Protect existing surfaces not to be restored from damage during concrete removal procedures.

.2 Cut and/or cap existing services within the work area, if any, prior to start of Work as required, but do not affect the services of areas not under construction or essential to the ongoing operation of the building.

.3 In all cases, exercise all reasonable care during removal operations to avoid damaging items to be salvaged, re-used, or items that are not part of the Scope of Work.

.4 Seal off all work areas to prevent dust and debris from affecting other areas outside of work area. Prevent public access to areas being repaired.

.5 Tape and/ or seal and provide protection to all mechanical and electrical services and all fire alarm and security devices still functioning adjacent to the work areas to prevent damage resulting from dust, water, or impact.

.6 Cover floor drains as required to prevent concrete, abrasive blasting debris or any other material from entering the drains. Ensure that all drains continue to operate as required during construction.

.7 Remove or protect in place all surface mounted or permanent fixtures not to be demolished from damage during demolition procedure.

.8 Apply filter cloth to all exhaust and ventilation vents within work area to prevent dust generated by the construction activity from escaping.

.1 Contractor shall clean, or replace filter cloth if the filter cloth becomes unsuitably dirty as determined by Consultant.

3.3 Demolition

.1 Execute Work in accordance with requirements of authorities having jurisdiction.

.2 At end of each day's work, leave Site in a safe condition and erect safety barriers and lights as required. Ensure that no parts of existing structure are in danger of collapsing.

.3 Perform demolition work where not specifically indicated, but required to make provisions for new Work.

.4 Provide any additional materials, labour and services required, not specifically mentioned or shown on Drawings, but necessary for proper completion of Work.

.5 Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

.6 Leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of areas not to be demolished from exterior elements.

.7 Demolition of concrete shall be performed by percussive techniques to prevent damage to the embedded reinforcing to remain and the supporting structural steel framing below.

.8 Provide shoring to support the slab when removals reduce its load-carrying capacity, as directed by the Consultant. No payment will be made for such shoring as it is to be included in the cost of repair as outlined in these documents.

.9 Materials forming permanent part of the building that require removal become contractor's property and must be removed from site daily, unless such materials are otherwise specified or shown on Drawings to be reused under this Contract (or turned over to Owner). Remove materials not suitable for reuse as shown on Drawings (as specified) from site.

.10 Leave building in a "broom-clean" condition on completion of work to Owner's satisfaction.

.11 Clean existing surfaces specified to receive new applied finishes to assure proper adherence.

.12 Clean existing surfaces to receive paint finish to paint manufacturer's written specifications and/or recommendations.

.13 Confine operations and workers to those parts of the building which are defined on Drawings, and exercise great care not to damage existing construction beyond that necessary for the carrying out new work and make good any such damage in every respect.

.14 Do not disturb adjacent items designated to remain in place.

.15 All required re-painting due to damage, overspray, etc. is the Contractor’s responsibility.

3.4 WASTE DISPOSAL

.1 Disposal of waste products and material is to be in strict accordance with the product manufacturer’s material safety data sheets and in accordance with the governing waste control regulations.

.2 The existing drainage system is not to be used to dispose of project wastes and / or materials

.3 Store volatile wastes or material in covered metal containers. All wastes which create hazardous conditions must be removed from the premises daily.

END OF SECTION

Section 06400
Architectural Millwork

PART 1 - GENERAL

1.1 Definition

.1 Architectural woodwork: Shall mean custom fabricated cabinetry, counters/countertops, wood door frames, custom fabricated wall/ceiling panels.

1.2 Quality Assurance

.1 The "Quality Standards" of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), Edition 2, 2014 together with authorized additions and amendments, shall be used as a reference standard and shall form part of this Project Specification.

.2 Where modifications to the AWMAC Quality Standards contained within the Manual are included in this Project Specification, then such modifications shall govern in case of conflict.

.3 Any reference in Custom or Premium grade in this Specification shall be as defined in the AWMAC Quality Standards.

.4 Any 'item not given a specific quality grade shall be Premium grade as defined in the AWMAC Quality Standards.

.5 All architectural woodwork to be used in the Project shall meet the requirements of the AWMAC Quality Standards for the particular grade specified.

.6 References in this Specification to part and item numbers mean those parts and items contained within the AWMAC Quality Standards Manual.

1.3 Submittals

.1 Shop Drawings:

.1 Prepare and submit to the Consultant for review Shop Drawings for architectural woodwork in accordance with 01330.

.2 Shop Drawings shall show wood and metal construction details of all architectural details of all general arrangements, locations of all service outlets: typical and special installation conditions; materials being supplied and all connections, attachments, anchorage and location of exposed fastenings, as applicable, field measured dimensions and coordination with other trade Contractors.

.3 Shop Drawings shall incorporate plans, elevations, sections and details for all architectural woodwork included in this Section.

.4 No Work shall be fabricated until the Shop Drawings have been reviewed and all other related submittals, and samples as required by the Specifications, have been approved by the Consultant.

.5 Submission of Consultant’s Drawings for Shop Drawings is not acceptable.

.2 Samples:

.1 Provide 3 samples of each plastic laminate, wood veneer and solid polymer surface to Consultant for review.

.3 Brochures:

.1 Submit manufacturer's descriptive literature of specialty items not manufactured by the architectural woodwork manufacturer as required by the Consultant.

1.4 Product Handling and Storage

.1 The architectural woodwork manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork are not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

.2 Architectural woodwork delivery, storage, and handling shall be in accordance with AWMAC Quality Standards.

.3 Delivered, materials which are damaged in any way or do not comply with these Specifications will be rejected by the Consultant and shall be removed from the job site and replaced with acceptable materials.

1.5 Warranty

.1 Warrant labour, materials and Workmanship against defects and deficiencies for a period of two (2) years after the date of Substantial Performance.

PART 2-PRODUCTS

2.1 Millwork

.1 General: Use clean stock only and comply with AWMAC Quality Standards grades as indicated.

.2 **Plastic Laminate (Plam)**: 1.6 mm thick, (allow for 3 colours)

.1 Manufacturer: Abet Laminati, Wilsonart, Nevemar, Pionite or Formica

.2 Colour: to be selected by Consultant from full colour range

.3 **Solid Polymer Fabrication (SO)**: Solid, mineral based, non porous surfacing material, acrylic; not coated, laminated or of composite construction; in accordance with ANSI Z124 Type 6 and meeting the following:

.1 Properties:

.1 Tensile strength (ASTM D638-84): 6000psi.

.2 Tensile modulus (ASTM D638-84): 1.5 x 10 psi.

.3 Elongation (ASTM D638-84): 0.4%

.4 Hardness (Rockwell “M” Scale): 94.

.5 Hardness (Barcol Impressor): 60.

.6 Gloss – 60 deg. Gardner 9ANSI Z124-80, HUD Bulletin UM-73-84): 5 – 20.

.7 Colour stability (NEMA LD3): no change 200 hours.

.8 Wear, cleanability (ANSI Z124-80, HUD Bulletin UM-73-84): pass.

.9 Fire hazard (ASTM E84):

.1 Flame spread: maximum 15.

.2 Smoke developed: maximum 25.

.10 Water absorption (ASTM D570-81): 0.04% @ 24 hours/0.4% @ long term for 19 mm thickness sample.

.11 Stain resistance (ANSI Z124).

.2 Acceptable Manufacturers:

.1 Solid Surface by Wilsonart

.2 Corian as manufactured by DuPont.

.3 Staron as manufactured by Samsung.

.3 Colour: To be selected by consultant from Colour Group 5 (one colour).

.4 Not Used

.5 Hardwood lumber: moisture content 12 % or less in accordance with National Hardwood Lumber Association (NHLA) and AWMAC premium grade.

.1 Species: poplar where scheduled to receive paint finish, white oak where scheduled to receive stain finish.

.6 Plywood: veneer core, softwood, 19 mm thick typical unless otherwise indicated.

.1 Softwood: to CSA 0151.

.2 Fir to CSA0121-M1978.

.3 Hardwood plywood: to CSA O115.

.4 Poplar plywood (PP): to CSA O153, standard construction

.5 Where plywood is used for wall construction, the Flame Spread rating must be 150 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.6 Where plywood is used in ceiling construction, the Flame Spread rating must be 25 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.7 Particle board: not permitted

.8 Medium density fibreboard (MDF): to ANSI A208.2, density 769 kg/m. Medium density fibreboard must:

.1 meet the performance requirements of ANSI A208.2.

.2 be manufactured such that formaldehyde emissions do not exceed [0.15] ppm (180 g/m) when tested in accordance with ASTM E 1333.

.3 contain at least [15] % recycled materials by weight.

.4 Where MDF is used for wall construction, the Flame Spread rating must be 150 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.5 Where MDF is used in ceiling construction, the Flame Spread rating must be 25 or less on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

.9 Sealant: As per 07920.

2,2 Millwork Hardware

.1 As per Drawings/details.

2.3 Millwork Finishing - General

.1 Finish all interior millwork surfaces in plastic laminate, unless otherwise indicated.

2.4 Fabrication - General

.1 Obtain all on-Site dimensions before fabricating items. Obtain all relevant data and incorporate provisions for items of equipment enclosed by millwork.

.2 Verify wall alignment prior to proceeding with fabrication. Site conditions at variance with reviewed Shop Drawings shall be specifically noted on reviewed Drawings and forwarded to Consultant. Variances, due to Site conditions necessitating revisions to Shop Drawings shall be accepted prior to fabrication.

.3 Fabricate running members in maximum standard lengths obtainable for the particular species wherever possible.

.4 Fit all joints tight. Locate joints at points which will not interfere with, affect strength or detract from appearance of materials.

.5 Securely fasten intersecting framing members together at corners in an approved manner. Reinforce as required for rigid assembly designed for applicable loads.

.6 Wherever practicable, install, fit and adjust all hardware specified, in shop.

.7 Incorporate adequate provisions for scribing and fitting to adjoining surfaces in a manner acceptable to Consultant.

.8 Provide for and incorporate provisions to recognize inherent shrinkage characteristics of materials specified.

.9 Casework core material: 19 mm veneer core plywood.

.10 Casework edge trim: Plastic laminate with plastic laminate millwork and solid wood lippings with wood veneer millwork.

.11 Plastic laminate finish at all exposed surfaces, including cabinet/drawer interiors unless noted otherwise.

2.5 Accessories

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; stainless steel finish elsewhere.

.2 Wood screws: to CSA B35.4 stainless steel, type and size to suit application.

.3 Splines: wood.

.4 Adhesive: recommended by manufacturer.

.5 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

PART 3 - EXECUTION

3.1 Job Conditions

.1 Job conditions for installation of architectural woodwork shall be as specified under AWMAC Quality Standards.

3.2 Installation

.1 Cabinet and Casework: Install in accordance with Section 705 of the AWMAC Quality Standards.

.2 Panelling and Trim: Install in accordance with Section 706 of the AWMAC Quality Standards.

.3 Finish Hardware: Install finish hardware in accordance with Section 711 of the AWMAC Quality Standards.

.4 All cutting and fitting of trim around fixtures and receptacles to be done as no extra cost to Contract.

.5 Scribe countertops to wall during installation. Install silicone sealant at backsplash/wall junction at time of installation. Colour to Consultan’s selection.

END OF SECTION

Section 07840
Firestopping

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY

.1 Section Includes: Furnishing of all labour, materials, services and equipment necessary for the supply and installation of firestopping as indicated on drawings and as specified.

.2 Related Work:

.1 Cast-In-Place Concrete: Section 03300

.2 Concrete Masonry Units: Section 04220

.3 Joint Sealants: Section 07920

.4 Gypsum Wall Board: Section 09250

.5 Mechanical: Division 15

.6 Electrical: Division 16

1.3 REFERENCES

.1 CAN4-S115-M85, "Standard Method of Fire Tests of Firestop Systems".

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01330 - Submittals.

.2 Product Data: Submit three copies of manufacturer's specification and installation instructions for each type of material required. Include data substantiating that materials comply with specified requirements.

.3 Shop Drawings: Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.4 Samples: Submit duplicate 300 mm x 300 mm (12" x 12") samples showing actual firestop material proposed for project.

1.5 DELIVERY, STORAGE, & HANDLING

.1 Comply with manufacturer's recommendations for handling, storage and protection during installation.

.2 Do not allow materials to become wet or soiled, or covered with ice or snow.

1.6 JOB CONDITIONS

.1 Examine substrate and the conditions under which the insulation work is to be performed. Do not proceed with firestopping work until unsatisfactory conditions have been corrected.

1.7 FIRE-RESISTANCE RATINGS

.1 Ratings of firestop systems shall be not less than the fire-resistance ratings noted on drawings and required by authorities having jurisdiction for firestopping of the floor, wall, ceiling and roof assemblies involved.

.2 Ratings of firestop assemblies for service penetrations shall be not less than the fireresistance rating of the floor, wall, ceiling or roof assembly being penetrated.

.3 Use only ULC tested firestopping assemblies as approved by the Consultant prior to firestop installations.

2.0 PRODUCTS

2.1 MATERIALS

.1 Firestopping Systems: In accordance with CAN4-S115-M85. All firestopping systems installed shall be from single manufacturer. Trade Contractors shall coordinate with General Contractor.

.1 Accepted Products:

.1 "Fire & Smoke Containment Systems" by Tremco Ltd., Construction Division.

.2 "Firebarrier Firestop Systems" by A/D Fire Protection Systems Inc.

.3 "Fire Protection Products" by Electrical Products Division/3M.

.4 "Firestop Systems" by Hilti (Canada) Limited.

. 5 Or approved alternative.

.2 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115-M85 and not to exceed opening sizes for which they are intended.

.3 Firestop System Rating: Equal to fire separation rating as noted on drawings.

.2 Service Penetration Assemblies: Certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.

.3 Service Penetration Firestop Components: Certified by ULC in accordance with CAN4-S115-M85 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.

.4 Fire-resistance rating of installed fire stopping assembly not less than the fire-resistance rating of surrounding floor and wall assembly.

.5 Firestopping at openings intended for ease of re-entry such as cables: Elastomeric or resilient seal; do not use cementitious or rigid seal at such locations.

.6 Firestopping at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: Elastomeric or resilient seal; do not use a cementitious or rigid seal at such locations.

.7 Primers: To manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): Potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: Non-sagging.

3.0 EXECUTION

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with firestopping materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

.1 Install firestopping material and components in accordance with ULC certification and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and un-penetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.3 INSPECTION

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

3.4 SCHEDULE

.1 Firestop at:

.1 Edges of floor slabs and rated roof slabs at slab edge covers, aluminum windows/curtain wall.

.2 Deflection space at top of fire-resistance rated masonry and gypsum board walls.

.3 Intersections of fire-resistance rated masonry walls to concrete and to gypsum board walls and of fire-resistance rated gypsum board walls to concrete and to masonry.

.4 Penetrations through fire-resistance rated masonry, concrete and gypsum board walls.

.5 Penetrations through fire-resistance rated floors, ceilings and roofs.

.6 Openings and sleeves installed for future use through fire separations.

.7 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.8 Firestopping around mechanical and piping assemblies penetrating fire separations by Division 15 - Mechanical. Firestopping systems and products to be coordinated with this specification section.

.9 Firestopping around electrical assemblies penetrating fire separations by Division 16 - Electrical. Firestopping systems and products to be coordinated with this specification section.

3.5 CLEAN-UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION.

Section 07900
Joint Sealants

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Labour, Products, equipment and services necessary for sealant Work in accordance with the Contract Documents.

.2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.

1.2 REFERENCES

.1 ASTM C834, Specification for Latex Sealants.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 SUBMITTALS

.1 Product data: Submit copies of Product data in accordance with the Conditions of the Contract describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Samples: Submit following samples in accordance with the Conditions of the Contract.

.1 Two samples of sealant/caulking, for colour selection.

.2 Two samples of back-up material and primer for physical characteristics.

1.4 QUALITY ASSURANCE

.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 SITE CONDITIONS

.1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 WARRANTY

.1 Submit a warranty for Sealant Work in accordance with General Conditions, except that warranty period is extended to 2 years. Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces. Warranty shall be for complete replacement including affected adjacent Work.

PART 2 - PRODUCTS

2.1 Materials

.1 General:

.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

.2 Sealant **Type A**: ASTM C920, Type M, Grade NS, Class 25; Two-part, Polyurethane non-sag type, in standard colours selected.

.1 Sikaflex 2C-NS by Sika Canada Inc.

.2 Dymeric 240 by Tremco Ltd.

.3 Sealant **Type B**: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.

.1 786 Mildew Resistant Silicone Sealant by Dow Corning Inc.

.2 Tremsil 200 Silicone Sealant by Tremco Ltd.

.4 Sealant **Type C**: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).

.1 Tremflex 834 Silconized Sealant by Tremco Ltd.

.2 CRL 800 Acrylic Latex Caulk with Silicone by CR Laurence Ltd

2.2 Accessories

.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible w ith primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

.3 Bond breaker: Type recommended by material manufacturers.

.4 Void filler around the window frames to be one part expanding polyurethane foam.

.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 Mixing

.1 Follow manufacturers instructions on mixing, shelf and pot life.

PART 3 – EXECUTION

3.1 Preparation

.1 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.

.2 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.

.1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.

.2 Ensure recess is dry.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.

.3 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

.4 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.

.5 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.

.6 Prime sides of recess, in accordance with sealant manufacturer's instructions.

.7 Condition products for use in accordance with manufacturer’s recommendations.

3.2 Installation

.1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.

.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth stains or other defects.

.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

.3 Make sealant bead uniform in colour.

.4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.

.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.

.6 Clean recesses and re-apply sealant.

.7 Remove masking tape immediately after joints have been sealed and tooled.

3.3 Cleaning

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.4 Schedule of Locations

.1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally seal following locations:

.1 Concrete, masonry, wood and stone to metal.

.2 Wood to masonry, concrete and stone.

.3 Metal to metal.

.4 All dissimilar materials.

.2 Sealant **Type A**:

.1 Exterior joints between masonry and steel or aluminum.

.2 Exterior joints between masonry and shelf angle.

.3 Exterior joints between steel or aluminum and concrete or masonry.

.4 Interior and exterior control joints, except in floors.

.5 Door frames, louvre frames, interior and exterior side.

.6 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.

.7 Seal thresholds.

.3 Sealant **Type B:**

.1 Control joints in tiled areas.

.2 Between vanity and tile.

.3 Between vanity and mechanical fixtures/fittings.

.4 Between access panels and tile.

.5 Between tiles and adjacent materials.

.4 Sealant **Type C:**

.1 Perimeter of interior windows.

.2 Perimeter of firehose cabinets.

.3 Junction between drywall and masonry.

END OF SECTION

PART 1 - GENERAL

1.1 Work Included

As detailed or scheduled in the contract documents, supply of:

.1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.

.2 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.

.3 Solid core wood doors.

1.2 References

.1 ANSI/NFPA 80-1999, Standard for Fire Doors and Fire Windows

.2 ASTM A653/A653M-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM C553-02, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications

.4 ASTM C578-05, Specification for Rigid, Cellular Polystyrene Thermal Insulation

.5 ASTM C591-01, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation

.6 ASTM C592-04, Specification for Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction

.7 ASTM C1289-05a, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.8 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies

.9 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

.10 CGSB 41-GP-19MA (1984), Rigid Vinyl Extrusions for Windows and Doors

.11 CSA W59-2003, Welded Steel Construction (Metal Arc Welding)

.12 CSDMA, Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000

.13 CSDMA, Selection and Usage Guide for Steel Doors and Frames, 1990

.14 CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products – 08 11 00, 2006

.15 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

.1 Quality Standards for Architectural Woodwork (Latest addition).

1.3 Submittals

.1 Submit shop drawings in accordance with Section 01330.

.2 Indicate each type of door, frame, steel, construction and core.

.3 Indicate material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, paneled or louvered) and arrangement of standard hardware.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule of the Architect.

.5 Contractor responsible for coordination and installation of products provided under this Section shall;

.1 Verify and provide to the contractor responsible for the supply of steel door and frame products, actual opening sizes and field conditions by field measurement before fabrication. Submittal drawings shall reflect measurements and conditions provided, and product manufactured accordingly. Coordinate field measurements with fabrication and construction schedules to avoid delays.

.2 Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.

.6 Manufacturer shall not proceed with fabrication without receipt of approved submittal drawings and approved hardware schedule.

1.4 Warranty

.1 Materials and workmanship shall be warranted by the manufacturer for a period of one (1) year from date of substantial performance.

PART 2 - PRODUCTS

2.1 Hollow Metal Door Materials

.1 Acceptable Materials: Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

.2 Steel: Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.1 Interior Doors: Face sheets shall be 0.042 in. (1.0 mm) minimum thickness.

.3 Door Core Materials

.1 Interior Doors: Fiberglass: Loose batt type, density 24 kg/m3 (1.5 pcf) minimum, conforming to ASTM C553 or ASTM C592.

.4 Primers

.1 Rust inhibitive touch-up only.

.6 Miscellaneous

.1 Door Silencers. Single stud rubber/neoprene type.

.2 Exterior Top Caps. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

2.2 Glass and Glazing

1 General: All materials under work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content limits.

.2 Tempered glass **(TGL)**: CAN/CGSB-12.1-M, Type 2, Class B, Category II, minimum 6 mm thick, clear.

2.3 Fabrication – Hollow Metal Frame Products

.1 Frame products shall be 16 gauge. Interior frames, transoms, sidelight and window assemblies shall be welded type construction. Exterior transom frames, sidelight and window assemblies shall be welded type construction, thermally broken.

.2 Frame product shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Mortised cutouts shall be protected with steel guard boxes.

.4 Frame product shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.5 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm (60") provide two (2) anchors, and an additional anchor for each additional 760 mm (30") of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from the top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum. Fasteners for such anchors shall be provided by others.

.6 Minimum reinforcing, anchor and other component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.7 Each door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings, except on gasketed frame product.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.9 Fire-rated frame products shall be provided for those openings requiring fire protection as determined and scheduled by the Architect. Frames, transom and sidelight assemblies shall be listed for conformance with CAN4-S104. Window assemblies shall be listed for conformance with CAN4-S106. All fire-rated frame products shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated frame products shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers

.10 Provide grout guards fabricated from not less than 0.016 in. (0.4 mm) thick steel at all hardware mortises on frame product to be grouted.

2.4. Welded Type

.1 Frame product shall be accurately mitered or mechanically jointed.

.2 As defined in Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", frame product perimeter corner joints shall be:

.1 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.

.3 Joints at mullions, sills and center rails shall:

.1 Be coped accurately, butted and tightly fitted.

.2 At intersecting flush profile faces, be securely welded, filled and ground to a smooth, uniform, seamless surface.

.3 At intersecting recessed profile faces, be securely welded to concealed reinforcements, with exposed hairline face seams.

.4 At all other intersecting profile elements, have exposed hairline face seams.

.4 Welding shall conform to CSA W59.

.5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two (2) holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm (6") of the base of the jamb, shall be substituted.

.6 Weld in two (2) temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.

.7 Glazing stops shall be formed steel channel, minimum 16 mm (0.625") height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access, when advised by the contractor responsible for coordination or installation, as specified on the Architect's drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.

.9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.

.10 Refer to drawings/details/schedules for frame depth/throat opening sizes

2.5 Fabrication – Hollow Metal Doors

.1 General

.1 Interior doors shall be welded stiffener construction. Exterior doors shall be laminated core construction.

.2 Longitudinal edges shall be continuously welded, filled and sanded with no visible edge seams.

.3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for template hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.4 Holes 12.7 mm (0.5") diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm (0.5") diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.5 Doors shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.6 Top and bottom of doors shall be provided with inverted, recessed, welded steel channels. Exterior doors, and where otherwise scheduled by the Architect, shall be provided with flush steel top caps.

.7 Minimum reinforcing and component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.9 Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Architect. Such products shall be listed for conformance with CAN4-S104. All fire-rated doors shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated doors shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.10 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.

.2 Welded Stiffener Construction (Interior Doors)

.1 Both face sheets for interior doors shall be formed from a sheet of 18 gauge steel.

.2 Doors shall be reinforced with vertical stiffeners, securely welded to each face sheet at 150 mm (6") on center maximum.

.3 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.

PART 3 - EXECUTION

.1 Site Storage and Protection of Materials

.1 Doors and frame product shall be removed from their wrappings or coverings upon receipt on site, be stored in a vertical position, and be spaced with blocking to permit air circulation between them.

.2 All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported, in writing, to the supplier.

.3 All damages incurred during shipment shall be noted on the carrier's Bill of Lading and immediately reported, in writing, to the supplier.

.4 Any scratches or disfigurement of doors or frame product caused by shipping or handling shall be promptly cleaned and touched-up with a zinc-rich primer.

.5 All materials shall be properly stored on planks or dunnage, out of water and covered to protect from damage from any cause.

.2 Installation

.1 Prior to installation, remove temporary shipping spreaders.

.2 Prior to installation, the area of floor on which the frame is to be installed, and within the path of the door swing, shall be checked and corrected for flatness.

.3 Door and frame product shall be checked for correct size, swing, rating and opening number.

.4 Caulk perimeter of frames between frame and adjacent material.

.5 Set frames plumb, square, level and at correct elevation.

.6 Fire-rated door and frame product shall be installed in accordance with the terms of their listings, NFPA-80, or the local Authority Having Jurisdiction (AHJ).

.7 Secure anchorages and connections to adjacent construction.

.8 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1200 mm (48") in width.

.9 During the setting of frame product, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

.10 Grout guards and junction boxes are intended to protect hardware mortises and tapped holes from masonry grout of 4 in. (101 mm) maximum slump consistency that is hand troweled in place.

.11 Frame products are not intended or designed to act as forms for grout or concrete. Grout hollow metal sections in "lifts" or take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.

.12 Keep hollow metal surfaces free of grout, tar, and/or other bonding materials or sealers. Promptly clean grout, tar, and/or other bonding materials or sealers off of frame product and doors.

.13 Remove wood spreaders after frames have been built-in.

.14 Make allowance for deflection to ensure structural loads are not transmitted to frame product.

.15 Install doors, and hardware in accordance with hardware templates and manufacturer's instructions.

.16 Adjust operable parts for correct clearances and function.

.17 Install louvers, glazing and door silencers.

.18 Finish paint in accordance with Section 09910.

END OF SECTION

Section Number 08120
Interior Aluminum Doors and Framing

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Design, labour, Products, tool, equipment and services necessary for aluminum work in accordance with the Contract Documents.

1.2 REFERENCES

.1 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

.2 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.3 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.4 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.5 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.6 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.7 ASTM C920, Specification for Elastomeric Joint Sealants.

.8 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.9 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.10 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.11 CAN/CGSB 1.108-M, Bituminous Solvent Type Paint.

.12 CAN/CGSB 79.1-M, Insect Screens.

.13 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.

1.3 DEFINITION

.1 Aluminum work: Shall mean aluminum storefront, entrances, operable units, vestibules, doors, and framing mentioned in Part 2 of this Specification Section.

1.4 DESIGN REQUIREMENTS

.1 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 (under uniformly distributed positive design wind load), and 10 mm maximum regardless of span.

.2 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

.3 Provide all reinforcing within aluminum members as required by design and OBC to provide structurally sound assembly. In any case, mullion size shall not be increased due to provision of reinforcing.

.4 Design aluminum work and connections to substrate where the bottom of the aluminum work extends to a point below 1070 mm above finished floor level and separates a floor level from an adjacent interconnected space to withstand the required guard and handrail loads in accordance with the OBC and applicable local regulations. When requested by Consultant, provide a letter signed and sealed by a Professional Engineer certifying that the aluminum work conforms to the OBC requirements.

1.5 SUBMITTALS

.1 Shop drawings: Submit shop drawings in accordance with the Conditions of the Contract indicating:

.1 Plans, sections, details, type of extrusions, profiles, finishes, panels, operating components, doors, related flashings, closures, fillers, and end caps, and sealants.

.2 Products and glazing types.

.3 Anchorage inserts, system installation tolerances.

.4 Section and hardware reinforcement, anchorage, assembly fixings.

.5 Detailing, locations, and allowances for movement, expansion, contraction

.6 Path of cavity drainage and air pressure equalization.

.2 Samples: Submit two samples of following in accordance with the Conditions of the Contract.

.1 250 mm long samples of each type of extrusion and finish.

.2 250 x 200 mm samples of insulating glass unit.

.3 One complete corner detail of door frame, glazing, and finish for each door type.

.4 Each door and window hardware item for Consultant's approval.

.5 200 x 200 mm sample of insect screen for operable windows for Consultant's approval of fibreglass mesh.

.3 Reports:

.1 Submit substantiating engineering data, and independent test results of pretested, aluminum work to substantiate compliance with the design criteria including air leakage and water penetration conforming to ASTM E283 and ASTM E331.

.2 Submit documentation to substantiate ten years of experience in aluminum window and door manufacture and installation.

.4 Close-out submittals: Submit window data for incorporation into the Operations and Maintenance Manual as part of the Conditions of the Contract.

1.6 QUALITY ASSURANCE

.1 Mock-up:

.1 Fabricate, deliver, and erect one, full scale mock-up of each type of aluminum work, in location acceptable to Consultant.

.2 Demonstrate full range of Products, finishes, textures, quality of fabrication, and workmanship.

.3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Handle aluminum work in accordance with AAMA CW-10.

.2 Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.8 EXTENDED WARRANTY

.1 Submit a warranty for aluminum work in accordance with General Conditions, except that warranty period is extended to 5 years.

.1 Warrant against failure to meet the design criteria and requirements such as interior leakage, insulating glass unit failure, finish degradation, frame condensation.

.2 Coverage: Complete replacement including affected adjacent Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)

.1 Interior Partition Framing: 'Trifab VG 450' by Kawneer Company Canada Limited with SSG at vertical joints (typ), or equivalent per Specification 01250.

.3 Aluminum Interior doors:

.1 '350 Swing Doors' by Kawneer Company Canada Limited.

.3 Equivalent per Specification 01250.

2.2 MATERIALS

.1 All materials under Work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.

.1 Profile and dimensions: Refer to Contract Drawings.

.2 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.

.3 Reinforcements and anchors: ASTM A167, Type 304 to AISI No. 2B finish. Size as shown.

.4 Glass and glazing materials: As specified in Section 08800.

.5 Spandrel panel insulated panel airseal backpan: ASTM A653/A653M; 0.9 mm thick, Z275 galvanized steel sheet.

.6 Frame sealant: Type as recommended by the aluminum work manufacturer.

.7 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.

.8 Anchors, clips, and angles: Extruded aluminum or stainless steel.

.9 Shims and blocking for frame: Rigid plastic, wood is not permitted.

.10 Flashings, closures and trim: 1.0 mm minimum aluminum sheet, finish to match curtain wall extrusion finish.

.11 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304.

.12 Isolation coating: CAN/CGSB-1.108-M; Bitumastic coating, acid and alkali resistant material.

2.3 FABRICATION

.1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.2 Fabricate aluminum work systems in accordance with reviewed shop drawings and manufacturer's written instructions.

.3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints for weatherproof seams.

.4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.5 Do not expose manufacturer's identification labels on aluminum assemblies.

.6 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate filler and closure pieces as necessary for a complete and weather tight installation.

.7 Position operable windows on main frame to provide direction of opening specified, free and smooth operation, without binding or sticking against main frame members.

.8 Fabricate doors and frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

.9 Fabricate aluminum work closures and trim from aluminum sheet. Form to profile shown. Make weathertight.

.10 Double weatherstrip windows and doors. Install weatherstripping in specially extruded ports and secure to prevent shrinkage or movement.

.11 Fabricate glazing recess with drainage to exterior.

2.4 ALUMINUM DOORS

.1 Fabricate doors of welded construction.

.2 Glazing stop: Aluminum, square, snap-on type, designed for glazing system.

2.5 FINISH

.1 Extrusion finish: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31.

.2 Doors: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install aluminum work in accordance with reviewed shop drawings, manufacturer's written instructions, and CSA A440/A440.1.

.2 Install Work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.3 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.

.4 Install flashings, closures, and trim pieces.

.5 Fill voids between aluminum framing and adjacent construction with foam insulation.

.6 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.

.7 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08800.

.8 Automatic door operators to be supplied and installed by Section 08700. Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.

.9 Install aluminum door manufacturer's standard weatherstripping at door frame perimeter. Install weatherstripping throughout entire length and width of doors at jambs and heads.

.10 Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.

.11 Adjust operable parts for correct function.

.12 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.

.13 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.2 ERECTION TOLERANCES

.1 Tolerances: Non-cumulative.

.1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.

.2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.

.3 Vertical and horizontal positions: +/- 3 mm.

.4 Racking of face: 6 mm, nil in elevation.

.5 Operable components: Consistent with smooth operation and weatherproof performance.

.6 Maximum perimeter sealant joint between aluminum work and adjacent construction: 13 mm.

3.3 JOINT BACKING AND ALUMINUM WORK SEALANT

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at aluminum work and perimeter joints for weather tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.4 CLEANING

.1 Maintain aluminum work, inside and outside, in clean condition throughout construction period.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Remove CSA A440/A440.1 certification labeling when directed by Consultant, in writing.

.4 Wash aluminum work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

Section Number 08350
Folding Grilles

PART 1 - GENERAL

1.01 SUMMARY

.1 Section Includes:

.1 Side-folding aluminum grilles.

.2 Operating hardware and supports.

1.02 PERFORMANCE REQUIREMENTS

.1 All locking posts shall allow for horizontal sway without pressure to side walls of track from trollies while opening and closing the curtain.

.2 All post's standard locking hardware and handles shall be flush within post with exceptions for exit hardware.

1.03 REFERENCES

.1 ASTM International (ASTM) B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.04 SUBMITTALS

.1 Submittals for Review:

.1 Shop Drawings: Indicate track layout and dimensions including pocket, required curves, types and locations of posts, required locking and hardware, options, finish and installation details.

.2 Product Data: Provide information on grille construction, components, materials, and finishes.

.2 Closeout Submittals:

.1 Operation and Maintenance Data

1.05 WARRANTIES

.1 Provide manufacturer's 2 year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

.1 Basis of design: MobilFlex Inc as distributed by Tri-S Industries Ltd

.2 Equivalent products by the following manufacturers are acceptable:

.1 Dynamic Closures Corporation. (www.dynamicclosures.com)

.2 CHI Overhead Doors. (www.chiohd.com)

.3 Overhead Door Corp. (www.overheaddoor.com)

.4 Wayne-Dalton Corp. (www.wayne-dalton.com)

.5 Equivalent products per Specification 01250.

2.02 MATERIALS

.1 Aluminum Extrusions: ASTM B221, 6063-T5 or T6 alloy and temper.

2.03 COMPONENTS

.1 "SYSTEM S-525" by MobilFlex Inc.

.2 Curtain: The top and bottom of each section will be fitted with an aluminum panel 4” high. This panel will consist of an aluminum extrusion 1/16” thick and composed of modules with a 15° angle between them to facilitate the operation of the closure. The curtain is constructed of vertical rods of 5/16” (8mm) diameter spaced out at every 3“ (76mm). These rods are linked together by 2” (51mm) modules spaced vertically every 14” (356mm), by aluminum sleeves of 1/2” (12.7 mm) in diameter.

3 Locking:

.1 Lead post shall be equipped with a hook bolt lock with MobilFlex cylinders each side.

.2 Lead post shall engage a full height wall jamb.

.3 Trailing post shall be self-locking at the top and bottom inside the storage pocket.

.4 Free floating intermediate posts shall be located at all curves and at intervals not exceeding 10 feet (3M), 6 feet (2M) for counter top units. Intermediate posts shall be equipped with self-adjusting spring loaded drop bolts activated from the inside only. Drop bolts shall engage dust proof stainless steel receptacles.

4 Track: Curtain shall be hung from an overhead track 1-5/16” (33mm) wide by 1-9/16” (40mm) high. Track shall be aluminum 6351 alloy tempered to T6.

.5 Stacking: Stacking shall not exceed a depth of 1.15” per foot of closure width plus 3” for each post (lead, end or intermediate). (95mm/lin. M. + 76mm per post). Full egress doors add 7” (176mm).

.6 Finish: clear anodized.

PART 3 – EXECUTION

3.01 INSPECTION

.1 Verify that all preparation work has been completed by other trades.

.2 Verify dimensions of opening prior to installation.

3.02 INSTALLATION

.1 Install assembly in accordance with manufacturer's instructions.

.2 Anchor to adjacent construction without distortion or stress, level and plumb, to provide smooth operation.

3.03 ADJUSTING

.1 Adjust grilles for smooth operation throughout full operating range.

END OF SECTION

Section 08710
Finishing Hardware

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements listed in Division 1

.2 Furnish, deliver and install finish hardware.

.3 It is intended that the following list of hardware will cover finish hardware to complete the project. Bring to the Architect's attention any omissions, discrepancies that will affect work in this section during the bidding period.

1.2 QUALITY ASSURANCE

.1 Meet all requirements of the local building code and all other applicable regulations.

.2 Qualified suppliers must have in their employ a Certified A.H.C. (Architectural Hardware Consultant) as licensed by the Door and Hardware Institute. The supplier must have a minimum of two (2) years experience furnishing hardware for similar projects. Only firms that can extend manufacturers warranty to the project are to be considered as suppliers.

.3 Inspection of supplied Finishing Hardware will be done by a Certified A.H.C. A complete Site Inspection Report will be issued to the Architect.

1.3 SUBMITTALS

.1 Upon request, provide mounted samples of hardware items to be supplied.

.2 Prepare and submit two (2) copies of a detailed hardware schedule listing product numbers, size and finishes. Include two (2) sets of catalog cuts.

.3 Furnish other sections with two (2) complete sets of hardware templates for related fabricating and installation.

.4 Submit for owner review and comments two (2) key schedules listing the door number, hardware heading or item, and the key group.

.5 Where electrical hardware is to be supplied, provide wiring diagrams showing all wire termination points. Where electrical hardware is to be supplied and installed provide the contractor with riser diagrams listing the correct wire runs and back box sizes as well as 115 VAC requirements.

.6 Where required in Division 1, provide two (2) operating manuals for the owners use. Include copies of the hardware schedule, templates, installation instructions and all maintenance data.

1.4 PRODUCT DELIVERY, HANDLING, AND STORAGE

.1 Deliver each hardware item in its original package complete with all fasteners, keys, templates, and installation instructions required for installation.

.2 Clearly mark each container with the door opening number and the hardware schedule item or heading number.

.3 The contractor must store hardware delivered in a secure area. The storage area must contain adequate shelf space to hold all the hardware off the floor. Ensure the area is kept dry and clean.

.4 When requested, package items of hardware separately for delivery to other fabricators for their installation.

1.5 WARRANTY

.1 Provide a written warranty for a period of two (2) years for all hardware supplied and a five (5) year warranty for the door closers.

.2 When requested provide extended warranties listed in Division 1.

PART 2 PRODUCTS

2.1 See Hardware Schedule

PART 3 EXECUTION

3.1 INSPECTION

.1 The consultant will inspect all the door openings to ensure the specified products are supplied and installed in accordance with the manufacturers instructions. A written report will be furnished to the Architect detailing openings where products are missing, installed incorrectly or in need of proper adjustment.

3.2 INSTALLATION

.1 The general contractor shall obtain a copy of ANSI/DHI A115.1G-94,"Installation Guide for Doors and Hardware". It is the intent of this document to be used as a reference guide in the proper handling, storage, and installation of finishing hardware, and doors and frames. This document can be obtained through the Door and Hardware Institute.

.2 Other trades installing hardware must follow all manufacturers instructionsincluding door closer adjustment, handing of locksets as required, and degree of door swing. Advise the consultant if door frames are not square and plumb and prevent proper door hardware installation.

.3 Use only the original manufactures fasteners for the installation of all hardware products. Drill and tap doors and frames, where required, to properly install finishing hardware products.

.4 Mount hardware to suit door elevations. Unless otherwise directed by the consultant, install hardware at the following mounting heights:

Locksets	40"	(1015mm)
Exit device	40"	(1015mm)
Push/Pull	42"	(1065mm)
Deadlock	48"	(1200mm)

.5 Manufacturers of specified products are responsible to instruct hardware installers in the proper installation methods of their products.

3.3 FIELD QUALITY CONTROL

.1 Verify each door leaf opens closes and latches. Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements. Test access control system and electrified hardware devices for proper operation, owner to sign off on verification of operation. Verify electric door release hardware operates properly upon activation of the fire alarm system.

.2 Perform bi-monthly on-site inspections during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

.3 Before completion of the work but after the hardware has been installed, submit a certificate to the architect stating that final inspection has been made and that hardware has been checked for installation and operation by a technician from the manufacturer and hardware consultant

3.4 ADJUSTING AND CLEANING

.1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

.2 Adjust doors with self-closing devices or automatic closing devices for operation after the HVAC system is balanced and adjusted. Adjust spring power of non sized door closers to close and latch the door.

.3 Hardware to be left clean and free of disfigurements.

.4 Instruct owner personnel in the proper operation, adjustment and maintenance of hardware.

.5 Check locked doors against approved keying schedule.

3.5 PROTECTION

.1 Protect hardware from damage during construction. Wrap locks, panic hardware, and fire exit hardware, door pull trim with kraft paper or plastic bubble materials to protect finish from damage until date of substantial completion. Remove and reinstall or where necessary, use temporary hardware to maintain finish in new condition and maintain manufacturer's warranty.

3.6 HARDWARE SCHEDULE

.1 See attached Schedule of Finishing Hardware

END OF SECTION

Hardware Group No. 001

For use on Door #(s):
D01
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW 127 X 114	652	IVE
1	EA	STOREROOM LOCK	L9080L 06B	630	SCH
1	EA	REQUEST TO EXIT	BY SECURITY / ELECTRICAL		UNK
1	EA	MORTISE CYLINDER	MEDECO GMK TO SUIT BY UTSC	626	MED
1	EA	ELECTRIC STRIKE	HES 1500C	630	HES
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	AUTO OPERATOR	SW200I PULL SIDE	689	BES
2	EA	ACTUATOR	REUSE EXISTING		UNK
1	EA	RELAY CONTROLLER	CX-33		CAM
1	EA	KICK PLATE	CBH 903 200 X 40MM LDW	630	CBH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 120/240 VAC	LGR	SCE
1	EA	HID R40 CARD READER	BY SECURITY CONTRACTOR		UNK
1	EA	SECURITY DOOR MODULE	SDM BY SECURITY CONTRACTOR		UNK

NOTES: CARD READER
DOOR ALWAYS CLOSED AND SECURE.
PRESENTATION OF VALID CREDENTIAL ACTIVATES CORRIDOR SIDE OPERATION BUTTON AND UNLOCKS ELECTRIC STRIKE.
FREE EGRESS AT ALL TIMES.
COORDINATE REQUIREMENTS WITH SECURITY CONTRACTOR

Hardware Group No. 002

For use on Door #(s):
D02
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	PUSH/PULL BAR	9190EZHD-205MM-NS	630	IVE
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	AUTO OPERATOR	SW200I PULL SIDE	689	BES
2	EA	ACTUATOR	CM-45-4	630	CAM

Hardware Group No. 003

For use on Door #(s):
D03
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 127X114MM	652	IVE
1	EA	CLASSROOM LOCK	L9070L 06B	630	SCH
1	EA	MORTISE CYLINDER	MEDECO GMK TO SUIT BY UTSC	626	MED
1	EA	WALL STOP	WS406/407CVX	630	IVE

Section 08800
Glazing for Interior Applications

PART 1 - GENERAL

1.1 References

.1 Canadian Door and Window Manufacturers, Certification Program.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

.2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.

.3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.

.4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.

.5 CAN/CGSB-12.5-M86, Mirrors, Silvered.

.6 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.

.7 CAN/CGSB-12.8-97, Insulating Glass Units.

.8 CAN/CGSB-12.9-M91, Spandrel Glass.

.9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.

.10 CAN/CGSB-12.11-M90, Wired Safety Glass.

.11 CAN/CGSB-12.12-M90, Plastic Safety Glazing.

.12 CAN/CGSB-12.13-M91, Patterned Glass.

.13 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings

.3 Flat Glass Manufacturers Association (FGMA), Glazing Manual

1.2 Submittals

.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures. Where indicated, Shop drawings shall be sealed by a qualified professional engineer licensed to designs structures and registered in Place of the Work.

1.3 Closeout Submittals

.1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01780 - Closeout Submittals.

1.4 Quality Assurance

.1 Installer shall comply with GANA (Glass Association of North America) - Glazing Manual other relevant standards, guidelines, and the Ontario Building Code

.2 Tempered glass:

.1 Tempered and heat strengthened glass shall be horizontally treated; vertical treatment will not be acceptable. Fabrication and treatment shall be such that distortion lines (where they occur) run horizontally (parallel to sill and head) after installation.

.2 Tempered glass shall bear the manufacturer’s identification as to thickness. Such identification for glazing shall be permanently etched so as to be visible after glass has been installed. Glass other than fully tempered (FT) glass shall not have etched labels.

.3 Identification: Label each pane of glass and glass unit with type, thickness, quality, and colour of glass and with manufacturer’s trade name

.4 Glazing: Glazing compounds and methods shall conform with applicable requirements of GANA Glazing Manual.

.5 Where glass and glazing is located less than 1m (40”) above finished floor, it shall be designed as a guardrail as per OBC 4.1.5.14. and shall be tempered.

PART 2 – PRODUCTS

2.1 General:

.1 Where safety glass is indicated or where required by applicable laws and safety codes, laminated glass shall be employed for interior and exterior wood or steel door glazing, interior glass doors, and interior glass panels.

.2 Glazing to be used for interior and exterior wood or steel door glazing, interior glass doors, and interior glass panels shall be heat treated to strengthen glass in bending to not less than 4.5 times annealed strength. Glass shall have minimal waviness or distortion and with all areas free of tong marks

2.2 Glass

.1 Clear Tempered Glass: Clear tempered glass for indoor use such as glass panels shall conform to ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 Glazing Compounds

.1 Glazing Gaskets: Continuous, closed-cell, moulded or extruded neoprene or vinyl rubber of profile and hardness required to withstand seal, channel type, manufactured for glazing in type of metal doors and frames indicated, shall conform to applicable requirements of ASTM C509-06 (2011) Standard Specification for Elastomeric Cellular Performed Gasket and Sealing Material.

.2 The Consultant shall select the colour of glazing gasket from the manufacturer's standards. Gaskets shall be capable of being compressed 40 percent of their original size and shall have 100 percent recovery capability.

.3 Glazing tape: Synthetic rubber or polyurethene foam glazing tape, sheet or strip material reinforced and stabilized with fabric mesh in the centre and treated with a bonding agent on both contact surfaces.

Alternatively,

.4 High density, closed cell, flexible, non-extruding tape, adhesive backed one side only: recommended by manufacturer for exterior applications with normal pressure in glazing channel

.5 Acceptable products recommended by glass manufacturer suitable for conditions of application and use.

6 Spacers: Silicone material or continuous extrusions of hardness required by the glass manufacturer to maintain glass panes in place for installation indicated

.7 Glazing Adhesive Compounds:

.1 For face glazing: elastic glazing compound, manufactured for back bedding and face glazing of metal sash, in the colour to be selected by the Consultant from the manufacturer's standard

.2 Include door manufacturer's glass retaining clips or brackets for face glazing

.3 Elastomeric Joint Sealant: sealant for glass to glass edge joints shall be silicone sealant black in colour and conforming to ASTM C920 Standard Specification for Elastomeric Joint Sealants

.8 Silicone glazing (Weatherseal) sealant – for exterior door use:

.1 Medium-modulus, neutral-curing silicone sealant' shall comply with ASTM C920- 08 Standard Specification for Elastomeric Joint Sealants, Type M or S, Grade NS, Class 25

PART 3.0 - EXECUTION

3.1 Installation of Glazing

.1 Obtain field dimensions for each opening that is to receive glass and cut each glass to provide the optimal bit on, and clearance from, the sash or frame.

.2 Clean the surfaces that are to receive the glass and glazing materials. Surfaces shall be free of dirt, corrosion, residue, oils, and any other substance that may impair adhesion of glazing materials.

.3 Clean contact surfaces with solvent and apply primers to surfaces to receive tapes and sealants in accordance with the glass manufacturer's written instructions.

.4 Ensure all finishes are fully dry before installing the glazing.

.5 Seal porous glazing channels or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive glazing compound.

.6 Do not perform glazing when ambient temperature is below 4 degrees Celsius

.7 Ensure humidity level is low before installation.

.8 Install glazing according to manufacturers' specifications.

.9 Ensure space between double-glazing is perfectly clean before installing the second panel.

3.2 General Glazing requirements:

.1 Comply with the general provisions of GANA Glazing Manual and the Ontario Building Code for minimum glazing requirements, and ensure that minimum frame lap (minimum grip of glass) and edge clearances are provided as required for the size of openings. Provide for expansion and contraction of glass as required.

.2 Conform with the manufacturers' latest published installation instructions and recommendations for glazing of tempered glass, laminated glass, and insulating glass. Follow manufacturer's latest published instructions for protection of edges and sizing of glass.

.3 Install glass in fire rated assemblies in accordance with NFPA 80.

.4 Provide setting blocks at quarter points along the bottom of the glass pane. Blocks shall support the glass 1.5875 mm above the metal. Provide spacers to hold glass in centre between stops

.5 Provide spacers for glass panes where length plus width is greater than 1270 mm

.1 Locate spacers directly opposite each other on both inside and outside faces of the glass. Install correct size of spacers and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements

.2 Provide 3.2 mm minimum bite of spacers on glass and use thickness equal to sealant width.

.6 Adjust glazing channel dimensions as required by conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

.7 Protect glass edges from damage during handling and installation. Remove damaged glass from project site and dispose in accordance with municipal waste management and recycling requirements. Glass is considered to be damaged if edge damage, or other imperfections that, when installed, could weaken the glass and impair performance and/or appearance.

.8 Glazing of hollow metal doors and frames: glass shall be set around all edges with glazing gaskets hereinbefore specified. Provide setting blocks and spacers blocks as required. Set gasket legs on both sides of glass. Gasket shall be continuous, notched only at top rail in the centre. Compress gasket at least 15 percent to form a tight seal.

.9 For indoor glass panels: - set glass panes with proper orientation so that coating faces the correct specified direction

3.3 Tape Glazing:

.1 Position tapes on fixed stops so that, when compressed by the glass, their exposed edges are flush with or protrude slightly above sightline of stops.

.2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

.3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

.4 Follow tape glazing manufacturers documented instructions for application.

3.4 Finishing

.1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

3.5 Cleaning and Replacement

.1 Upon completion of glazing, remove paint spots, splatters, and other blemishes from glass

.2 Assure that each light is identified as to type and grade of glass

.3 Remove and replace glass panes that are cracked or broken and where distortion is evident and distracting, as determined by the Consultant.

.4 Remove paper labels, wash, and polish glass just before acceptance by Consultant.

.5 Protect glass against damage from subsequent construction activities and vandalism.

END OF SECTION

Section 09110
Steel Stud Framing for Interior Partitions

PART 1 - GENERAL

1.1 Description of System

.1 Non-load bearing steel framing includes non-load bearing steel studs framing members for interior framing systems (eg., partition walls, framed bulkheads, furring, etc.) as well as interior suspension systems (eg., supports for ceilings, suspended bulkheads, etc.).

1.2 References

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

.2 AISI North American Standard for Cold-Formed Steel Framing – Product Data

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

.4 ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

.5 ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.6 ASTM A1003 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-coated for Cold-Formed Framing Members

.7 ASTM C645 Standard Specification for Nonstructural Steel Framing Members

.8 ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.9 ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements]

.10 ASTM E413 Classification for Rating Sound Insulation

.11 ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

.12 ASTM E1190 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

.13 CAN/ULC S101 Standard Methods of Fire Endurance Tests of Building Construction and Materials

.14 CSSBI LSF Technical Bulletin Volume 7, Number 1 Maximum Height Tables for Interior Non-Load Bearing Partitions.

1.3 Quality Assurance

.1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate nonload bearing interior steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULS-S101.

.2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413.

.3 Retain a Professional Engineer registered in the province of Ontario to design the Lightweight Steel Framing System where indicated in drawings; to prepare, seal and sign all shop drawings; and to perform field review. Shop drawings shall show both design and installation requirements.

1.4 Design Criteria

.1 Conform to the requirements of fire-rated assemblies as scheduled in drawings/details which have been tested in accordance with CAN/ULC-S101 and provide fire resistance ratings as indicated.

.2 For Interior non-load bearing studs, conform to minimum design thickness, web depth and flange width as outlined in CSSBI Maximum Height Tables for interior non-load bearing partitions.

.3 A non-load bearing (non-structural) member is defined as a member in a steel-framed system which is limited to transverse (out-of-plane) load of not more than 480 PA, a superimposed axial load, exclusive of sheathing materials, of not more than 1460 N/m, or a superimposed axial load of not more than 890 N.

.4 A load bearing (structural) stud may be used in a non-load bearing application; however, non-load bearing members (studs or track) may never be used in a load bearing (axial and/or wind loading) applications.

.5 Track for interior walls and non-load bearing walls located at exterior walls shall have a thickness of not less than the thickness of the corresponding studs and shall have not less than 31.8 mm flanges.

.6 Connections between light steel framing members shall be by sheet metal screws, welding or crimping.

.7 Load bearing assemblies/applications/details:

.1 Design shall be based on Limit States Design principles using factored loads and resistances.

.2 Loads and load factors shall be in accordance with the National Building Code of Canada.

1.5 Submittals

.1 Make submittals in accordance with Section 01330 Submittals.

.2 Product data: For each product indicated.

.3 Submit shop drawings clearly indicating all construction details including connections and anchor requirements. Indicate type, size and spacing of fastening devices. Indicate design loads. Include seal and signature of Professional Engineer registered in the Province of Ontario for all components requiring structural design. Engineered connections are required for the following locations:

.1 Laterally braced head restraint at glazed partitions

.2 Support at head track for Folding Aluminum Closure Screen

.3 Additional locations as identified in drawings/details.

PART 2 - PRODUCTS

2.1 Materials

.1 Non-load bearing Steel Framing, General

.1 Steel sheet components shall comply with ASTM C645 requirements for metal, unless otherwise indicated.

.2 Steel for non-load bearing members shall have metallic coatings that conform to ASTM A653M or ASTM A792M with minimum metallic coating weights (mass) of Z120 and AZM150 respectively. Alternative coatings shall be permitted to be used if proven to have equivalent corrosion protection.

.3 Framing members shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) for conditions indicated.

.2 Suspension System Components

.1 Tie wire shall comply with ASTM A641/A641M zinc-coated, soft-annealed, 1.21 mm minimum diameter, or of a material and size having equivalent corrosion resistance and strength.

.2 Hanger attachments to concrete: Anchors shall be fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 2 times that imposed by construction as determined by testing by an independent testing agency according to ASTM E488.

.1 Type: Post-installed, expansion anchor

.3 Power-actuated fasteners, suitable for application indicated, shall be fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 2 times that imposed by construction as determined by testing by an independent testing agency according to ASTM E1190.

.3 Hanger wire shall comply with ASTM A641/A641M zinc-coated, soft-annealed, 3.77 mm minimum diameter, or of a material and size having equivalent corrosion resistance and strength.

.4 Carrying Channels

.1 Channels shall conform to ASTM C754 and shall be cold-firmed from steel with minimum 228 MPa yield strength and 1.37 mm base steel thickness.

.2 Channels shall have a minimum coating of Z120 galvanizing in accordance with ASTM A653/A653M. Other coatings (eg. Aluminum-zinc alloy to ASTM A792/A792M) providing equal or better corrosion protection may also be used.

.3 Carrying channels shall have minimum 12.7 mm wide flanges and minimum depth of 38 mm.

.5 Furring Members

.1 Furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and with minimum 12.7 mm wide flanges and a depth of 19.1 mm.

.2 Steel stud shall be manufactured from steel in accordance with the AISI North America Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base Steel thickness of 0.455 mm and depth as indicated on drawings.

.3 Hat-shaped, rigid furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and minimum depth of 22.2 mm. The minimum width of furring attachment flanges shall be 12.7 mm.

.4 Resilient furring channels are designed to reduce sounds transmission and shall have a minimum depth of 12.7 mm.

.6 Steel Framing for Framed Assemblies

.1 Steel studs and track shall be in accordance with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have minimum base steel thickness of 0.455 mm and a depth as indicated on drawings.

.2 Slip-Type Head Joints: Where indicated, provide one of the following:

.1 Deflection Track: steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and width to accommodate depth of studs.

.2 Single Long-Leg Track: track complying with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) with 50.8 mm deep flanges in thickness not less than indicated for studs, installed with studs frication-fit into top track and with continuous bridging located within 305 mm of the top studs to provide lateral bracing.

.3 Double-Track System: track complying with AISI North American Standard for Cold-Formed Steel Framing (Product Data), inside track with 50.8 mm deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction fit inside track.

.3 Flat Strap and Backing Plate

.1 Sheet steel for blocking and bracing in length and width indicated.

.2 Minimum base steel thickness is 0.455 mm.

.4 Channel bridging shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm with minimum 12.7 mm wide flanges and depth of 19.1 mm.

.5 Hat-shaped, rigid furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have minimum base steel thickness of 0.455 mm, a minimum depth of 22.2 mm. The minimum width of furring attachment flanges shall be 12.7 mm.

.6 Resilient furring channels are designed to reduce sound transmission and shall have a minimum depth 12.7 mm.

.7 Furring channels shall comply with the AISI North American Standard for Cold-Formed Steel Framing (Product Data) and shall have a minimum base steel thickness of 0.455 mm and with minimum 12.7 mm wide flanges and a depth of 19.1 mm.

.1 Furring Brackets: adjustable, corrugated-edge of steel sheet with minimum base steel thickness of 0.79 mm.

.2 Tie wire shall comply with ASTM A641/A641M zinc-coated, soft-annealed, 1.21 mm minimum diameter, or of material and size having equivalent corrosion resistance and strength.

.9 Z-shaped Furring: with slotted web or non-slotted web, face flange of 31.8 mm, wall attachment flange of 22.2 mm, and depth steel thickness of 0.455 mm, and depth required to fit insulation thickness indicated.

.10 Fasteners for Metal Framing: of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates in accordance with ASTM C1002.

.11 Isolation strip at exterior walls: provide one of the following:

.1 Asphalt-saturated organic felt: ASTM D226, Type 1 (no. 15 asphalt felt), perforated.

.2 Foam gasket: adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

PART 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.

.1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Suspended Assemblies: coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangars at spacing required to support the work and that hangars will develop their full strength.

.1 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 Installation, General

.1 Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

.1 Gypsum Plaster Assemblies: also comply with requirements in ASTM C841 that apply to framing installation.

.2 Portland Cement Plaster Assemblies: also comply with requirements in ASTM C1063 that apply to framing installation.

.3 Gypsum Veneer Plaster Assemblies: also comply with requirements in ASTM C844 that apply to framing installation.

.4 Gypsum Board Assemblies: also comply with requirements in ASTM C840 that apply to framing installation.

.2 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

.3 Install bracing at terminations in assemblies.

.4 Do not bridge building control and expansion joints with non-load bearing steel framing members. Frame both sides of joints independently.

3.4 Installing Suspension Systems

.1 Install suspension system components in sizes and spacings indicated on drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

.2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

.3 Suspended hangers from building structure as follows:

.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

.1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

.2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

.1 Size supplemental suspension members and hangers to support ceiling loads Within performance limits established by referenced installation standards.

.3 Wire Hangers: secure by looping and wire tying, either directly to structure or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

.4 Do not attach hangers to steel roof deck unless otherwise approved.

.5 Do not attach hangers to permanent mental forms. Furnish cast-in-place hanger inserts that extend through forms.

.6 Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

.7 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.4 For fire-resistance-rated assemblies, wire tie furring channels to supports.

.5 Installation Tolerances: install suspension systems that are level to within 3 mm in 3.6 m measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 Installing Framed Assemblies

.1 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

.2 Install studs so flanges within framing system point in same direction.

.1 Space studs as follows:

.1 Single-layer application: 406 mm o.c., unless otherwise indicated.

.2 Multilayer application: 406 mm o.c., unless otherwise indicated.

.3 Tile backing panels: 406 mm o.c., unless otherwise indicated.

.3 Install track floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions of structure.

.1 Slip-Type Head Joints: where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies die to deflection of structure.

.2 Door Openings: screw vertical studs at jambs to jamb anchor clips to door frames; install track section (for cripple studs) at head and secure to jamb studs.

.1 Install two studs at each jamb, unless otherwise indicated.

.2 Install cripple studs at head adjacent to each jamb stud, with a minimum 12.7 mm clearance from jamb stud to allow for installation of control joint in finished assembly.

.3 Other Framed Openings: frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

.4 Fire-Resistance-Rated Partitions: install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

.5 Sound-Rated Partitions: install framing to comply with sound-rated assembly indicated.

.6 Curved Partitions

.1 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

.2 Begin and end each arc with a stud, and space intermediate stud equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 150 mm o.c.

.4 Direct Furring

.1 Screw to wood framing.

.2 Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 610 mm o.c.

.5 Z-Furring Members

.1 Erect insulation as specified and hold in place with Z-furring members spaced 610 mm o.c.

.2 Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 610 mm o.c.

.3 At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 305 mm from corner and but insulation to fit,

.6 Installation Tolerance: install each framing member so fastening surfaces vary not more than 3 mm from the plane formed by faces adjacent framing.

END OF SECTION

Section 09250
Gypsum Board

PART 1 - GENERAL

1.1 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C1396 Standard Specification for Gypsum Board

.2 ASTM C 475-94, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C 514-94, Specification for Nails for the Application of Gypsum Board.

.4 ASTM C 557-93a, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.5 ASTM C 840-95, Specification for Application and Finishing of Gypsum Board.

.6 ASTM C 954-93, Specification for Steel Drill Screws for the Application of Gypsum Board.

.7 ASTM C 1047-94, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.8 ASTM C1177-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

.9 ASTM C1178M -08, Standard Specification for Coated Glass Mat Water Resistant Gypsum Backing Panel

.10 ASTM C1658-06, Standard Specification for Glass Mat Gypsum Panels

.11 ASTM C1629M-06, Standard Classification for Abuse Resistant Non Decorated Interior Gypsum Panel Products and Fiber Reinforced Cement Panels

.12 ASTM D3273-00, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-1988, Building Materials and Assemblies, Standard Method of Test for Surface Burning Characteristics of.

1.2 Site Environmental Requirements

.1 Maintain temperature minimum 10C, maximum 21C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

PART 2 - PRODUCTS

2.1 Materials

.1 Standard Gypsum Board: to ASTM C1396, Type X, 15.9mm (5/8” thick, 1200mm (4’-0”) wide x maximum practical length.

.2 Abuse Resistant Gypsum Board; Heavy duty glass mat facers with dense water resistant treated gypsum core to ASTM C1658 and ASTM C1629, Type X, 15.9mm (5/8”) thick, 1220mm (4’0”) wide x maximum practical length. Score of 10 (no mould growth) as per ASTM D3273). Provided to 1220mm (4’-0”) above finished floor at all new partitions unless noted otherwise.

.3 Not used.

.4 Steel drill screws: to ASTM C 1002.

.5 Stud adhesive: to CAN/CGSB-71.25 ASTM C 557.

.6 Laminating compound: as recommended by manufacturer, asbestos-free.

.7 Shadow gap: Bailey D300 Metal trim, CGC Dur-a-bead or Nicolson Rollforming No 114, fillable edge trim, 0.55mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A 525-93; perforated flanges; one piece length per location. To be used at the junction of all dissimilar materials and/or as detailed.

.8 Corner bead: Bailey D100-90, 90-degree corner trim fillable edge trim, 0.55mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A 525-93; perforated flanges; one piece length per location.

.9 Control joints: No 093 Zinc Control Joints by CGC Inc or Nicholson Rollforming. To be installed where indicated on drawings.

.10 Sealants: in accordance with Section 07900 - Joint Sealers.

.11 Acoustic sealant: concealed purpose made, non-skinning, non hardening type to CAN/CGSB-19.21-M87, as manufactured by Tremco or Monsey-Bakor, USE Hickson

.12 Sound attenuation insulation (acoustic batt insulation type 'C')

.1 Mineral or fiberglass sound attenuation batt or boards to ULC S702 and as required by fire rated tests.

.2 Thickness: full stud thickness or as otherwise stated on the Drawings and Schedule.

.13 Joint compound: to ASTM C 475, asbestos-free. Latex resin base, possessing good adhesion, mixed with fresh, unadulterated water having no detrimental effects on compounds. Type recommended by manufacturer for application indicated.

.14 Joint reinforcing tape; for gypsum board; 50mm (2") x 0.3mm (0.01") thick perforated paper with chamfered edges. Use alkali resistant glass-fiber tape at tile backer locations.

.15 1 hour rated walls to be filled with absorptive material processed from rock or slag with a mass of at least 2.8 kg/m^2 for 89mm thickness and completely filling the wall cavity.

PART 3 - EXECUTION

3.1 Erection

1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C 1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.10 Install wall furring for gypsum board wall finishes in accordance with ASTM C 840, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated

3.2 Application

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply 12 mm (1/2”) diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts,in partitions where perimeter sealed with acoustic sealant.

3.3 Installation

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150mm oc using contact adhesive for full length.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.

.6 Construct control joints of preformed units two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Locate control joints where indicated at changes in substrate construction at approximate 10m spacing on long corridor runs at approximate 15m spacing on ceilings.

.9 Install control joints straight and true.

.10 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Splice corners and intersections together and secure to each member with 3 screws.

.13 Install access doors to electrical and mechanical fixtures specified in respective Sections.

.1 Rigidly secure frames to furring or framing systems.

.14 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.15 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.16 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.17 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.18 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.19 Mix joint compound slightly thinner than for joint taping.

.20 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.21 Allow skim coat to dry completely for walls receiving high gloss paint and where indicated.

.22 Remove ridges by light sanding or wiping with damp cloth.

.23 Fasten board to metal support members by metal gypsum board screws at, 9.5mm (0.374”) minimum to , and 12.7mm (1/2”) maximum from, center of joints. Space screw:

.1 At ceilings of fire rated board at 200mm (8”) o.c. at edges and in field unless indicated otherwise.

.2 At walls of fire rated board at 200mm (8”) o.c. at edges and 305mm (12”) o.c. in field Locate screws opposite one another in adjacent panels unless indicated otherwise.

.3 At typical board walls at 400mm (16”) o.c. at edges and field unless noted otherwise.

.4 At typical board ceilings at 305mm (12”) o.c. at edges and field unless noted otherwise.

.24 When installing fiberglass mat faced mould and moisture resistant gypsum board do so as per manufacturers recommendations. Tape joints with self adhesive fiberglass tape and embed the tape in setting type compound. Finish joint with two layers of all purpose joint compound. High build primer should be applied to surface before painting. As with regular paper faced gypsum board, in areas where gloss paint is to be applied or in areas of critical light a skim coat should be applied to the surface before priming and painting.

END OF SECTION

Section 09500
Suspended Acoustical Ceilings

1 GENERAL

1.1 SECTION INCLUDES

.1 Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section

1.2 SUMMARY

.1 Section Includes

.1 Acoustical ceiling panels

.2 Exposed gird suspension system

.3 Wire hangers, fasteners, main runners, cross tees, and wall angle moldings

.4 Perimeter Trim

.2 Equivalent Products

.1 As per Section 01250 – Product Substitution Procedures.

.2 Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

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

.1 ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

.2 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

.3 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

.4 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

.6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

.7 ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

.8 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

.9 ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

A. Armstrong Fire Guard Products

.10 ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint

.11 ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems

.12 ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

.13 ASTM E 1264 Classification for Acoustical Ceiling Products

.2 ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

.3 Ontario Electrical Safety Code

.4 ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall

1.5 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

.2 Shop Drawings:

.1 Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

.3 Samples:

.1 Submit following sample panels in accordance with Section 01330.

.1 Minimum 6 inch x 6 inch samples of specified acoustical panel

.2 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees

.4 Certificates: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

.1 If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

.5 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01780.

1.6 QUALITY ASSURANCE

.1 Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

.1 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

.2 Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

.3 Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

.2 Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer,

NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

.3 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

.2 Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

.3 Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 SITE CONDITIONS

.1 Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

.2 HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

.3 HumiGuard Max Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Ceilings with HumiGuard Max performance can be installed in conditions up to 120°F (49°C) and maximum humidity exposure including outdoor applications, and other standing water applications, so long as they are installed with either SS Prelude Plus, AL Prelude Plus, or Prelude Plus Fire Guard XL suspension systems. Products with Humiguard Max performance can be installed in exterior applications, where standing water is present, or where moisture will come in direct contact with the ceiling. Only Ceramaguard with AL Prelude Plus suspension system can be installed over swimming pools.

1.9 WARRANTY

.1 Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following

.1 Acoustical Panels: Sagging and warping

.2 Grid System: Rusting and manufacturer's defects

.2 Warranty Period

.1 Acoustical panels: Ten (10) years from date of substantial completion

.2 Suspension: Ten (10) years from date of substantial completion

.3 Ceiling System: Thirty (30) years from date of substantial completion

.3 The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 MAINTENANCE

.1 Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

.1 Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed, for each ceiling type/pattern.

.2 Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed, for each ceiling type/pattern.

2 PRODUCTS

2.1 MANUFACTURERS

.1 Ceiling Panels: Model numbers for acoustic ceiling tiles and grid as manufactured by Armstrong World Industries, are listed to establish a standard of quality for design, function, materials, performance, workmanship, and appearance. The following manufacturers may be submitted for evaluation by the architect by following the conditions of the Product Substitutions Section 01250. The architect shall be the sole judge as to the acceptability of all products submitted for substitution.

.1 CertainTeed.

.2 Canadian Gypsum Company (CGC).

2.2 ACOUSTICAL CEILING UNITS TYPE (ACT)

.1 Surface Texture: Fine

.2 Composition: Fiberglass

.3 Color: White

.4 Size: 24in X 48in X 1in

.5 Edge Profile: Square

.6 Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.95

.7 Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 190

.8 Flame Spread: ASTM E 1264; Class A (UL)

.9 Light Reflectance (LR) White Panel: ASTM E 1477; 0.90

.10 Dimensional Stability: HumiGuard Plus

.11 Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label

.12 Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)

.12 Acceptable Product: OPTIMA PB, 3153PB No added formaldehyde as manufactured by Armstrong World Industries, or equivalent

2.3 SUSPENSION SYSTEMS

.1 Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653 with aluminum cap. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

.1 Structural Classification: ASTM C 635 Light Duty

.2 Color: White Aluminum to match the actual color of the selected ceiling tile, unless noted otherwise.

.3 Acceptable Product: PRELUDE Plus XL High Recycled Content 15/16" Exposed Tee as manufactured by Armstrong World Industries

.2 Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

.3 Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

.4 Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

.5 Accessories

.1 Shadow molding with ½" (13mm) reveal, exposed flange same width as exposed runners, to be used at interface with walls/bulkheads.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

.2 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

.3 Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

.1 Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.2 PREPARATION

.1 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

.2 Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

.1 Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

.1 Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

.2 Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

.3 Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

.4 For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

.5 Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 INTERFACE WITH OTHER WORK

.1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

3.5 ADJUSTING AND CLEANING

.1 Replace damaged and broken panels.

.2 Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

.1 Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.

.3 Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

Section 09650
Resilient Flooring

PART 1 - GENERAL

1.1 References

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

.1 ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.2 ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

.3 ASTM F 1861 Standard Specification for Resilient Wall Base.

.4 ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.5 ASTM F 1482 Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.

.6 ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

.7 ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

.8 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E 492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine.

.10 ASTM E 989 Standard Classification for Determination of Impact Insulation Class (IIC).

.2 National Fire Protection Association (NFPA):

.1 NFPA 253 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

.2 NFPA 258 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

.3 International Standards and Training Alliance (Install):

.1 Install Resilient Certification.

1.2 Submittals

.1 Product Data: Submit manufacturer's current printed Product literature, Specifications, installation instructions, and field reports in accordance with Section 01330 - Submittal Procedures.

.2 Shop Drawings: Submit Shop Drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:

1. Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts for corners when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.

.3 Samples: Submit duplicate 12" x 12" (300 mm x 300 mm) sample pieces of sheet material.

1.3 Closeout Submittals

1 Provide maintenance data and warranty for resilient flooring for incorporation into manual specified in Section 01780 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Installer experienced in performing Work of this section who has specialized in installation of Work similar to that required for this Project.

.1 Engage installer certified by flooring manufacturer

.2 Certificate: Submit certificate indicating installer qualification.

.2 Regulatory Requirements:

.1 Fire Performance Characteristics: Provide resilient linoleum sheet flooring with the following fire performance characteristics as determined by testing Products in accordance with ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:

Critical Radiant Flux: Class 1 Rating per NFPA 253 (ASTM E 648) (0.45 watts/cm² or greater).

Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).

.2 Provide slip resistant sheet vinyl safety flooring in compliance with the following:

.1 Ontario Building Code (OBC), latest edition.

.2 Workplace Safety Insurance Board (WSIB).

.3 Mock-Ups: Install at Project site a job mock-up using acceptable Products and manufacturer approved installation methods. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and Workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.

.1 Mock-Up Size: 3m x 3m, location as directed by Consultant.

.2 Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 General: Comply with Division 1 Product Requirements Sections.

.2 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

.3 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.4 Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.1 Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68º F (20º C) for at least 48 hours prior to the installation.

1.6 PROJECT CONDITIONS

.1 Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive flooring should be clean, fully enclosed and weathertight. The permanent HVAC must be fully operational, controlled and set at a minimum of 68º F (20º C) for a minimum of seven days prior to, during, and seven days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.

.1 Temperature Requirements: Maintain air temperature in spaces where Products will be installed for time period before, during, and after installation as recommended by manufacturer.

.1 Temperature Conditions: 68º F (20º C) for a minimum of seven days prior to, during, and seven days after the installation.

1.7 SEQUENCING AND SCHEDULING

.1 Finishing Operations: Install tile flooring after finishing operations, including painting and ceiling operations, have been completed.

.2 Concrete Curing: Do not install tile flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.

.1 It is the Flooring Contractor’s responsibility to verify suitability of substrate.

1.8 WARRANTY

.1 Project Warranty: Refer to "Conditions of the Contract" for Project warranty provisions.

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

.1 Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.9 MAINTENANCE

.1 Extra Materials: Deliver to Owner extra materials from same Production run as Products installed. Package Products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.

.1 Quantity: Furnish quantity of flooring units equal to 5% of amount installed for each colour/pattern. Extra material to be provided from same dye lot as installed material.

.2 Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 - PRODUCTS

2.1 RESILIENT TILE FLOORING (RES1, 2, 3, 4, 5, 6, & 7)

.1 Product Performance Requirements

.1 Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite, a Tarkett Company; iQ Optima

.2 Description: Homogeneous flooring composed of a 0.080” (2 mm) thick unique construction that is abrasion resistant and requires no wax. No need for polish or wax throughout the life of the product. Construction allows for dry buff for ease of maintenance.

.3 Product shall meet the following performance criteria of ASTM F 1913 Standard Specification for Vinyl Sheet Floor Covering without Backing.

.1 Polyurethane Reinforced (ASTM F 410): Yes

.2 Tile Squareness (ASTM F 2055): Passes

.3 Tile Dimensional Stability (ASTM F 2199): Passes

.4 Flexibility (ASTM F137): Passes

.5 Total Thickness (ASTM F 386): 0.080 in. (2 mm)

.6 Static Load Limit (ASTM F 970): Passes

.7 Resistance to Heat (ASTM F 1514): $\Delta E \leq 8$

.8 Resistance to Light (ASTM F 1515): $\Delta E \leq 8$

.9 Slip Resistance (ASTM D 2047): SCOF ≥ 0.5

.10 Fire Performance (ASTM E648 Flooring Radiant Panel): Class 1

.11 Chemical Resistance (ASTM F925): Passes

.3 Tile Size: 24in x 24in

.3 Gauge: 2mm (0.80”)

.4 Pattern and Color: As selected by Consultant from manufacturer's full pattern/color range. Allow for 7 colours. Refer to floor finish drawings for tile layout pattern.

.5 Adhesive: As recommended by manufacturer

2.2 RESILIENT SHEET FLOORING (RES A)

.1 Product Performance Requirements

.1 Description: Homogeneous tile linoleum of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto a polyester backing to ensure optimum dimensional stability. Pattern and color shall extend throughout total thickness of material.

.2 Size: Sheets of minimum 4’-0” (1.2m) width

.3 Gauge: 2mm (0.80”)

.4 Pattern and Color: As selected by Consultant from manufacturer's full pattern/color range. Allow for 1 colour.

.5 Adhesive: As recommended by manufacturer

.6 Heat welding rod to be supplied and/or recommended/approved by the resilient flooring Manufacturer.

.7 Acceptable product

.1 Marmoleum Fresco, manufactured by Forbo.

.2 Equivalent products per Spec 01250.

2 Resilient Flooring must:

.1 not be manufactured or formulated with heavy metals including cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), and nickel (Ni);

.2 not contain > 0.01 % by weight of arsenic (As);

.3 not contain > 1 % by weight of tin (Sn), and zinc (Zn);

.4 be manufactured with recycled content; and

.5 not contain or be manufactured with materials derived from species listed under CITES.

2.3 ACCESSORIES

.1 Resilient base: 100% PVC free, continuous, top set, complete with premoulded end stops and external corners:

.1 Type: thermoset rubber.

.2 Style: cove.

.3 Thickness: 3.17 mm.

.4 Height: 101.6 mm.

.5 Lengths: cut lengths minimum 2400 mm.

.6 Colour: To be determined by consultant from full colour range

.7 Acceptable products/manufacturers: Baseworks thermoset rubber Type TS by Johnsonite, Pinnacle by Roppe.

.2 Metal edge strips:

1. For edging between resilient sheet flooring and all other floor materials always use a flush anodized aluminum metal edging. Exact model number to be determined by the Contractor based on site conditions and height differential and to be approved by Architect prior to installation.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's Product data, including Product technical bulletins, Product catalog installation instructions, and Product carton instructions for installation.

3.2 EXAMINATION

.1 Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for Product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test).

.2 Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed.

.3 Commencing installation indicates acceptance of the substrate conditions by the installer.

3.3 PREPARATION

.1 Adjacent Surfaces Protection: Protect adjacent Work areas and finish surfaces from damage during Product installation.

.2 Surface Preparation:

.1 Prepare concrete subfloors in accordance with Flooring Manufacturer’s current printed Subfloor Preparation guidelines. All required preparation to be covered under this contract.

.2 Concrete floors must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitence, mold, mildew, and other foreign materials that may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.

.3 Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

.4 Perform moisture testing as recommended by manufacturer. Proceed with installation only after substrates have been tested and meet the minimum requirements from the manufacturer in accordance with ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.5 A pH test for alkalinity must be conducted on the concrete floor prior to installation with results between 7 and 9. If the test results are not within the acceptable range, then installation must not proceed until the problem has been corrected.measurements meet manufacturer’s recommendations, prior to installation.

.3 Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

.4 Floor covering shall not be installed over expansion joints.

.5 Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

.6 Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.4 INSTALLATION OF FLOORING

.1 Install the flooring according to the latest version of Resilient Flooring Manufacturers Installation Instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.

.2 Acclimate the flooring in the secure storage area provided by the General Contractor that is maintained permanently or temporarily at ambient service temperature and humidity (except walk in freezers or similar), or 68°F ± 5° F and 50% relative humidity, for at least 48 hours prior to application.

.3 When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it also helps to level the concrete.

.4 Prime the subfloor prior to using a suitable leveler, ensure minimum thickness is maintained if required by resilient flooring manufacturer.

.5 Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a residue that may interfere with the adhesive bond.

.6 Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.

.7 Extend flooring into toe spaces, door reveals, closets, and similar openings.

.8 Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

.9 Roll resilient flooring as required by resilient flooring manufacturer.

.10 Finish Flooring Patterns: As selected by Consultant.

3.5 APPLICATION OF RUBBER BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

3.6 CLEANING

.1 Cleaning: Remove temporary coverings and protection of adjacent Work areas. Repair or replace damaged installed Products. Clean installed Products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from Project site and legally dispose of debris.

.1 Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.

.2 Sweep and vacuum floor after installation.

.3 Do not wash floor until after time period recommended by flooring manufacturer.

.4 Damp mop flooring to remove black marks and soil.

3.7 PROTECTION

.1 Protection: Protect installed Product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

3.9 INITIAL MAINTENANCE PROCEDURES

.1 General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.

END OF SECTION

Section 09680
Carpet

PART 1.0 - GENERAL

1.1 References

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2- [92], Textile Test Methods.

.2 CGSB 4-GP-36M- [78], Carpet Underlay, Fiber Type.

.3 CAN/CGSB-4.129- [93], Carpets for Commercial Use.

.4 CGSB 20-GP-23M- [78], Cushion, Carpet, Flexible Polymeric Material.

.5 CAN/CGSB-25.20- [95], Surface Sealer Floors.

1.2 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Submit duplicate [675 x 900] mm pieces of each carpet type specified.

.3 Include installation recommendations for each type of substrate as specified in carpet manufacturer's installation guidelines and/or Carpet & Rug Institute Installation Standard 2011, where applicable.

1.3 Closeout Submittals

.1 Submit carpet maintenance recommendations as outlined by the carpet manufacturer for incorporation into manual specified in Section [01780 - Closeout Submittals].

.2 Include information on recycling of carpet including manufacturer's reprocessing program. Indicate which portions of materials are recyclable. Ensure compliance with Section 2.

1.4 Regulatory Requirements

.1 Prequalification: compliance with Department of Consumers and Corporate Affairs regulations under "Hazardous Products Act", Part II of the Schedule, tested to CAN/ULC-S102.2.

.2 Indoor Air Quality: compliance with CRI Indoor Air Quality Program, CRI -IAQ requirements for maximum total volatile chemicals released into air. Label each carpet product with CRI -IAQ label.

.3 Provide documentation that product meets or exceeds following criteria based on an emission factor measured in mg/m /hr:

.1 Total Volatile Organic Compounds - 0.5.

.2 Formaldehyde - 0.05.

.3 4-phenylcyclohexene - 0.05.

.4 Styrene - 0.4.

1.5 Delivery, Storage and Handling

.1 Label packaged materials. For tile products indicate nominal dimensions of tile.

.2 Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.

.3 Store carpeting and accessories in location as directed by Owner.

.4 Prevent damage to materials during handling and storage. Keep materials under cover and free form dampness.

.5 Maintain temperature of store room at a minimum of 20C, for at least 24 hours immediately before the installation

1.6 Waste Management and Disposal

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Ensure emptied containers are sealed and stored safely for disposal away from children.

.3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

.5 Collect and separate plastic and/or paper packaging for recycling.

.6 Use the least toxic sealants and adhesives necessary to comply with requirements of this section.

.7 Close and seal, tightly, all partly used sealant and adhesive containers and store protected in well ventilated, fire-safe area at moderate temperature.

.8 Place used hazardous sealant tubes and adhesive containers in areas designated for hazardous materials.

.9 Collect, package and store carpet cut-offs and waste material for recycling and return to recycler in accordance with Waste Management Plan.

1.7 Project/Site Environmental Requirements

.1 Moisture: Ensure substrate is within moisture limits prescribed by manufacturer.

.2 Temperature: Maintain ambient temperature of not less than [18] C from [72] hours before installation to at least 72 hours after completion of work.

.3 Relative humidity: Maintain relative humidity between 10 and 65% RH for 48 hours before, during and 48 hours after installation.

.4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.5 Ventilation:

.1 Ventilate area of work as directed by client by use of approved portable supply and exhaust fans.

1.8 Extra Materials

.1 Provide extra materials of carpet, carpet base, and adhesives in accordance with Section 01780 - Closeout Submittals.

.2 Extra Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10.67 sq. yd. (8.9 sq. m).

.3 Extra materials to be from same production run as installed materials.

.4 Identify each package of carpet and each container of adhesive.

.5 Deliver to Owner and store where directed by Owner.

1.9 WARRANTY

.1 Project Warranty: Refer to "Conditions of the Contract" for Project warranty provisions.

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

.1 Warranty Period: Five (10) year limited warranty commencing on Date of Substantial Completion.

PART 2.0 - PRODUCTS

2.1 Acceptable Manufacturers/Products

.1 Carpet CPT1

.1 Dexterity Collection manufactured by Mohawk Group

.2 Equivalent products as per Specification 01250.

.2 Size: 24” x 24”

.3 Colours

.1 Allow for two (2) colours, to be selected by Consultant from full manufacturer colour range.

.4 Installation Method

.1 To be selected by Consultant from manufacturer recommended installation methods prior to the time of installation.

2.2 Performance Characteristics

.1 Tufted Pile Weight: 16.0 oz. per sq. yd. (542 g/m2)

.2 Product Type: Tile

.3 Construction: Tufted

.4 Minimum Sq. Yd.: No Minimum

.5 Surface Texture: Textured Patterned Loop

.6 Gauge: 1/12 (47.00 rows per 10 cm)

.7 Density: 7,783

.8 Weight Density: 124,540

.9 Stitches Per Inch: 11.0 (43.31 per 10 cm)

.10 Finished Pile Thickness: .074" (1.87 mm)

.11 Dye Method: Solution Dyed Backing Material: EcoFlex Matrix Fiber Type: EnviroStrand™ PET

.12 Pattern Repeat: Not Applicable

.13 Size: 24" x 24" (.6096 m x .6096 m)

.14 Installation Method: Quarter Turn

.15 Technology: EcoSentry Soil Protection.

.16 Static: AATCC-134 Under 3.5 KV

.17 Flammability: ASTM E 648 Class II (Glue Down)

.18 Smoke Density: ASTM E 662 Less than 450

2.3 Accessories

1 Resilient Base: 100% PVC free, continuous, top set, complete with pre-moulded end stops and external corners:

.1 Type: thermoset rubber .

.2 Style: toeless

.3 Thickness: 3.17 mm.

.4 Height: 101.6 mm.

.5 Lengths: cut lengths minimum 2400 mm.

.6 Colour: To be determined by Consultant from full colour range

.7 Acceptable products: Pinnacle by Roppe or Optimum Edge TS by Mannington

.2 Carpet grippers: types recommended by carpet manufacturer.

.3 Seaming tape: types recommended by carpet manufacturer for purpose intended.

.4 Seaming adhesive: type recommended by carpet manufacturer for purpose intended.

.5 Binder bars: type recommended by carpet manufacturer.

.6 Adhesive:

.1 Acrylic release type: recommended by carpet manufacturer.

.2 Low VOC content in accordance with CRI requirements:

.1 Total volatile organic compounds: [10.0]mg/m /hr.

.2 Formaldehyde: [0.05] mg/m /hr.

.3 2-Ethyl-1l-Hexanol: [3.0] mg/m /hr.

.7 Carpet protection: non-staining heavy duty kraft paper.

.8 Concrete floor sealer: to CAN/CGSB-25.20, Type1.

.9 Subfloor filler: white premix latex requiring only water to produce cementitious paste.

.10 Metal Edge/Transition Strips: Extruded aluminum with mill finish of width shown and height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Provide at edging between carpet flooring and all other floor materials. Submit for review by Consultant prior to installation.

2.5 RECLAIMATION

.1 All carpet provided under this contract to be removed at the end of its' life cycle is at no cost to the Owner and must be sent for reclamation. Manufacturers must provide certification that reclaimed carpet will not go to landfill.

.2 Reclamation to be third party certified.

PART 3.0 - EXECUTION

3.1 Preparation

1 Prepare floor surfaces in accordance with Contract Carpet Manual, Standard for Installation of Textile Floorcovering Materials No.001.

.2 Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

.1 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing moisture and pH tests as recommended by carpet tile manufacturer.

.2 Use trowelable leveling and patching compounds that contain a cementitious base with a latex additive, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

.3 Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

.3 Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

.4 Pre-condition carpeting following manufacturer's printed instructions.

.3 Install toeless type resilient base before proceeding with carpeting.

3.2 Installation

.1 Install carpeting using minimum of pieces.

.2 Install in accordance with manufacturer's printed instructions and in accordance with Contract Carpet Manual, Standard for Installation of Textile Floorcovering Materials No.001.

.3 Finish installation to present smooth wearing surface free from conspicuous seams, burring and other faults.

.4 Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area. Maintain constant pile direction.

.6 Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.

3.3 Application of Rubber Base

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

3.4 Protection of Finished Work

.1 Perform the following operations immediately after installing carpet tile:

.1 Remove excess adhesive, and other surface blemishes using cleaner recommended by carpet tile manufacturer.

.2 Remove yarns that protrude from carpet tile surface.

.3 Vacuum carpet tile using commercial machine with face-beater element.

.2 Protect installed carpet tile to comply with Carpet & Rug Institute Installation Standard 2011, "Protecting Indoor Installations."

.3 When construction or move-in activities will continue where new carpet is installed, provide non-staining building material paper to protect carpet. Do not use plastic sheeting as it can trap moisture, and self-sticking plastic sheeting can transfer adhesive residue to carpet that will attract soil.

.4 When heavy objects are moved over carpet within 24 hours of installation, use plywood over carpet to prevent buckling and wrinkling.

.5 Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

Section 09910
Painting

PART 1 - GENERAL

1.1 Related Sections.

.1 Section 01330 - Submittal Procedures.

.2 Section 01610 - Basic Product Requirements.

.3 Section 01780 - Closeout Submittals.

1.2 References

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada.

1.3 Quality Assurance

.1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Conform to latest MPI requirements for interior painting work including preparation and priming.

.4 Materials primers, paints, fillers, thinners, solvents, etc. shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.

.7 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: No defects visible from floor at 45degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 Environmental Performance Requirements

.1 Provide paint products meeting MPI "Environmentally Friendly"ratings based on VOC (EPA Method 24) content levels.

1.5 Scheduling of Work

1 Submit work schedule for various stages of painting to Consultant for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Consultant for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.7 Quality Control

.1 When requested by Consultant prepare and paint designated surface, area, room or item in each colour scheme to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.8 Delivery, Handling and Storage

.1 Deliver, store and handle materials in accordance with Section 01610 - Basic Product Requirements.

.2 Labels shall clearly indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in a well ventilated area with temperature range 7C to 30C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.9 Site Requirements

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces

.2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Contractor and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 C.

.2 Substrate temperature is over 32 C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is less than 3 C variance between the air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when the maximum moisture content of the substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:

.1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected

1.10 Extra Materials

1 Submit maintenance materials in accordance with Section 01780 - Closeout Submittals.

.2 Submit – (one) four litre can of each type and colour of primer, stain, and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

PART 2 - PRODUCTS

2.1 Materials

.1 Paint and fillers shall be manufacture's premium quality, of type and brand herein specified and listed under "Paint Product Recommendations" premium grade as covered in the association manual, latest edition, for specific uses and only as supplied by **Pratt & Lambert Co., Benjamin Moore & Co., Para Paints Canada Inc., ICI Paints (Canada) Inc, (Glidden), Sherwin Williams Canada Inc., Pittsbugh Paints**. Paint material such as linseed oil, shellac, turpentine and the like, and any of the materials not specifically mentioned herein but required for first class work with finish specified shall be highest quality product of approved manufacturer. Where specific products are indicated in painting schedule, use product manufacturer as specified.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with "Environmentally Friendly" rating are acceptable for use on this project.

.4 Water-borne surface coatings must be manufactured and transported in a manner that steps of process, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.5 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.6 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.0 C or greater.

.7 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

.1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.8 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" rating.

.9 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.

.10 Recycled water-borne surface coatings must not contain:

.1 Lead in excess of 600.0 ppm weight/weight total solids.

.2 Mercury in excess of 50.0 ppm weight/weight total product.

.3 Cadmium in excess of 1.0 ppm weight/weight total product.

.4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.

.5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.11 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 Colours

.1 Consultant will provide Colour Schedule after Contract award.

.2 Interior Colours will be based upon the selection of two (2) base colours and three (3) accent colours. No more than eight colours will be selected for the entire project and no more than three colours will be selected in each area. Include for 25% dark tones.

.3 Exterior colors will be based on three (3) base colors and four (4) accent colors with a maximum of three (3) deep or bright color. No more than seven (6) colors will be selected for the entire project. Note that this does not include pre-finished items by others, e.g. flashings, aluminum or vinyl windows, aluminum doors, etc

.4 Selection of colours will be from manufacturers full range of colours.

.5 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.6 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 Mixing and Tinting

1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Consultant's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 Gloss/Sheen Ratings

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte of Flat finish	0 to 5	10 max
G2	Velvet Finish	0 to10	10 to 35
G3	Eggshell Finish	10 to 25	10 to 35
G4	Satin Finish	20 to 35	35 min
G5	Semi-Gloss Finish	35 to 70	
G6	Gloss Finish	70 to 85	
G7	High Gloss Finish	➢ 85	

.2 Gloss level ratings of painted surfaces shall be as specified herein and as noted on Finish Schedule

2.5 Interior Painting Systems

.1 Plaster and Drywall: Int 9.2A Latex (G3) finish over latex sealer

.2 Plaster and Gypsum Board Ceilings: Int 9.2A Latex (G1) finish over latex sealer

.3 Wood trim: Int 6.4A (G5) finish over alkyd sealer.

.4 Concrete Unit Masonry: PT: Int 4.2A Latex (G3) finish.

.5 Structural steel & metal fabrications: Int 5.1E (G5) finish.

.6 Galvanized metal/zinc coated steel: Int 5.3L (G5) finish

.7 Use fire retardant paint on fire rated plywood sheets behind electrical panels.

All Finishing System Codes are from the Ontario Painting Contractors Association.

PART 3 - EXECUTION

3.1 General

.1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 Existing Conditions

1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, Plaster and Gypsum Board: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Wood: 15%.

3.3 Protection

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Consultant.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants and general public in and about the building.

.5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.

.6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Consultant

3.4 Cleaning and Preparation

.1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 Do not apply paint until prepared surfaces have been accepted by Consultant.

3.5 Application

1 Method of application to be as approved by Consultant. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Consultant.

.4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.6 Sand and dust between coats to remove visible defects.

.7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges and behind wall mounted items.

3.6 Mechanical/Electrical Equipment

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red, if required.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 Field Quality Control

.1 Advise Consultant when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.8 Restoration

.1 Clean and re-install all hardware items removed before undertaking painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

Section Number 10505
Metal Lockers

PART 1 - GENERAL

1.1 References

.1 CAN/CGSB-44.40-[92], Steel Clothing Locker.

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.

.2 Indicate type and class of locker, thicknesses of metal, fabricating and assembly methods, assembled banks of lockers, tops, rods, hooks, shelves, bases, trim, numbering, filler panels, end/back panels, doors, handles, locking method, ,ventilation method, finishes.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Submit duplicate 50 x 50 mm samples of colour and finish on actual base metal.

PART 2 - PRODUCTS

2.1 Manufactured Units

.1 Approved Manufacturers:

.1 ASI Storage Solutions

.2 Deluxe Series Lockers by Shannahan's

.3 Emperor Lockers by Hadrian Manufacturing,

.2 Sizes:

.1 Locker type 1 (Triple Tier): 15" wide x 15" deep x 72" high, consisting of 1no 36" high bottom tier and 2no 18" top tiers (refer also to drawings).

.3 Assembly: knock down construction.

.1 Sides and backs shall be no less than 22-gauge and should not contain extra unnecessary holes unless otherwise specifically used for the assembly of the lockers and accessories on the project.

.2 Edges shall be formed to provide a strong and rigid assembly when bolted or riveted together Locker backs are flanged at right angles providing a triple thickness of metal at the back corner connections.

.4 Doors: double pan design consisting of 20ga outer panel welded to 24ga inner panel with 1" cell honeycomb core, continuous 14ga piano hinge, door swing Right Hand Reverse. Provide magnet at latch to keep door in closed position.

.5 Accessories: 20ga hat shelf, 3 single prong coat hooks, 4" tall pedestal base, flat top, 11ga hasp for trouble free use with standard padlock

.6 Finish: high grade epoxy polyester powder finish, colour to be determined by consultant from manufacturer's standard colour range.

2.2 Schedule

.1 Provide lockers as scheduled in the following quantities:

.1 Locker Type 1: thirteen (13)

PART 3 - EXECUTION

3.1 Installation

.1 Assemble and install lockers in accordance with manufacturer's written instructions.

.2 Safely and securely anchor all lockers properly to walls and/or floors as required. Use fasteners appropriate to load and the substrate.

.3 Provide continuous sealant between wall and locker – see specification 07900 for sealant.

.4 Install finished end panels to exposed ends of locker banks.

END OF SECTION

UNIVERSITY OF TORONTO SCARBOROUGH CAMPUS

SW 311 / BV 355 Retrofit

MECHANICAL AND ELECTRICAL SPECIFICATION

SPI PROJECT NO. 2019-1031B

February 11, 2020

Issued for Tender

GENERAL MECHANICAL CONDITIONS - SECTION 20 01 00 3

SPRINKLERS - SECTION 21 30 00 11

HOT WATER HEATING - SECTION 23 20 00 12

WARM AIR HEATING, VENTILATING & AIR CONDITIONING - SECTION 23 85 00 13

CONTROLS - SECTION 25 10 00 14

GENERAL ELECTRICAL CONDITIONS – SECTION 26 05 00 19

RACEWAY, ELECTRICAL DEVICES AND CONTROLS – SECTION 26 05 20 26

LIGHTING CONTROLS – SECTION 26 09 33 27

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WORKING IN EXISTING BUILDING AND CONTINUITY OF SERVICES – SECTION 26 50 10 32

VOICE AND DATA CABLING AND COMMUNICATION - SECTION 27 05 13 35

FIRE ALARM SYSTEM - SECTION 28 31 00 43

APPENDIX

UTSC CABLE SYSTEM Specifications

UTSC WIRELESS Specifications

GENERAL MECHANICAL CONDITIONS - SECTION 20 01 00

1. Conform to Instructions to Bidders, General Conditions and General Requirements.

2. The University of Toronto Scarborough Campus general conditions of the contract and amendments thereto, general instructions and instruction to tenderers, form an integral part of this specification.

3. This Section 20 01 00 shall apply to all Mechanical Division Sections.

4. Provide all materials, equipment labour, tools, scaffolding, temporary services and other items required to complete all the work indicated on the drawings and in the specifications. Provide well qualified trades persons to carry out each phase of work. Installation of materials shall meet all applicable Provincial, Federal and Municipal Requirements.

5. Substitutions:
   Substitutions will not be considered unless offered on bid form document with reference to proposed alternatives and substitutions (unsolicited) section. Where substitutions are made for equipment specified by name or model number, be fully responsible for capacities as well as physical fit of substituted materials.

6. Permit:
   Apply for, obtain, and pay for including all sales taxes and GST/HST, certificates of approval, permits, and inspections required by authorities having jurisdiction submit all plans, etc., required and obtain permits immediately after notification of award of contract. Do not start work prior to obtaining approval and permit. Give all notices required for test and inspections. Make all corrections and changes required by the authority having jurisdiction without additional charge or expense to the University of Toronto Scarborough Campus.

7. Guarantee:
   Warrant all labor and materials installed under this division for a period of one year from the date of final acceptance. Provide all additional warranties provided as standard by equipment manufacturer. The contractor shall, before final payment is made, guarantee all materials and workmanship supplied by him in the performance of this contract for a period of one year from date of final acceptance and shall, when called upon, make good without further cost to the Owner such defects as may appear within this period.

8. Liability:
   Assume full responsibility for coordinating and layout of all work and for any damage caused to University of Toronto Scarborough Campus' property or the work of other divisions by improper location or carrying out of this work.

9. Protection of Property:
   Assume full responsibility for protecting University of Toronto Scarborough Campus'

property while carrying out the work of this contract. Repairs shall be carried out at own expense of any damage caused by this contractor or by his sub-contractors. Repair work shall be carried out for this contractor by trade whose work is affected.

10. Site Conditions:
Examine site conditions before submitting tender to be sure that work can be satisfactorily carried out as indicated. If site examination reveals any ambiguities, difficulties, discrepancies, departures from relevant codes having jurisdiction, and/or from good practice, obtain clarification prior to submitting tender failure to do so shall result in all additional costs being the responsibility of the contractor.

11. Site Visit:
The contractor shall attend the mandatory site visit at the time given in the tender documents prior to submitting tender.

12. Continuation of Existing Services:
    a. Continue existing services using same type material as used for existing service, except where indicated otherwise on the drawing or in the specification.
    b. Allow for connections to existing systems during after hours or weekends, including but not limited to plumbing and drainage, water piping, heating systems, electrical and control connections.
    c. All existing services must be maintained at all times during construction. This Contractor to provide all necessary temporary lines, etc. so as to carry out the above.

13. Mechanical Services:
Arrange with utilities division and make connection to / disconnect from existing services where indicated on drawings. Coordinate with University of Toronto Scarborough Campus' representative ten (10) working days before any essential service is interrupted. Comply with instruction for time and duration of interruptions. Prior to cutting pipes and capping, contractor should ensure that the pipes are not live. Provide standby manpower and ensure that required services are maintained. Advise the University of Toronto Scarborough Campus' representative immediately of any difficulties encountered and remedial actions to be taken. Utilities division shall shut off services, drain and refill the systems and then reactivate services including venting of systems when connections are completed by this contractor. On domestic cold water, domestic hot water, heating water supply and heating water return services where the system isolation valves do not hold, contractor shall make freeze stop on the piping systems using cryogenic equipment followed by hot tap connection. Contractor shall include provision in their tender for such connection method.

14. Ductwork and Pipping Penetration thru wall / ceiling
Where exposed ductwork or piping penetrates wall or ceiling provide frame or trim around perimeter of the duct or pipe for neat appearance. This is in addition to smoke seal requirements.

15. Cutting and Patching:
All cutting and patching for mechanical work will be the responsibility of this sub-Contractor. Hire specialized trades to do this work. X–Ray floors prior to cutting and coordinate for after hour X -Ray of the floor.

16. Drawings:
    a. The mechanical drawings are diagrammatic in nature, intended to convey the scope of the work. Any information involving accurate measurement of the building and equipment shall be taken from the building itself, figured dimensions on architectural drawings and certified manufacturer's shop drawings of equipment. Be responsible for a thorough knowledge of same before proceeding with the work. All measurements shall be taken from building site and architect's drawings.
    b. If an item is indicated on a plan, section or detail, it shall be considered as appearing on all views. If the item is called for in the specification, it shall be considered as appearing on the drawings.
    c. Where an item is specified in a note on a drawing, it shall be considered as appearing in this specification. Dimensional data shown on mechanical drawings shall be construed as true figures when conflicting data appear on both mechanical and architectural/structural drawings.

17. Clean-Up:
Upon completion of work and portion of the work, remove from the premises all tools, debris, supplies and waste materials resulting from operations under this division, the working areas shall be left in a clean and satisfactory condition. Clean all equipment and leave all items in proper order ready for operation.

18. Painting:
Touch up all scratches and other damage to painted finish on all factory pained equipment. All other paining work shall be done under the painting division, including all new and existing grilles and diffusers, all new and existing exposed piping, all new and existing exposed ductwork, and all existing perimeter baseboard unit enclosures.

19. Electrical Work:
All electrical wiring, instruments, and installation shall comply with the requirements of the electrical specification division 16. All electrical power wiring shall be by electrical contractor. Factory installed wiring on mechanical equipment and control wiring as indicated on drawings and in specification shall be the responsibility of mechanical contractor.

20. Electrical Equipment:
All electrical equipment, including motors shall be CSA or Ontario Safety Authority inspections approved and shall bear evidence of same.

21. Scheduling and Hours of Work:
Refer to Division 1 specifications for more info on scheduling and hours of work. All work

shall be done in accordance with the approved construction schedule and all specified interim schedules. Contractors must comply with the general contractor's construction schedule. Include the cost of premium time in the tender price for work provide during nights, weekends or other times outside normal working hours, necessary to maintain all mechanical services in operation and to meet the project schedule.

22. Coordination:
Coordinate work with other divisions to avoid interference with other services.

23. Receiving and Storage:
The contractor shall be responsible for receiving, unloading, storing, safekeeping, and protection from the weather of all materials that form part of this contract.

24. Demonstrate:
Upon completion of the work, set all equipment into operation, demonstrate the successful operation and familiarize the owner's operating personnel with the new system, equipment and changes to the existing system under this division. Prior to demonstration, the contractor shall have submitted the maintenance manuals and successfully operated the system and equipment.

25. Maintenance Manuals:
    a. Provide "operation and maintenance manuals" in accordance to Division 1 specifications.
    b. "Operation and Maintenance Manuals" shall contain installation instructions, maintenance instructions and reviewed shop drawings of all items of equipment supplied under this division: all balance reports, and all warranties.

26. Shop Drawings:
    a. Before equipment is manufactured or shipped to the site, submit to the University of Toronto Scarborough Campus the shop drawings in PDF format through e mails to the engineer for review. All shop drawings shall be fully checked and signed by the contractor for accuracy to ensure satisfactory installation.

    b. Subsequent review by the University of Toronto Scarborough Campus is for general arrangement only and does not relieve the contractor of any responsibility for the correctness of the work.

    c. The following information shall be given on each drawing:

        i. Performance figures and data to confirm those given in the specification.
        ii. Dimensions and weights where applicable.
        iii. Date of issue of shop drawing and name and project number of contract, reference letters and numbers of pieces of equipment.
        iv. The contractor shall supply shop drawings for equipment indicated on trades sections in this specification.

d. Submit samples of materials when required.

e. Submit electronic copies of shop drawings for review covering major manufactured items, i.e. hot water reheat coils, controls, grilles and diffusers etc.

27. Ordering of Equipment:
Place orders for equipment immediately upon receipt of award of contract, so that the manufacturers can commence preparation of shop drawings. Submit proof that orders are placed.

28. Demolition:
a. For asbestos abatement and selective demolition scope of work, special project procedures, required enclosures, and applicable regulations and programs refer to divisions 0 and 1 specifications.

b. Prior to any demolition work to be done in the renovation area, including general trades work, all existing air moving systems, including supply, return, transfer, exhaust and fresh air intake, whether attached or not to main building systems shall be isolated and capped air-tight to avoid contamination and waste of energy. The contractor shall liaise with the facilities and services utilities division through the University of Toronto Scarborough Campus representative to isolate the systems which might involve shutting down air handling equipment, cutting back ductwork and putting plastic sheet coverings to seal off air inlets and outlets, providing temporary bypass ductwork between supply and return systems and removing air filters and frames at the return air systems. The contractor shall provide all labour and materials to carry out the isolation work and the subsequent work required to resume the operation of the system after the construction.

c. Carefully remove existing piping, fixtures, equipment, ductwork, etc. as indicated on the drawings and/or as required by the work the University of Toronto Scarborough Campus' representative shall decide which materials or items are to be disposed off-site by the contractor, or which are to be handed over to the University of Toronto Scarborough Campus. Seal ends of existing services that are to remain to enable services to be reactivated.

29. Lifting and Scaffolding:
a. Provide all cranes, hoists, etc., required for lifting and placing equipment, ducting and piping in position on roof, on walls and in ceiling as required.
b. Provide all scaffolding required, including its dismantle and removal from the site on completion.
c. Coordinate with other divisions to enable them to also use the scaffolding. The space required and locations of lifting equipment and scaffolding shall be agreed with the University of Toronto Scarborough Campus' representative.
d. Provide sufficient caution signage around lifting equipment and scaffolding working areas.

30. Hazardous Materials Removal and Selective Demolition:
Hazardous materials, if found, they shall be removed by hazardous material abatement contractor according to the type of procedures stipulated by the regulations and in Divisions 0 & 1 specifications for this contract.

31. Payment for Changes:
Provide a complete itemized cost breakdown of all materials, equipment, labour costs and mark-up fees associated with each submission for additional or deleted work.

32. Record Drawings:
Record all changes made to design on set of prints kept on site for this purpose.

33. As-Built Drawings:
Provide “As-Built Drawings” in accordance with general conditions of contract. As-Built drawings shall record all changes to design. Keep accurate record of "as-built" drawings and submit these before final certificate of completion. Buried services must be dimensioned. Provide electronic files in AutoCad and PDF format of the AS_BUILT drawings to Consultant for review and verification. After verified, provide also hard copy.

34. Definition: The word “provide” shall mean supply, install and test.

35. Maintain Liability Insurance to protect Owner and the Contractor from any and all claims under the Worker's Compensation Act.

36. All materials shall conform to CSA, HEPC and CEC requirements and shall bear CSA label.

37. Temporary light, power and water by General Contractor.

38. Provide temporary buildings and material storage as required and be responsible for any loss or damage thereto.

39. Supply and locate all bases, supports, sleeves, etc. required for this work.

40. Unless otherwise noted, all motors 1/2 HP and under shall be 115/1/60, motors over 1/2 HP shall be of 3 phase voltage available on project.

41. Supply proper starters with overload protection and disconnect switches for powered mechanical equipment and hand over to Electrical Contractor for installation. This does not include isolation switches, unless stated specifically.

42. All power wiring by electrical contractor, control and interlock wiring by mechanical contractor. Control wiring in return air ceiling spaces shall be FT-6 or installed in conduit.

    a. Unless specifically noted, otherwise all wiring by this contractor.

43. Supply and install all necessary access doors for mechanical equipment including entering and leaving sides of all coils, fire dampers etc. Where necessary, doors shall be rated to suit fire assembly rating.

44. Pipe hangers shall be Clevis split type with mild steel rods. For copper pipe use plastic inserts. Use oversized hangers and saddles for c.w. piping. Do not support equipment, ducts or piping from roof deck without permission from Architects. Supply and install necessary steel to transfer load to structural members.

45. Provide concrete or metal curbs or sleeves around all mechanical room floor penetrations where room is not located on grade. Seal all openings watertight.

46. All dissimilar metal (steel-copper, etc.) shall be separated using gaskets and insulating washers or Watts "Di-Electric" fittings.

47. Install chrome-plated escutcheons where branch pipes pass through finished surface.

48. All surfaces must be left clean and smooth, ready for painting by General Trades.

49. Identify all piping. Use stencils or colour codes and directional arrows.

50. Identify all remote control and all other equipment as to service by a black lamacoid engraved nameplate with white core, firmly affixed with screws to each unit.

51. Provide fire stopping and smoke seals.
    a. Primers to manufacturer's recommendations for specific material, substrate, and end use.
    b. Damming and backup materials, supports and anchoring devices to be to manufacturer's recommendations; and in accordance with tested assembly being installed as acceptable to authority having jurisdiction.
    c. Sealants for vertical joints to be non-sagging.
    d. Firestop and smoke seal around mechanical and electrical assemblies penetrating non-rated fire separations.
    e. Rigid ducts with dimensions greater than 1300 mm to be fire stopped by bead of fire stopping material between retaining angle and fire separation, and between retaining angle and duct, on each side of fire separation.
    f. Remove excess materials and debris and clean adjacent surfaces immediately after application.
    g. Remove temporary dams after initial set of fire stopping and smoke seal materials.

52. After acceptance, instruct Owner in equipment operation and provide him with operating and maintenance manuals standards and extended warranty documents, inspection certificates and copies of shop drawings of installed equipment.

53. Should any discrepancy appear between these specifications and the drawings to cause doubt as to the true meaning and intent of the drawings and specifications, a ruling shall

be obtained from the Architect Consultant before submitting the tender. If this is not done it will be assumed that the more expensive alternative has been included in the contract.

54. Any error or inconsistency in the drawings or specifications noted after award of contract must be reported to the Architect Consultant before commencing work.

55. The omission or incorrect mention of work, materials, etc. that are indispensable to the completed work, is not to be interpreted as relieving of the necessity of providing such work, materials, etc. at no expense to the Owner.

End of Section

SPRINKLERS - SECTION 21 30 00

1. Alter the existing sprinkler system to suit revised layout.

2. This is performance specification only. Prepare sprinkler shop drawings for submission to Engineer, Underwriters and Building Department for approval prior to installation. Engineers drawings indicate general areas to be sprinklered only. This contractor to provide hydraulic calculations or Pipe Schedule method (whichever is applicable or/and required) prepared and stamped by Professional Engineer of Ontario.

3. System shall be complete with all necessary piping, hangers, heads, drips, drains, test connections, spare sprinklers and cabinets, etc., all in strict accordance with standards as stipulated in the National Fire Prevention Association NFPA 13 as revised to date and/or as approved by the local Fire Department and Building Department.

4. Where additional sprinklers (in addition to existing quantity of sprinkler heads before renovation) is required, this contractor to include in contractor for site investigation to determine location of existing main of adequate size. Provide new sprinkler line from existing main as required to accommodate new sprinkler heads.

5. All shut off valves and isolating valves shall be supplied with ULC listed monitor switches for electrical supervision of valve.

6. In general, system shall be installed in accordance with "Light Hazard Occupancy" Standards.

7. All heads unless noted otherwise shall be equal to Grinnell "Duro Speed". Low heads shall be equipped with guards.

8. Where suspended ceilings occur, piping shall be concealed above ceilings. Semi-recessed sprinkler heads with removable escutcheons shall be installed in all areas having ceiling tiles and drywall ceilings. In areas where there are no suspended ceilings, heads shall be upright type with plain bronze finish. Submit samples to Architect for approval before installation.

9. Contractor shall pay all necessary charges he incurs from underwriters for their review of these drawings.

10. Where ceilings are raised or lowered, adjust heads to suit new ceiling heights.

11. Where ceilings are removed and replaced, remove and replace heads as required to permit execution of necessary work.

End of Section

HOT WATER HEATING - SECTION 23 20 00

1. Supply and install all heating equipment and piping as shown on drawings.

2. Piping shall be standard weight steel Schedule 40 with screwed 125 lb. class fittings. Use only eccentric reducers on horizontal piping.

3. Provide flanges or unions at all equipment requiring servicing. Unions shall be brass to iron ground joint. Flanges shall be 150 psi steel slip on.

4. Piping over 2 1/2" (65mm) shall be welded or assembled using grooved couplings Victaulic or approved equal. 2" (50mm) and under may have screwed joints piping.

5. Install automatic air vents complete with isolating valves in all high points. Heavy duty air vents in equipment rooms shall be piped to drains. Provide drain cocks at all low points.

6. All valves up to 2" (50mm) shall be full throat bronze ball valves. 2 1/2" (65mm) and over use butterfly valves.

7. All piping shall be completely flushed out with chemical cleaning compounds. System shall then be drained, cleaned and refilled.

8. Install ball valves on inlet and outlet sides of all reheat coils etc.

9. Water reheat coils for duct insertion:
    a. copper tubes with aluminum fins connected in serpentine fashion.
    b. fin density not more than 640 fins/m.
    c. maximum tube length 750 mm.
    d. casings of1.6 mm thick galvanized sheet steel designed for bolting to other sections.
    e. factory tested with air under water at 1.7 MPa.
    f. selected for not more than 3.5 m/s face velocity.
    g. fluid side pressure drop of not more than 15 kPa for water heating coils.
    h. ratings certified by manufacturer.
    i. Standard of Acceptance: Aerofin, Trane, McQuay, York, Carrier, Heatcraft, Engineered Air, USA Coils & Air, and Coil Company Ontario

10. Insulate all piping with 1 1/2" (40mm) thick fibreglass standard pipe insulation complete with all service jacket. Mitre insulation at elbows or use insulating cement and canvas.

11. In exposed areas, finish insulation with PVC jacketting.

End of Section

WARM AIR HEATING, VENTILATING & AIR CONDITIONING - SECTION 23 85 00

1. Supply and install all heating, ventilation and air handling equipment as shown on drawings.

2. Supply and install ductwork as indicated on drawing. Ductwork shall be fabricated and installed in strict accordance with latest SMACNA standards and shall be manufactured of galvanized steel unless specifically noted otherwise.

3. Install manual balancing dampers at all branch takeoffs and in other locations where necessary for system balancing.

4. Flexible ducts shall be aluminum helically wound spiral duct, equal to Flexmaster T/L, maximum 10 ft. length. Provide acoustic flex equal to Flexmaster model T/L-A, where ducts are to be internally insulated.

5. Install UL labelled fire dampers and fire stop flaps where shown and where required. These shall be installed in accordance with ULC approved methods. For ducts under 12" (300mm), use 100% free air dampers. Dampers in aluminum and stainless steel duct shall be manufactured of stainless steel. Advise drywall trades of approved installation methods in drywall partitions. Refer to structural and / or architectural drawings for type of fire separation construction and provide all required accessories etc. for complete and ULC approved installation of fire dampers.

6. Where shown, ductwork shall be lined internally with (1/2") (1") (12mm) (25mm) faced flexible duct liner. Shown sizes are clear inside dimensions, increase duct size accordingly.

7. Supply all grilles and diffusers where shown on drawings. Finish shall be off-white baked enamel. Refer to schedule on the drawings.

8. All air conditioned air supply ductwork, unless specifically noted otherwise, shall be insulated with 1" (25mm) thick foil faced flexible fibreglas duct insulation. Apply using recommended adhesive and tape all joints using vapour barrier tape. Exposed supply ductwork or supply ductwork located in ceiling space used as return air plenum do not need to be insulated.

9. In renovation work, verify existing air quantities before proceeding with modifications. Submit report to consultants.

10. Upon completion of renovations balance all air systems and supply written air balancing reports in electronic format. Set air systems controls and demonstrate operation to Owner's representative.

End of Section

CONTROLS - SECTION 25 10 00

1. Control system shall be by base building contractor. Exiting BAS is Siemens. Contact person: Dave Barrett (email: david.barrett@siemens.com) or Peter Christiansen (email: peter.christiansen@siemens.com). This Contractor to hire and pay for Siemens scope of work.

2. In renovated areas, replace all existing pneumatic control with DDC type. Remove all redundant pneumatic tubing back to mains.

3. Controls for renovated areas to be connected to existing BAS. All controls to be Siemens with control zones, control points etc. as indicated on the drawing and/or described in the specification. Siemens is to be responsible for visiting the site and examining all conditions affecting the proposed installation, including verifying existing RBC/MBC locations. Siemens is to carry any new RBC/MBC panels if the current panels do not have capacity. New control panels to be wired back to the BAS front and through the IT infrastructure. All low voltage wiring associated with controls to be by Siemens.

4. All new thermostats to be temperature sensors “flat face” to match base building standard sensors.

5. All control wiring shall be carried by this contractor; Power wiring shall be by Electrical division. This contractor to hire and pay for electrical contractor to perform required power wiring. The control system shall be supplied and installed complete in all respect and fully functional. Demonstrate to the mechanical Consultant or UTSC representatives on completion of work.

6. All new controls to be DDC type and in accordance with UTSC Standards. All new DDC controllers and devices shall meet BACNET communication standards as defined in the most current ANSI / ASHRAE Standard 135 and be listed on the BTL most recent database. All new BACNET controllers shall be as per UTSC Standards and to be compatible with existing. All BAS control devices to be connected to F & S LAN with approved sub-networks. The BAS control strategy to reside at controllers and communicate with F & S LAN using MS/TP or IP data link protocol.

7. All new controllers at the building field level shall be connected in a daisy chain configuration as per RS-485 serial data standard. All new MS/TP daisy chains (or IP) shall be connected to B-BC’s / building broadcast management devices (BBMD’s). B-BC’s shall be connected to the F & S LAN through a F&S switch.

8. The new control systems shall be capable of stand-alone and networked operation to achieve sequence of operation described on the drawings.

9. For all coordination, password protection, password set-up, point nomenclature, graphic screens, dynamic symbols, acceptance test, and instruction and training requirements refer to UTSC standards or as per UTSC Facility & Services Team.

10. All points at the field level points including BACNET object points, calculated points virtual points, and wired points required to satisfy the sequence of operation shall be configured readable/writeable so as to allow for intercommunication with overarching BACNET enterprise management software. Point nomenclature shall be consistent and approved by the University of Toronto Scarborough Campus. The point name shall uniquely identify the point and describe the function of the point. The name shall include the point location, category, equipment type, space type, and point type. A set of documents shall be used in conjunction with the sequences of operation to graphically describe the inputs and outputs associated each piece of mechanical and electrical equipment being controlled, including all required calculated and virtual points. The controls schematics shall be used as a basis for the temporary working graphics and the integrator graphics. All graphics shall be compatible with the F&S station as approved by the University of Toronto Scarborough Campus. Contractor is responsible for insuring that: all points required to satisfy the sequences of operations are configured discoverable/readable/writeable: point nomenclature and graphics are compatible with F&S station; and password access protection is provided as per University of Toronto Scarborough Campus requirements before the system is considered complete.

11. All new controllers (B-MC's, B-ASC's, and B-BC's) shall have a battery backup using a lithium battery with a minimum battery life of five (5) years. Battery backup shall ensure that the energy management software, the DDC software, the database parameters, and all other programs and data stored in the RAM are retained for a minimum of fifty (50) hours.

12. Self-diagnostic routines shall report an alarm for low battery condition; alarm to indicate that the controller is under battery power; alarm any malfunctions or abnormal conditions within the controller; alarm conditions that exceed desired parameters as determined by programming input.

13. NEMA electrical enclosure for housing each new DDC controller enclosure shall be complete with lockable hinged door; control transformer (120V, 1PH, 60Hz – primary side) with low-voltage control circuits protected by a resettable circuit breaker on the low-voltage (secondary) transformer side, secondary side grounding; terminal blocks for connection of all external control wiring; terminal blocks for connection of power supply wiring; an accurate schematic wiring diagram permanently affixed to the inside of the door.

14. Provide uninterruptible power supply (UPS) to serve new B-BC control panel. UPS shall be equipped with a cord and plug. UPS shall be complete with dry contacts for monitoring and alarming through BAS that: UPS is operating on battery power; low battery condition; UPS failed a self-test. Monitoring points for new UPS shall be: UPS is operating on battery power-alarm; low battery condition-alarm; UPS failed a self-test-alarm.

15. Mounting height of thermostats / temperature sensors shall be 5'-0" (1500mm) from finished floor or within 36" (900mm) to 43" (1100mm) if in barrier free path of travel.

Coordinate location with architect. Do not install in vicinity of electrical lighting dimmer or heat generated appliances / devices or on exterior wall.

16. Clean and recalibrate all existing thermostats upon completion of construction. Submit report that this work has been completed.

17. Provide alarms at new DDC controller and F&S station for each new zone:
    a. Zone/space temperature out of range-high (3ºC above set-point); zone/space temperature out of range-low (2ºC below set-point). Temperature alarm set-points shall be adjustable.

18. Make provisions for integration of all control systems serving renovation area into existing BAS. Provide detailed coordination of integration with the University the Toronto Facilities and Services Department. All new controllers serving renovation area shall be mapped, labeled and programmed into existing building operator work station.

19. All points shall be configured for discoverability, readability, write ability at the University of Toronto Scarborough Campus' discretion from BAS front end.

20. In general, all control, monitoring, and alarm points will be connected to BAS. The controls schematics are to be used as a basis for the temporary working drawings and the integrator graphic.

21. Provide shop drawings for all control components for approval. Provide control drawings with schematics, sequence of operation, and equipment list for review and approval.

22. Provide programming and database setup. Establish setback and setup temperatures and time schedules. Setback and setup temperatures and time schedules to be determined by client.

23. Provide testing and verification of system functionality and sequence of operation. Demonstrate system operation to University of Toronto Scarborough Campus representative.

24. Provide control system demonstration and training for personnel designated by the owner when system has been completed and verified. Provide training materials. All training materials and agenda shall be approved by the University of Toronto Scarborough Campus project manager.

25. Provide one copy of approved control logic programming and database and approved project specific graphic software on CD/DVD or USB key.

26. Contractor is responsible for software that allows complete configuration of the BAS.

27. Contractor shall provide all licensed software associated with the project to the University of Toronto Scarborough Campus F&S. The software must include the following: All

licenses and operating keys; most recent service/technicians tools software as used by the manufacturers service technicians; capable of programming and serving all the DDC devices; backup and restore controller(s) databases; add, modify and delete any existing or new system points; help files and fully open library of the manufacturers installed control devices; latest controller global library; latest version of controller databases. Include all software updates during the warranty period. Provide unlimited licence without annual fees.

28. Provide all required material and labour required to execute the component and system commissioning in accordance with the commissioning authority requirements.

29. Provide all controls and wiring including appurtenances necessary for complete and operating systems. Provide where required a PE switches to convert pneumatic signal to DDC. Control wiring for mechanical equipment controls shall be minimum size #14 awg copper for 120V controls, #16 awg copper for low voltage controls, and special cables in accordance with equipment manufacture's recommendations minimum conduit size shall be 20mm. for control wiring. Final control conduits connections to all rotating and vibrating equipment hall be made using liquiseal flexible metal conduit or equal. Interior conduits shall be EMT with steel compression type fittings. Exterior conduits shall be rigid galvanized steel with threaded connectors. Control wiring and associated conduits work must be performed by members of the international brotherhood of electrical workers, local 353.

30. All control wiring and associated conduits shall be carried by Mechanical Division; Power wiring to control systems shall be by Electrical Division.

31. Provide all necessary EMT conduit, fittings and wire to provide a complete and operating control system. Hard wire all electrical control devices into the associated system magnetic starter. Provide power to control panel from the nearest normal power electrical distribution panel.

32. Provide BACNET application specific controller(s) as required to achieve sequence of operation and support number of control points. Controller(s) shall be connected to the F&S LAN by electrical contractor. Coordinate with electrical division as required.

33. A copy of requisite field software is to be provided as a part of the implementation process. Provide setting tool and programs required to configure controller(s).

34. Coordinate with UTSC for exact location of controllers. Provide NEMA 1 enclosure to serve each new controller. Enclosure shall be complete with lockable hinged door. An accurate schematic wiring diagram shall be permanently affixed to the inside of the door.

35. Provide shop drawings for all control components for approval. Provide control drawings with schematics, sequence of operation, and equipment list for review and approval.

36. Provide programming and database setup. Establish setback & setup.

37. Temperatures and time schedules. Setback and setup temperatures and time schedule to be determined by client.

38. Provide testing and verification of system functionality and sequence of operation. Demonstrate system operation to UTSC representative.

39. Provide all required material and labour required to execute the component and system commissioning in accordance with the commissioning authority requirements.

40. The control system shall be supplied and installed complete in all respect and fully functional.
    a. Demonstrate to the mechanical consultant on completion of work.
    b. Provide control system demonstration and training for personnel designated by the owner when system has been completed and verified.
    c. Provide training materials. All training materials and agenda shall be approved by UTSC project manager.
    d. Provide one copy of approved control logic programming and database and approved project specific graphic software on CD/DVD or USB key.

41. Provide warranty for 2 years.

42. Provide Controls systems training for Owner / Landlord when system has been completed and verified as per specifications. Provide four hours minimum for new HVAC control systems.

End of Section

GENERAL ELECTRICAL CONDITIONS – SECTION 26 05 00

1. Comply with University of Toronto Scarborough Campus general conditions of the contract and Mechanical Division, Mechanical Specifications. Mechanical Division shall be the Prime Contractor. General conditions of the contract and instructions to tenderers form are an integral part of this specification.

2. This section applies to all sections of Electrical Division.

3. All electrical construction work must be performed by members of the international brotherhood of electrical workers, local 353.

4. This contractor shall be responsible for visiting the site and examining all conditions affecting the electrical installation. No consideration will be given to claims for extra costs arising from failure to visit site.

5. Relocation of outlets up to ten feet, prior to installation, to be done without extra charge.

6. The word "provide" shall mean supply, install, connect and test.

7. Provide each item mentioned or indicated of quality and subject to qualifications noted; perform according to conditions stated each operation prescribed; and provide therefore all labour, material, equipment, tools, scaffolding, temporary power, incidentals and services required to complete the installation.

8. The drawings for electrical work are diagrammatic in nature, intended to convey the scope of work. The drawings do not show interior design, architectural, mechanical, structural or base building details. Be responsible for a thorough knowledge of same before proceeding with work.

9. Work by other Divisions
    a. Painting of exposed conduits, ducts and unfinished electrical equipment: under Mechanical Division.
    b. Concrete work – under Electrical Division.
    c. Cutting and patching will be by Electrical Division. Patching shall be of same material as surrounding area and shall be painted or finished to match existing,

10. Make a set of white prints and as the job progresses, mark on changes made through any approved change order as well as the location of feeders, conduit runs, junction boxes, and all changes in circuiting, location of equipment, runs of conduits, wiring, etc. from that originally shown, so that on the completion of the job the record drawings will show the exact location as actually installed. Record drawings shall be kept at the site and shall be brought up to date as the work progresses. Submit completed record drawings before final certificate of job acceptance is issued.

11. The following documents shall be submitted to the Consultant on the completion of the project as described above:
    d. electrical inspection certificate
    e. as-built drawings (AutoCad, pdf and hard copy) in accordance to general contract specifications, division 1.- general requirements. As-built drawings shall record all changes to design.
    f. operation and maintenance manuals in accordance to general contract specifications, division 1.- general requirements.
    g. guarantee
    h. other certificates specified.

12. All material shall be stored neatly and out of the way. Clean up daily all refuse caused by work. This contractor shall remove all his debris (cartons, wiring reels, connectors, wiring, etc.) from electrical rooms in which he is working.

13. Bind within a hard-covered, loose-leaf binder, a complete set of manufacturer's operating and maintenance instructions showing all major electrical equipment and systems. Include shop drawings and detail drawings. Instructions shall be complete for installation, operation and maintenance. Spare part suppliers, lists and addresses shall be included. Make any additions and/or corrections required by the Consultant and submit two correct copies to the Consultant. Instructions shall be reviewed with the operating personnel to ensure a thorough understanding of the equipment and its operation.

14. Examine the site, existing equipment and the local conditions affecting the work under this contract. No allowance will be made subsequently for any obvious considerations overlooked.

15. After the work is complete but before final payment, give the Owner a written guarantee that you will, at no charge to the Owner, replace or repair any defects in workmanship and materials not due, in the opinion of the Architect to misuse or neglect. Guarantee shall cover a period of 12 months from the date of acceptance of the work by the Architect. This guarantee shall in no way supplant any other guarantee or guarantees of longer period, but shall be binding on all other work not otherwise covered.

16. All work shall comply strictly to the requirements of the latest editions of the Ontario Electrical CSA Code as adopted and amended by provincial regulations and the Building Code; and applicable CSA and ULC standards. These codes and any additional requirements of the power utility shall form an integral part of this specification. Where drawings call for equipment, wiring or other requirements exceeding the minimum requirements of the code, the drawings shall be followed.

17. Before starting any work, submit the required number of copies of the electrical drawings to the power authority and electrical inspection department regional office, for their approval and comments.

18. Pay all fees for examination of drawings and obtain all permits required and pay all permit and inspection fees.

19. Apply and arrange for inspection of all work by the power authority, inspection department, Ontario Electrical Safety Authority.

20. On award of contract, submit for review list of delivery dates and electronic copies of shop drawings for all equipment.

21. All materials shall be new and free from defects, noise and vibration. All equipment shall be CSA approved.

22. Schedule and coordinate all work with other trades. Relocate or replace conduit or equipment which interferes with other trades due to lack of coordination with other trades at no extra cost to the Client. Assume full responsibility for layout for all work and for any damage caused to UTSC property, or the work of other divisions by improper location or carrying out of this work. Any repairs shall be carried out at own expense of any damage caused by this contractor or by his subcontractors.

23. Coordinate with general contractor for drilling, cutting, patching and painting required for all electrical work and shall be provided by general contractor. X-ray the floors prior to any core drilling. Use covermeter to locate bottom reinforcing locally, and if necessary, adjust location of bolts to avoid drilling through bottom reinforcing. Paint all exposed conduits and surface mounted wireway in finished areas to match adjacent surfaces.

24. All electrical power supply interruptions shall be arranged with the UTSC construction supervisor at least 15 working days in advance and shall be carried out only outside normal working hours.

25. The UTSC shall have temporary use of installation prior to final acceptance.

26. All claims for extras shall be supported by written authorization and shall be submitted with itemized material and labour costs breakdowns. The format of the breakdown shall follow that of the change document (i.e. that of the notice of change, site instruction, change directive, etc.). Materials shall be priced at cost including any discount. Labour units shall be based on CECA and NECA labour unit tables suitable for the type of work involved. There shall be no extra claim for relocation of any equipment within 10 feet (3m) from the original location, provided that the change is made before installation.

27. All electrical equipment mounted and connected by this contractor, whether supplied by him or not, shall be identified by means of plastic nameplates.

28. Provide all grounding to conform with the requirements of Ontario electrical safety code and all other authorities having jurisdiction, regardless of whether or not it is shown on the drawings. a separate insulated green ground wire shall be installed in each power conduit or raceway, sized per Ontario electrical safety code but no less than #14 awg.

29. Provide all conduits and wiring as follows:
    a. Size wiring for a 2% maximum voltage drop to farthest outlet based on circuit rating. Home runs to lighting and receptacle panels which exceed 25m (75'-0") shall be minimum no. 10 awg.
    b. All electrical power wiring shall be copper, minimum size no. 12 awg, type rw90xlpe, 600v insulation. All electrical wiring shall be stranded. Power wiring shall be installed in metallic conduit, or metallic raceway, unless noted otherwise. All outdoor wiring shall have copper conductors with rwu-90, x-link, -40°f, 600v insulation. For all applications where flexibility is required, use seal tight flexible metallic conduit, unless noted otherwise. Termination lugs for feeder cables shall be compression type. Final wiring connections to all rotating and vibrating equipment shall be made using liquidseal flexible metal conduit or equal.

       BX (ac90) is only allowed from junction boxes above the lighting fixtures to the lighting fixtures and lighting fixture to lighting fixture above the drop ceilings. BX (ac90) shall not be used at any other locations except by special permission from UTSC.

       Maximum length for 15 amp, 120/208 volt branch circuit home runs shall be as follows:

Load	#12 AWG	#10 AWG
Receptacle	65 ft (20m)	over 65 ft (20m)
Lighting	90 ft (27m)	over 90 ft (27m)

    c. Wiring for doors:
       .1 By this electrical contractor:
          - Provide all wiring, conduits & junction boxes.
          - Wiring shall be solid copper conductors, riser rated and installed in conduits.
          - All low voltage wirings hall be #22AWG, stranded and s shielded and installed in conduit or plenum rated in hollow metal door frame where accessible.
          - Minimum conduit size to be 3/4”.
          - Refer to University of Toronto Scarborough Campus Security and access control Specifications for additional information.
       .2 By UTSC contractor:
          - Final connections, programming and commissioning of door control system. This electrical contractor to coordinate as required.
       .3 By General Contractor:
          - Provide door control devices such as transfer hinge, card reader, door controller, door contacts etc. This electrical contractor to coordinate as required.
    d. Fire alarm system wiring for initiating devices shall be copper, minimum size no.14 awg, or special cables required as per fire alarm system manufacturer recommendations, installed in emt. Wiring for signal circuits shall be #12 awg

minimum installed in emt.

e. Horizontal runs of conduits shall be installed above suspended ceilings and fastened to the structure above, unless noted otherwise. The down drops on existing walls shall be installed with surface mounted wiremold type wireway sized to suit the application, unless noted otherwise. The conduits shall be concealed in new walls, unless noted otherwise.
f. All conduits shall run parallel to building lines.
g. Conduits shall be installed to allow for expansion and expansion fittings shall be provided where required.
h. Connectors for EMT conduit shall be steel, compression type, nylon insulated. Steel set screw type is acceptable.
i. Expansion fittings shall be installed in conduits crossing expansion joints.
j. Joints in conduits installed underground, in concrete slab on grade or in a concrete duct bank shall be made completely watertight.
k. Minimum concrete thickness over or around a conduit in a concrete slab shall be 3" (75mm).
l. A separate insulated ground wire shall be installed in all conduits, except computer telephone/control conduits.
m. Conduits for computer systems shall comply with Enterprise Infrastructure Solutions (EIS) Standards.
n. Conduits: interior conduits shall be emt with steel compression type fittings in all cases, minimum size 3/4" diameter, except by special permission and/or as noted otherwise. On building exteriors it shall be rigid galvanized steel with threaded connectors. The underground conduits shall be PVC type 2 complete with approved fittings. The conduits in concrete slabs above grade level shall be rigid galvanized steel with threaded connectors or PVC type with approved fittings.
o. Provide conduit supports as required by the latest edition of the Ontario electrical safety code.
p. Provide nylon fish wire in all empty conduits.
q. Where conduits pass through fire rated walls or floors, provide listed fire stopping material which bears label of CSA and ULC, and maintain same fire rating as that of building component penetrated.

30. Mark in black on the colour coded cover plates the year when this colour code was applied. Use 4-digit numbers to represent the year.

31. All materials and equipment shall be CSA or Ontario electrical safety special inspection approved and bear evidence of same.

32. Light switches and receptacles on normal power shall be white.

33. Light switches and receptacles on emergency power shall be red.

34. Isolated ground receptacles shall be orange.

35. All Receptacle outlets shall be permanently identified indicating the circuit number and source of supply (e.g. Panel board designation).

36. Nameplates shall be engraved lamacoid, with white letters on a black background, fastened with stainless steel screws. Pen size for all lettering shall be 1mm (minimum).

37. All low voltage and multi conductor cables shall be installed in conduit.

38. Unless otherwise noted on the architectural and electrical drawings, mounting heights of equipment above finished floor shall be as follows:
    a. Mounting height of the panelboards shall be 4'-6" from finished floor to centre of the panelboards. The top breaker of the panelboards shall be not more than 6'-0" from finished floor.
    b. Light switch - 43" (1100mm) from floor to the centre of the switch.
    c. Motor starter/thermostat – same as light switch.
    d. Receptacle, telephone, data, etc. - 12" (300mm) ") from floor to the bottom of the receptacle, unless noted otherwise.
    e. Receptacles in mechanical rooms and other unfinished areas - 47" (1200mm).

39. If number of conductors in any one conduit exceeds 6 line conductors, conductor size shall be increased to allow for derating as required by Code.

40. Mechanical trade will supply all starters, control transformers and controls for equipment supplied by them and will mount all these except for wall mounted starters and wall mounted line voltage controls, which shall be mounted by electrical trade. Electrical trade shall do all power wiring, which is wiring that carries the load current of the motor, heater, hot water tank or other equipment supplied by mechanical trade. Mechanical trade will do all other related wiring.

41. All conduits and outlet boxes shall be supported from the building surfaces and shall not be supported from other conduits, ducts or pipes.

42. Provide electrical service “gooseneck” type flashing for any services penetrating roof for watertight installation.

43. Provide Fire Stops. Fire stops shall seal off all fire rated walls and ceilings. Fire stops shall be CSA and UL listed and shall be designed for application required to meet the various fire rated separations. Fire stop shall be Hilti, Tremstop manufactured by Tremco, 3M or equal.

44. Warrant all labour and materials installed under this division for a period of one year from the date of final acceptance and submit warranty certificate to UTSC.

45. Hazardous materials removal and drilling of holes in walls and ceiling that contain asbestos: hazardous materials, if found, they shall be removed by hazardous material abatement contractor according to the type of procedures stipulated by the regulations

and in division 1 specifications for this contract. For drilling of holes in walls and ceiling that contain asbestos refer to division 1 specifications.

End of Section

RACEWAY, ELECTRICAL DEVICES AND CONTROLS – SECTION 26 05 20

1. Provide all material, equipment and labour required for a complete and adequate installation of electrical materials as shown on the drawings and as described herein.

2. Switches and dimmers shall be unless otherwise indicated, Lutron.

3. Coverplates for receptacles, light switches, telephone, data and TV outlets shall be:
   a. Stainless steel, suitable for the respective device, for all devices mounted in flush-mounted outlet boxes located in finished areas.
   b. Metal cover plates for wiring devices mounted in surface-mounted FS and FD type conduit boxes.
   c. Cover plates in race-way – as per architect.

4. Outlet boxes shall be electro galvanized and made of code gauge steel, where more than one device is shown on plan, a multi-gang box shall be used. Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent areas. Outlet box for devices mounted side by side or one above the other shall be separated by a minimum of one inch (25mm). Opposing outlets on partition walls shall have a 6" (150 mm) horizontal separation. They shall not be mounted back to back.

   Outlet, junction and pull boxes shall be sized to suit particular device and application. In new walls, outlet boxes shall be flush-mounted. Use 4 gang back boxes with barrier at locations where power/data/telephone outlets are recessed together in walls. On existing walls, outlet boxes shall be surface mounted wiremold type boxes, unless noted otherwise. Outlet boxes in new walls and partitions shall not be mounted back-to-back; provide a minimum horizontal separation of 6" between opposing boxes. Floor mounted outlet boxes shall be wellmark fm series, unless noted otherwise.

5. Electrical boxes (applies to all services) occurring in acoustic walls shall be installed with preformed neoprene box seals.

6. Provide all wiring devices, complete with outlet boxes and stainless steel cover plates as called for on the drawings. Wiring devices shall be specification grade 'Hubbell' or approved equal, including but not limited to receptacles. All receptacles to be labelled with machine generated adhesive labels to indicate the corresponding circuit numbers.

7. Receptacles shall be white decore style mounted at 300mm (12") from floor to the bottom of the receptacle, unless noted otherwise.

8. Receptacles on emergency power shall be coloured red.

End of Section

LIGHTING CONTROLS – SECTION 26 09 33

1. Provide Lutron Modular Dimming controls Lutron GRAFIK Eye QS. For additional info refer to drawings.

2. SYSTEM DESCRIPTION
   .1 Modular dimming control: Factory assembled dimming control, interfaces, and modules. Low voltage wall stations.

3. WARRANTY
   .1 Provide manufacturer's warranty covering two-year 100% parts and labor coverage from date of commissioning.

4. COMMISSIONING
   .1 Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation of system. Train owner same day.

5. PRODUCTS
   .1 Main control unit to be Lutron Grafik QS unit complete with digital loop capability supporting up to 64 ecosystem dimming drivers. Unit to support 6,8 or 16 zones and be capable of digitally assigning drivers to any zones. Reconfiguration is without rewiring. Unit to have 4 scenes and off buttons programmable by user.
   .2 Dimming nodes – 0-10 volt units – QSN-4T16-S - to be added to link to allow for control of both normal and emergency lighting thru zones of main GRAFIK EYE controller. Where emergency lighting involved, include for an LVS load side 0-10v relay such that designated emergency lighting goes to full upon loss of normal power
   .3 Where adjacent rooms are in scope, provide contact interface and partition sensors to provide automatic sensing of partition status.
   .4 System can accommodate Lutron motorized blinds where applicable. Connect Lutron blinds to QS power panel and run low voltage wiring. Connection of other manufacturer blinds- where compatibility exists- will require interfaces and modifications to wiring and is responsibility of electrical contractor. Coordinate with architect and GC before wiring / ordering.
   .5 Include for wireless occupancy sensors to link directly without wires to local grafik eye control unit. Use ceiling – LRF2-OCR2B-P-WH or wall mount - LRF2-OWLB-P-WH wireless sensors for reliable communication. Sensors from other manufacturer not allowed.
   .6 System to be compatible with and by same manufacturer of digital ballasts for one source responsibility.
   .7 Unit to be c/w astronomic timeclock and is programmed at the unit without use of PC.
   .8 Low voltage keypad ties to main unit and allows for scene and zone control as required by end user.
   .9 System to be supplied by Lutron Electronics Co., Inc., no substitutions allowed.

SERVICES AND DISTRIBUTION – SECTION 26 24 00

6. Provide all material, equipment and labour required for a complete and adequate distribution system as described herein.

7. Power panels:
    a. Provide panelboards as called for on the drawings.
    b. Power panels shall contain circuit breakers or fusible units. Fusible units will not be accepted in lieu of breakers and vice versa.
    c. Panelboards shall be industrial quality, complete with copper bus, copper ground bus, main breaker, designed for use with bolt-on, thermally compensated, trip-free circuit breakers; 2 pole and 3 pole circuit breakers shall have common trip handles. Tie handles are not acceptable. Panelboards shall be rated at minimum 18ka IC for 208v, series rating is acceptable. Panelboards enclosure shall be dead front construction with hinged door having latch and key, and factory-finished grey ASA no. 61. Provide typewritten directory information, protected with plastic cover.
    d. Panelboards shall be completed with 200% rated neutral.
    e. Surface-mounted panelboards shall be complete with drip shield and weather proof connectors.
    f. Mounting height of the panelboards shall be 4'-6" from finished floor to centre of the panelboards. The top breaker of the panelboards shall be not more than 6'-0" from finished floor.
    g. Balance the connected loads across the phases on the panel, within 5%.
    h. Panelboards shall conform to CSA requirements.
    i. Panelboards shall be manufactured by Schneider, Siemens or Eaton.

8. Provide feeder circuit breakers as called for on the drawings. Feeder circuit breakers shall have a short circuit interrupting capacity to match existing power distribution board. Where interrupting capacity is not evident, consult with UTSC. representative.

9. Provide circuit breakers off the splitter as called for on the drawings. Circuit breakers off the splitter shall be molded case type in eemac-1 enclosure. Circuit breakers shall be Schneider, Eaton or Siemens.

10. Tandem double density circuit breakers are not acceptable.

11. All materials and equipment shall be CSA or Ontario electrical safety special inspection approved and bear evidence of same.

12. All current carrying material shall be copper, including but not limited to panelboard bus, splitter bus, transformer windings, and wiring.

13. Fusible units shall have quick-make, quick-break mechanism and shall be front operated. Unit shall be individually enclosed with insulated end barriers. Fuse clips shall be high pressure type suitable for and complete HRC fuses.

14. Circuit breakers shall have ampacity and frame size shown on the drawings. Breakers shall have definite off and trip positions with provisions for padlocking. Breakers shall be bolted to the bus. Two and three pole breakers shall have common trips.

15. Unless otherwise noted, two and three pole moulded case circuit breakers shall have a minimum interrupting capacity of 22kA RMS symmetrical, and 10kA RMS symmetrical for single pole.

16. Each fusible unit or breaker shall have a lamacoid nameplate attached with contact cement or screws. Nameplate shall carry name of equipment or panel served by the unit or breaker.

17. All the power distribution equipment shall have permanent identification lamicoid name plates identifying source of power supply and connected load.

18. Fuses shall be HRC Form 1. Fuses protecting motors or transformers shall be time delay type.

19. Panelboards, including tubs, shall be factory finished ANSI 61 grey. Emergency power panelboards shall be green.

20. Submit shop drawings for switchboard, panels, transformers, service poles and all other products indicated by Consultant, for approval by Consultant and UTSC. Submit short circuit calculations at panels and provide all required adjustment on equipment to suit.

End of Section

LIGHTING - SECTION 26 50 00

1. Supply and install all lighting fixtures, lamps, and all required accessories as indicated on the drawings by letter type and as hereinafter specified. Provide lighting fixtures as called for on the drawings.

2. Submit shop drawings for each lighting fixture type.

3. Replace and install without extra cost to the owner:
   a. All defective or noisy ballasts or drivers for a period of one year.
   b. Any incandescent or low voltage lamp which fails within 30 days of takeover.
   c. Any fluorescent or H.I.D. Lamp which fails within 90 days of takeover.
   d. LED lights within 90 days.

4. Incandescent lamps shall be 130V standard service type as manufactured by G.E., Philips, or Sylvania, unless otherwise noted.

5. Compact fluorescent lamps shall be 3500K type or as specified with CRI of 82 as manufactured by G.E., Philips or Sylvania. Ballasts for compact fluorescent lamps shall be high power factor, electronic.

6. Fluorescent T-8 lamps shall be bi-pin, rapid start, 3500K with CRI of 85, initial lumens of 3000 for F32 T-8, as manufactured by G.E., Philips, Osram, or Sylvania, unless otherwise noted.

7. Ballasts for fluorescent T-8 lamps shall be high frequency electronic, rapid start with Class “A” sound rating, minimum power factor of 95%, maximum total harmonic distortion of 15%, minimum ballast factor of 85%, and maximum crest factor of 1.7. Ballasts shall meet ANSI/IEEE specification C62.41 for transient and surge immunity, and FCC Part 18 Subpart C for non-consumer limits for EMI and RFI emission. Ballasts shall be manufactured to Certified Ballast Manufacturers standards and as manufactured by G.E./Motorola, Advance/E.B.T., Magnetek, Flotronic (347V only) or Osram.

8. Drivers for LED lights to be dimmable (0-10) where dimming control is shown.

9. All lighting fixtures, including those mounted in suspended ceiling, to be supported from building structure. The supports required for mounting and installation of lighting fixtures shall be supplied and installed by this contractor. The supports shall be attached to the structure. The drop ceiling system shall not be used as a supporting means.

10. Coordinate the installation of lighting fixture with all trades to provide spacing intended.

11. Fixtures shall be properly cleaned and left clean and dust-free. Any fixture showing marks or scratches due to handling or tool marks shall be replaced.

12. Lighting switches shall be white decore style mounted at 1100mm (43") from floor to the centre of the switch.

13. Dimmer switches shall be rated to control the required load.

14. Provide exit lights as called for on the drawings. LED's 4 watt, high power factor, surge protected and CSA approved. Exit lights shall be Emergi-lite, Lumacell, Beghelli or approved equal manufacture.

15. Lighting fixtures connected on emergency power shall be labeled with red dot marking.

End of Section

WORKING IN EXISTING BUILDING AND CONTINUITY OF SERVICES – SECTION 26 50 10

1. Mechanical and electrical alterations and additions are being made in the existing areas as noted on mechanical drawings and specifications.

2. Visit the site and examine the existing conditions and all tendering documents, drawings and specifications. Make all necessary allowances in tender price for removal, relocation, rerouting, reconnection of existing electrical equipment and wiring as may be necessary for the execution and completion of this project. No allowance will be made later for any expense incurred by this trade through failure to make this examination.

3. Remove and/or relocate and reinstall all wiring and equipment as necessary to accommodate Mechanical alterations and additions indicated on the drawings. Wiring located in areas being altered or demolished, but feeding outlets or equipment required to remain in service shall be rerouted as required to maintain the continuity of these services.

4. Existing electrical equipment removed and indicated for reuse shall be cleaned before installation. All unused conduit entrance openings shall be sealed. All defective components shall be replaced before reinstallation.

5. All wiring shall be run concealed where possible except that conduits in unfinished areas and on existing walls and ceiling may be installed on surface.

6. Rework existing power service and distribution to suit mechanical equipment revisions. Provide new power panel, splitter and fusible units, etc., as required.

7. Supply, install and maintain all required temporary wiring to occupied areas at all times. Provide adequate protection to existing wiring and equipment serving the existing and new work and particularly where wiring and electrical equipment have become exposed to mechanical injury or moisture in the course of alterations or new work.

8. Removal of existing breakers from the existing electrical panels and installation of new breakers in the existing electrical panels shall be carried out only outside normal working hours with proper power shut down procedures and shall be coordinated with UTSC utilities division.

9. Power shutdown, if required, must be coordinated with client’s representative. All electrical power supply interruptions shall be arranged with the UTSC construction supervisor at least 15 working days in advance and shall be carried out only outside normal working hours.

10. Fire alarm isolation shall be arranged with the UTSC project manager and fire prevention at least 48 hours in advance.

11. Contractors working on live equipment of 30 volts or more without a power shutdown to the equipment will be liable for injuries and/or damages for any power disruption that may be caused, even if permission is granted to work on live equipment.

12. Certain items are identified on the drawings as existing equipment to be “removed”. Disconnect said equipment and make safe. Obsolete conduits and cables shall be disconnected from their source of supply, cut back to a suitable point.

13. All unused fused switches and circuit breakers shall become spare. Provide new, up-dated directories for panels.

14. Certain items are identified on the drawings as existing equipment “relocated”. Disconnect said equipment from its present source and after relocation, reconnect and reinstall all electrical components. Provide new disconnects to suit equipment rating.

15. All existing equipment and material not required in the final installation shall be carefully removed at the appropriate time and shall be disposed of except starters for mechanical equipment being handed back to the Client.

16. Demolition:
    a. Verify existing conditions before starting work.
    b. Verify field measurements and circuiting shown on drawings.
    c. Verify that abandoned wiring and equipment serve only abandoned facilities.
    d. Demolition drawings are based on casual field observation. Report discrepancies to University of Toronto Scarborough Campus before disturbing existing installation.
    e. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
    f. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
    g. Existing electrical service: maintain existing system in service until new system is complete and ready for service. Disable system only to make switch overs and connections. Follow University of Toronto Scarborough Campus procedures for scheduling shutdowns. Minimize outage duration.
    h. Remove, relocate, and extend existing installations to accommodate new construction.
    i. Remove abandoned wiring to source of supply.
    j. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
    k. Provide blank cover for abandoned outlets which are not removed.
    l. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

m. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories. Recycle all elements where possible. Dispose of hazardous materials at appropriate facilities.
n. Repair adjacent construction and finishes damaged during demolition and extension work.
o. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
p. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.
q. Clean and repair existing materials and equipment which remain or are to be reused.

End of Section

VOICE AND DATA CABLING AND COMMUNICATION - SECTION 27 05 13

1. GENERAL SCOPE OF WORK

a. This document includes specifications for the UTP cable, fibre optic cable, cabling components, conduit and raceway infrastructure, cable terminations, testing and "as-built" documentation within the designated areas.

b. The contractor is to provide horizontal UTP cabling and termination hardware installed, terminated and tested. EMT conduits are to be provided for horizontal cabling.

c. Much of the work is described in broad terms in the “product and installation specifications for building data and voice communication cabling” and “University of Toronto Scarborough Campus communication infrastructure specifications, standards and practices” documents.

d. All work must conform to the following; industry accepted practices, manufacturer’s component installation guidelines and the latest versions of the applicable codes including any technical services bulletins and addenda. These include the Ontario building code, the Canadian electrical code part I, Ontario hydro electric safety code, and the following communications standards:

Standard	Title
ansi/tia-568-c.0,	"generic telecommunications cabling for customer premises", published 2009
ansi/tia-568-c.1,	"commercial building telecommunications cabling standard", published 2009
ansi/tia-568-c.2,	"balanced twisted-pair telecommunication cabling and components standard", published 2009
ansi/tia-568-c.3,	"optical fiber cabling components standard", published 2008, errata issued in October, 2008
CSA t530	commercial building standard for telecommunications pathways and spaces
CSA t528	administration standard for the telecommunications infrastructure of commercial buildings
CSA t527	commercial building grounding and bonding requirements for telecommunications
ansi/neca/bicsi-568	standard for installing commercial building telecommunications cabling
CSA c22.1	Canadian electric code part 1 and Ontario Hydro electrical safety code
CSA-c22.2 no. 182.4-m9	plugs, receptacles and connectors for communication systems

CSA-c22.2 no.214-94 communications cables

e. All work must also conform to the “University of Toronto Scarborough Campus product and installation specifications for building data and voice communication cabling” and “University of Toronto Scarborough Campus communication infrastructure specifications, standards and practices”. In the event of a conflict between the above standards and the above two documents ("product and installation specifications for building data and voice communication cabling” and “University of Toronto Scarborough Campus communication infrastructure specifications, standards and practices") the latter shall take precedence.

f. Approved telecommunications products shall be Hubbell, Panduit, Commscope and Belden.

g. System shall be end-to-end certified with minimum 25 year warranty. As part of shop drawing review, contractor to provide confirmation from manufacturer that contractor is licensed to provide a certified end-to-end system.

h. Certified system shall be complete with minimum 25 year warranty.

i. Submit shop drawings for review and approval including but not limited to: cabling, jacks, patch panels, wire management, cable trays, etc.

2. CABLING PATHWAYS

.1 Provide telephone outlets, wiring and conduits as called for on the drawings. Each wall mounted telephone outlet shall be connected with minimum size 3/4" diameter conduit from the nearest telephone pull box, unless noted otherwise. The zone conduits and pull boxes requirements shall be same as data pull boxes and zone conduits.

.2 Provide data outlets, cabling & conduits as called for on the drawings.

.3 General requirements for data conduits installation shall include the following:

- Maximum distance of conduit run between two pull boxes to be 30m. The pull boxes shall have screw type cover not hinged. All pull boxes must be accessible with a minimum 24" x 24" hinged access hatch provided where required. Pull boxes for vertical conduits must be installed to provide a straight pass through for vertical cables. The exception is where 4" diameter conduit is used, then 30" x 24" x 6"d pull boxes are acceptable. For 2" diameter conduit, 16" x 12" x 4"d pull boxes shall be provided.

- There are to be no more than two 90° bends or the equivalent between pull boxes.

- Conduits shall have a minimum bend radius of ten times the internal diameter of the conduit and this requirement shall be borne in mind when attaching conduit to junction boxes. In any case, the conduit bend radius shall be not less than 8" except at the final data outlet point.

.4 Each wall mounted data outlet shall be connected with minimum size 3/4" diameter conduit from the nearest data pull box, unless noted otherwise.

.5 Provide ladder type cable tray, 4"x12", 8" rung spacing in server rooms.

.6 Provide basket type cable tray, black, 4"x6" minimum in other areas.

.7 Provide all cable tray accessories and supports including trapeze hangers, offsets, angles, vertical offsets, vertical downs and radius downs.

.8 Center hung cable trays are not acceptable. Sizing of cable tray indicated on drawings are minimum sizes. Contractor to verify cable counts, weights and routes and provide components to suit quantity, lengths and route of cabling to be provided. Avoid interferences with architectural, structural and mechanical elements. Provide vertical offsets to accommodate changes in elevation.

.9 Provide j-hooks from cable trays to conduit drops. J-hooks shall be supported from slab.

.10 Wire data outlets shown on the drawings, as per data cabling specification.

.11 Provide fire stopping and sealant at all locations where conduits penetrate walls and floors.

.12 Provide fire barrier pillow (3m) at all locations where cable trays penetrate walls and floors.

.13 Wire data outlets shown on the drawings, as per data cabling specification.

.14 Remove abandoned data wiring.

3. DATA CABLING & COMPONENTS

.1 Provide 4 pair, Category 6 cabling in conduit from outlet locations to the existing network rack in room #7024a, as shown on the drawings, unless noted otherwise.

.2 The approved horizontal data cabling shall be solid copper, blue for the data network, unshielded twisted pair (UTP), 4-pair, 24 awg, CMR rated (ft4), category 6 cable as applicable. The cable shall be, Hubbell, Panduit, Belden IBDN 2400, or Commscope Systimax Gigaspeed xl.

.3 All cables should be installed in a way to comply with the ansi/tia/eia-568-c.2 wiring standard.

.4 The approved horizontal UTP Category 6 data cabling to be terminated at each outlet location as indicated on the drawings with modular 8 position, 8 wire RJ45 connector. Modules to be wired as per t568a. Modular data jacks shall be blue in color for Category 6 data network. Hubbell, Panduit, Belden, Commscope are the approved manufacturers.

.5 Provide:

- 7'-0" category 6 patch cord cable, one for each data drop connection at the relay rack location - patch cables to be blue in color.
- 10'-0" category 6 patch cord cable, one for each data drop connection at each user location - patch cables to be blue in color.

.6 Provide as required 2u 48 port patch 19" panels, Category 6 compliant, modular jacks in existing network rack. Modular jacks to be color blue in the relay rack. One horizontal cable manager per copper patch panel is to be provided. Managers are to be 1u for 24 port panel and 2u for 48 port panel.

.7 Cross connects to data network switch by UTSC client. Notify UTSC project manager to coordinate for cross connections.

4. CATEGORY 6 DATA CABLING & COMPONENTS (for wireless connections - WAP)

.1 Provide data cabling in conduit from each outlet location to the WAP patch panel in the data rack in room #8053.

.2 Provide two Category 6 UTP cables at each wireless data outlet location. Extend the Category 6 cables from each outlet to patch panel in data rack.

.3 Faceplates shall be single gang with modular jacks. Provide blanks for all unused jacks.

.4 Provide:

- 7'-0" category 6 patch cord cable, one for each data drop connection at the relay rack location - patch cables to be orange in color.
- 3'-0" category 6 patch cord cable, one for each data drop connection at access point location - patch cables to be white in color.

.5 Category 6 cabling shall be terminated in modular orange data jacks at the patch panel end and modular white data jacks at the access point end.

.6 UTSC to supply the wireless access points to be mounted at locations on drawings, adjacent to corresponding data outlets. Wall mounted access points to be installed approximately 10'-0" A.F.F. Ceiling mounted access points to be

positioned below the ceiling. Contractor shall install the access point and connect the category 6, white data UTP cable from access point to wireless data outlet.

.7 Provide as required 2u 48 port patch 19" panels, category 6 compliant, modular jacks in existing network rack. Modular jacks to be color orange in the relay rack. One horizontal cable manager per copper patch panel is to be provided. Managers are to be 1u for 24 port panel and 2u for 48 port panel.

5. SPECIFIC SCOPE FOR VOIP CABLING

.1 Supply and install cable runs of category 6 cable from outlet locations as indicated on the drawings to the voip patch panel in data rack in room #7024a.

.2 The approved horizontal UTP category 6 voice cabling to be terminated at each outlet location with modular 8 position, 8 wire RJ45 connector. Modules to be wired as per t568a. Modular voice jacks shall be white in color. TE connectivity, Commscope and Belden are the approved manufacturers.

.3 Provide:

- 7'-0" category 6 patch cord cable, one for each voip data drop connection at the relay rack location - patch cables to be white in color.
- 10'-0" category 6 patch cord cable, one for each voip data drop connection at each user location - patch cables to be white in color.

.4 Provide as required 2u 48 port patch 19" panels, category 6 compliant, modular jacks in existing network rack. Modular jacks to be color white in the relay rack. One horizontal cable manager per copper patch panel is to be provided. Managers are to be 1u for 24 port panel and 2u for 48 port panel.

6. SPECIFIC SCOPE FOR VOICE CABLING

.1 The approved horizontal voice cabling shall be white unshielded twisted pair (UTP), 4-pair, 23 awg, CMR rated (ft4) category 6 cable. The cable shall be Hubbell, Panduit, Belden IBDN 2400 system, the Commscope Systimax Gigaspeed xl.

.2 Supply and install cable runs of category 6 cable from outlet locations, as indicated on the drawings, to the BIX termination fields in room #7012.

.3 The approved horizontal UTP category 6 voice cabling to be terminated at each outlet location with modular 8 position, 8 wire RJ45 connector. Modules to be wired as per t568a. Modular voice jacks shall be white in color. Hubbell, Panduit, Commscope and Belden are the approved manufacturers.

.4 Provide BIX 10a frames and 1a4 connector strips as required for the telephone closet. Terminate all voice cables and cross connects as required by the bell telephone company.

7. TESTING

.1 Refer to “University of Toronto Scarborough Campus product and installation specifications for building data and voice communication cabling” document.

.2 The cabling contractor is to use the fluke DTX series or equivalent with the latest version of firmware to test the UTP cabling system. A light source and power meter will be used to for all fibre optic cables. The cabling contractor must ensure that all cabling is tested in accordance to the proposed specifications of the category installed.

.3 Upon completion of testing by the cabling contractor, a university representative may choose to witness up to 10% of the cables being tested.

.4 All deficiencies must be corrected before the project manager will provide a certificate to release the holdback on the project.

.5 Category 6 field test parameters shall be: testing of all 4 pairs is to include but not be limited to the following:

- wire map
- insertion loss
- equal level far end cross talk (elfext)
- power sum equal level far end cross talk (pselfext)
- delay skew
- attenuation (psacr)
- near end cross talk (next)
- propagation delay
- cable length
- power sum near end cross talk (psnext)
- return loss

.6 Fiber field test parameters shall be: testing of all strands is to include but not be limited to the following:

- cable id
- UTSC building number
- attenuation values
- tx location
- rx location
- wavelength
- fiber type

- connector type
- test equipment; tx type and rx type
- reference setting at first wavelength
- contractor name
- technician name and signature
- date test performed
- relevant additional comments

.7 A tester with the most recent version of its software and firmware must perform all tests in accordance to ansi/eia/tia tsb-67. The nominal velocity of propagation (NVP) must be set specific to each cable manufacturer before testing. Portable testers to be calibrated on a minimum annual basis. Fluke DTX or equivalent shall be used.

.8 Test patch cords for the tester must be designed and approved for testing by the manufacturer. Feld assembled patch cords are not acceptable.

.9 All cable faults must be corrected. Splicing of any cables will not be permitted, for any reason, unless prior authorization if received in writing by the University of Toronto Scarborough Campus.

8. LABELLING

.1 Cable labels shall be of self-laminating vinyl construction with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times and be installed within 2" of the termination point of the cable, patch cord or pigtail.

.2 All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 (ref. d-16). In addition the labels shall meet the general exposure requirements in UL 969 for indoor use.

.3 All cable labels shall be compliant with the tia/eia-606(a) section 6.2.2 cable labeling, section 6.2.4 termination hardware labeling, and section 6.2.6 termination position labeling.

.4 All patch panel and 110 block labels are to be mechanically printed and are to follow the guidelines in csa-t528-93 for colour coding of termination fields.

.5 Label all cabling in accordance with CSA-528 specifications. One label should be attached to the front of the workstation faceplate, one to the front of the patch panel, and one at each end of the cable.

.6 All intra-building and inter-building backbone cables for voice and data shall be labeled. Labeling shall include destination (building) to and from at each end.

.7 The horizontal cables shall be labeled in the format type [data or voice]-floor#-room#-cable#. The per room cable numbers shall be sequential beginning at 1. example:
d03-038-2 represents a second data cable to room 038 of the third floor.
v11-099-5 represents a fifth voice to room 099 of the 11th floor.

9. DOCUMENTATION

.1 As-built drawings
The cabling contractor is required to provide as-built drawings of the cable installation. This shall include the pathway of the cables from the telecommunications rooms to the workstation. The as-built drawings shall also include all additional cabling installed during the project. The cabling contractor shall provide the as-built drawings to the University of Toronto Scarborough Campus within 7 business days of the completion of the project.
Must contain the following detail:

- pullbox locations and sizes
- outlet locations
- conduit routing and sizes
- labelling of outlets and equipment

.2 Cable test results
The cabling contractor shall provide all test results in soft copy to the University of Toronto Scarborough Campus. If sent electronically, ensure the test results are sent in the proper tester format. Test results shall include all voice and data horizontal cables and all backbone cables. The report should indicate for each cable, when it was tested successfully and the signature of the technician that performed the test. The entire report must be signed by an authorized person for the cabling contractor at the end of the project.

End of Section

FIRE ALARM SYSTEM - SECTION 28 31 00

2. The fire alarm system is existing Siemens (Fire Finder) panel. The existing system is combination of conventional and addressable.

3. Account Manager for UTSC Fire Alarm Systems is:
Ryan Brockway
Siemens Canada Limited
Cell: 416-388-7672
Email: ryan.brockway@siemens.com

4. The existing fire alarm in the renovated areas as follows:
   a. BV 260
      - Conventional loop heat / smoke in the room
      - Hallway addressable 24DLC'SW loop 3A/BW loop 3B
   b. BV 355
      - No existing devices in the room
      - All conventional devices found on 3rd level
   c. SW311
      - Conventional loop heat / smoke in the room
      - Addressable 28DLC'ARC loop 7A/SW loop 7B

5. This contractor to hire and pay for Siemens fire alarm scope of work.

6. Include for Siemens to investigate the site to determine the load capacity for each existing loop in the renovated areas where applicable. Use existing loops where possible, however, for the purpose of pricing allow for new loops.

7. Provide new addressable loops, isolation modules, relays etc. for complete and functional installation of new fire alarm devices. Refer to drawings for location of the renovated spaces and existing fire alarm panel. New wiring/cabling and conduits to run in ceiling of corridors where possible. Where conduits/wiring have to run thru occupied spaces coordinate with University of Toronto Scarborough Campus for access to affected areas. Allow for work after hours in areas other than public corridors.

8. Provide new addressable type fire alarm devices as shown or specified. New smoke detector, horns, strobes and all fire alarm devices and accessories shall be compatible with the existing system.

9. Complete installation shall comply with the requirements of CAN/ULC-s524 "standard for the installation of fire alarm systems" and shall be verified to CAN/ULC-s537 "standard for the verification of fire alarm systems". Where the requirements of this section exceed the minimum requirements of the ULC standard, these specifications shall govern.

10. Wiring:

a. Separation of wiring shall adhere to suggested wiring and installation guide of CAN/ULC-s524.
b. Wiring:
   Wiring shall be sized in accordance with class 2 requirements, but shall be protected from mechanical injury or other injurious conditions such as moisture, excessive heat or corrosive action in accordance with class 1 requirements. Conductors shall be solid copper. The minimum size of any conductor shall be:
   - For alarm receiving circuit #18 awg twisted shielded pairs. In no case shall the wire resistance in these circuits exceed 50 ohms.

c. For audible signal circuits #14 awg for 1 or 2 conductors in a cable, #18 awg for 3 or 4 conductors in a cable. In no case shall the voltage drop to any signal exceed 10%.
d. Rating of cable shall be 90 degrees c and 300 volt minimum.
   - Wiring shall be installed in conduit and in any case shall conform to the system manufacturer's recommendations. All conduits shall be grounded per class 1 wiring.

11. Verification and certification of equipment:
    a. All existing fire alarm system modifications and new installations shall be verified in accordance with the requirements of the Ontario fire code. In addition, verification in its entirety shall be witnessed by the University of Toronto Scarborough Campus' fire alarm testing and maintenance contractor, to help to ensure the integrity of the field verification process. The contractor performing the work shall include only the cost of subcontracting the fire alarm system verification work as required in his bid. The cost of verification witnessed by third party (the University of Toronto Scarborough Campus' fire alarm testing and maintenance contractor) will be paid by the owner. The contractor (through the UTSC project manager) shall schedule the third party verification with the University of Toronto Scarborough Campus fire prevention office (on the appropriate form) at least two weeks in advance of its commencement. Verification will not be accepted without a letter of witnessing from the UTSC's fire alarm testing and maintenance contractor. Fire alarm system verification shall be carried out only outside normal working hours.
    b. Further to above item, when a relocation, addition, or deletion of a device has been carried out, all devices in the zone shall be tested and documented for proper operation. This applies to both alarm initiating and signal (output) circuits. This testing shall be witnessed as noted in the previous item.
    c. That the type of equipment installed is that designated in the specifications.
    d. That the wiring connections to all equipment components show that the installer undertook to have observed ULC and CSA requirements.
    e. That equipment of the manufacturer's manufacture has been installed in accordance with the manufacturer's recommendations, and that all signaling devices of whatever manufacture have been operated or tested to verify their operation.
    f. That the supervisory wiring of those items of equipment connected to a supervised circuit is operating and that the governmental regulations, if any,

concerning such supervisory wiring, have been met to the satisfaction of inspecting officials.

g. The manufacturer shall supply reasonable amounts of technical assistance with respect to any changes necessary to conform to the above. During the period of inspection by the manufacturer, make available to the manufacturer electricians as designated by the manufacturer.
h. Open flame and smoke are not to be used for testing.

12. Completion of the inspection and when all of the above conditions have been complied with, the manufacturer shall issue to the consultant:
    a. A copy of the inspecting technician's report showing location of each device and certifying the test results of each device.
    b. A certificate of verification confirming that the inspection has been complete and showing the conditions upon which such inspection and certification have been rendered.
    c. Proof of liability insurance for the inspection.

13. All costs involved in this inspection shall be included in the tender price (unless stated otherwise).

14. All conduits shall enter the fire alarm control units from the bottom of the cabinet. Two additional knockouts shall be punched in the bottom of each cabinet, and fitted with a wire mesh screen in order to protect system components from possible water damage that may enter the control panel via conduits. Fire alarm control units shall be protected from sprinkler discharge by adequate drip trays.

15. Fire alarm system conduits shall be identified every 3 metres by a band of red tape or other means deemed acceptable in writing by UTSC Fire Prevention. Junction boxes for fire alarm.

16. System wiring shall be similarly identified or marked “F/A”. Signal circuit wiring shall be run in a separate conduit from initiating circuit wiring or communication wiring (including active field device wiring).

17. Where fire alarm junction boxes will normally be inaccessible, properly identified access hatches shall be provided. Locations of access hatches shall be shown on as-built drawings and shall be identifiable in the field by permanently affixed markings to the approval of University of Toronto Scarborough Campus Fire Prevention.

18. A complete set of as-built drawings shall be compiled and submitted to UTSC Fire Prevention, showing locations of all fire alarm devices, conduits, junction boxes, and end of line devices. Drawings shall identify numbers of conductors and zones served, as well as device addresses for addressable systems. The installation will not be accepted until this documentation has been received in full.

End of Section

UTSC CABLE SYSTEMS SPECIFICATION

SITE DESIGN CRITERIA

DESIGN REQUIREMENTS

INSTALLATION

PRODUCTS

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Valid starting May 25, 2017

VERSION 3.4

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CHANGE LOG

Version 3.4

Special Version for New Residence

1.0 VALIDITY AND SCOPE

Unless agreed to in writing by the IITS Network Administrators the UTSC Cable Systems Specification is only valid under the following circumstances:

An official, dated, quote issued between the dates listed on the title page

An official response to an issued tender that explicitly lists this document version as it appears on the title page

In the case of a large project the Network Administrators may, at their discretion, issue a version of the Cable Systems Specification valid for that project only.

Anything not explicitly called out by the Cable Systems Specification is DISALLOWED. If some detail is not accounted for, contact the Network Administrators for clarification before commencing any work.

This document describes the various components of a structured cable system and gives the standard design criteria for University of Toronto Scarborough Campus based on the university's existing cable standards, the ANSI/TIA Building Telecommunications Wiring Standards for Commercial Buildings (TR-42 Engineering Sub-committee Documents) and the ANSI/TIA-942 Data Center Standard as well as other standards documents. This document will provide design & product recommendations for all projects and MAC (moves adds and changes) work that occurs on the University of Toronto Scarborough Campus.

This document, through reference in this text to standards, constitute requirements of this specification. At the time of publication, the editions (where revision codes are indicated were valid). All standards are subject to revision, and parties to agreements based on this specification are required to apply the most recent editions of the standards indicated including all addenda.

2.0 DESIGN CRITERIA

The goal of the design criteria is to standardize on a clear set of technical solutions and installation recommendations for structured cable systems within U of T Scarborough Campus. As stated in the Scope section, the design criteria describes what goes into the structured cable system and why. The intent is to clearly communicate to U of T Facilities and the IT staff, network engineer, technician and contractor what is expected within every U of T Scarborough installation.

In reality the design criteria standards "show" how the university wants the cable system to be designed and installed. In the large volume of detail that follows,

the reader walks through the cable system from the work area to the entrance facility, expanding each segment of the cable system along the way. Contractors and IT project managers can use this information to specify and quote all cable systems U of T Scarborough Campus requires.

3.0 STRUCTURED CABLING

Structured Cabling comprises six basic components as defined by the ANSI/TIA standards. They are:

Work Area (Equipment Outlet)

Horizontal Cabling (Cabling Subsystem 1)

Telecommunications Room (Distributor A)

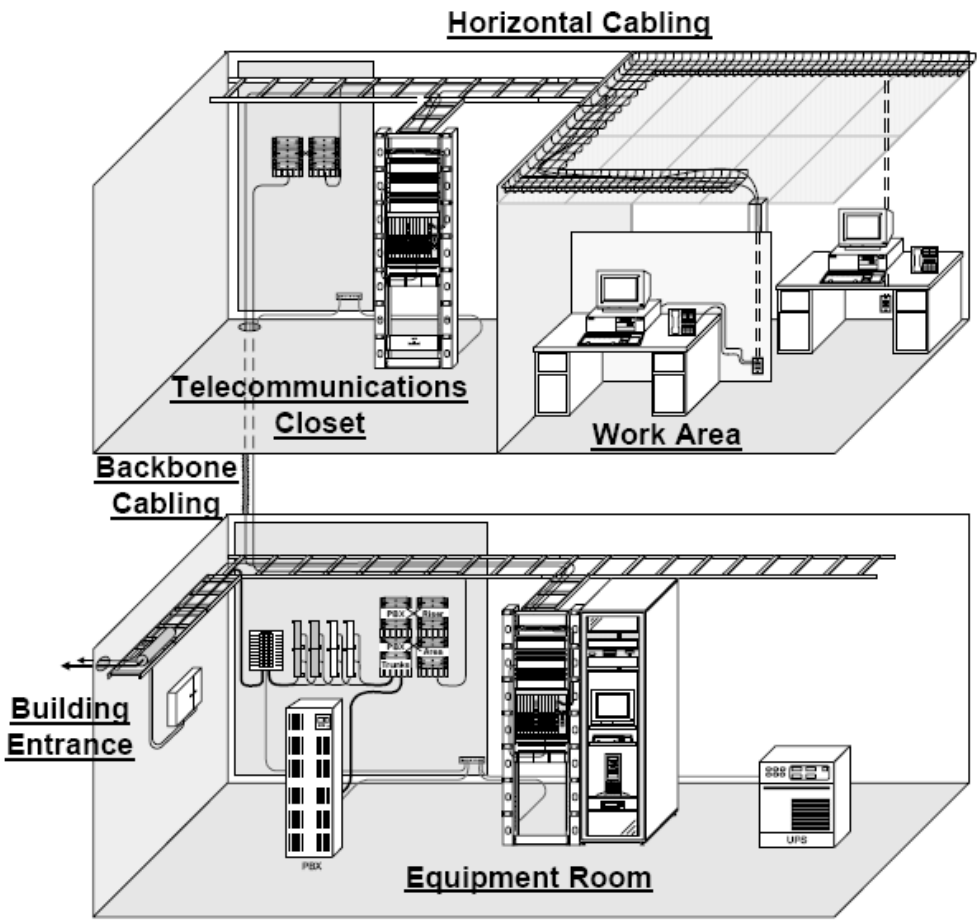
Backbone Cabling (Cabling Subsystems 2 and/or 3)

Equipment Rooms (Distributors B and/or C)

Data Centers

The following diagrams are examples of how these components are interconnected:

Under-floor or Overhead System



4.0 WORK AREA

4.1 DESIGN

Each 4 pair cable in the horizontal shall be terminated in a standard eight-position modular jack (RJ45) in a permanently mounted location. A machine printed label with the cable label will be affixed, preferably behind a clear, protective, cover. All labeling to follow the standard below.

4.2 STANDARD WORK AREA OUTLET (WAO)

The Work Area Outlet should accommodate:

Modular eight position jacks

Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary.

A blank filler to be installed when extra ports are not used.

A dust cap to be installed on all modular jacks.

The standard WAO has "multi-use" Information Outlets (IO) or jacks installed for voice and data use. The IO consists of the jack and cable, terminated using the T568A standard.

4.3 COLOUR CODE FOR NETWORK JACKS

Colored Jacks will be used to differentiate Cable Types:

Jack & Icon colors for Cat 5E drops are blue.

DEPRECATED: Only use to repair exiting wiring, all new cable to be CAT 6+

Jack & Icon colors for Cat 6 drops are green.

Jack & Icon colors for Voice drops are gray.

Jack & Icon colors for Security drops are orange.

4.3.1 GigaFlex PS6+ MDVO JACK

Picture is to indicate style only, for color selection refer to the table below.

Part Number	Description
AX101070	GigaFlex PS6+ module, MDVO Style T568A/B, Green
AX101063	GigaFlex PS6+ module, MDVO Style T568A/B, Gray
AX101067	GigaFlex PS6+ module, MDVO Style T568A/B, Orange

4.5 LABELING

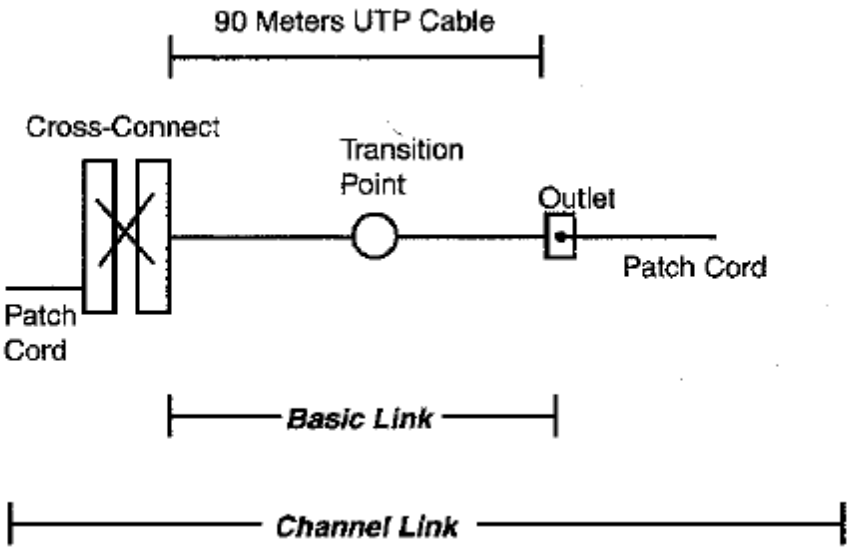
The modular jack should incorporate printed label strips on the dust cap module for identifying the outlet. Printed labels should be permanent and compliant with ANSI/TIA -606 standard specifications. Hand printed labels should not be accepted. Please refer to the labeling system outlined later in the document.

4.6 COMMUNICATIONS PATCH CORDS

The contractor will provide factory-terminated and tested UTP patch cords and equipment cords for the complete cabling system. The UTP patch cables will be Belden PS6+ Modular cords. The contractor will consult the tender document and IITS Network Administrators for exact numbers, lengths, and colours.

The contractor is responsible for RJ45 conn or cross connect.

The maximum length of the channel link shall not exceed 100 meters or about 327 feet. The line cord between the WAO and the attached device shall not exceed 3 meters, (9.8 feet) leaving 7 meters of cord in the telecom room -- end-to-end allowing for 100 meters in the channel -- the horizontal (permanent) link (90m) and the two cords (10m) combined.



4.7 COLOUR CODE FOR PATCH CORDS

Usage	Category	Colour
Equipment	Belden PS6+	Green

PoE Devices	Belden PS6+	Black
Voice (Non-PoE)	Belden PS6+	White
DEPRECATED	Belden PS5+	Blue

5.0 HORIZONTAL CABLING

5.1 DESIGN

All horizontal channels shall contain only Belden IBDN System 4800 components, including cables, jacks, patch cords, patch panels, cross-connects, and workstation outlets. In all circumstances the cable shall be Plenum Rated (CMP – part number DataTwist 4813). Riser Rated cable (CMR) is not to be used. All cable MUST be WHITE in color.

The only exception to the use of Plenum Rated cable is for horizontal channels that terminate outdoors, in which case outdoor rated cable may be used, and transition to CMP will be done within 3 meters of entering the building or in compliance with building code whichever is shorter.

5.2 CABLE LENGTH

The maximum allowable distance from the patch panel in the Telecommunications Room or TR to the Work Area Outlet is 90 meters (295 feet). This should be taken into account when identifying the size of a TR service area.

5.3 CABLE SUPPORT

Care should be taken when initial designs for a TR service area are engineered, not to under-size this critical segment of the horizontal system. Retrofitting an existing occupied building to support more horizontal cabling, if it is possible at all, is expensive to implement in every way, from engineering design through installation.

Cable pathways are to be in straight lines with as few turns as possible, and shall align with building geometry. In all instances every effort should be made to have these pathways parallel and in proximity to public spaces (such as hallways). This makes it easy for access and minimizes workers downtime due to technicians within the work area.

Cable Tray or a combination can be used to support cable between the WAO and TR. In locations where large cable quantities exist, cable tray should be used.

If cable trays are not appropriate or feasible conduit is to be used. J-Hooks are only to be used when explicitly called for in a tender.

Under no circumstances should horizontal cable be run unsupported, or supported by any other method other than listed in this document.

5.4 CABLE TIES

Cable containment is the purpose of cable ties, to manage, organize and control large amounts of cable. Cable ties are widely used to bundle cable in manageable groups during each phase of installation. When applied too tight they change the physical characteristics of the cable, resulting in degraded electrical performance. The proper use of cable ties is the focus of installing horizontal cable. Sections, Design and Installation, touch on similar topics with this section answering the "whys" of cable ties, and Installation "hows."

U of T Scarborough requires loose cable ties (non-cinching)! Ties, preferably Velcro or Millie-Tie™ should be installed so that they loosely wrap around the bundle and one finger can be slipped inside the cable and the tie.

In addition, the application of cinching cable ties during preliminary phases of installation should be avoided as they can compress the cable to the point of bending the conductors inside each cable facing out in the group. Care shall be taken during early phases of work to not damage the cables. This has a detrimental effect in performance.

5.5 BUNDLING

Containment is the goal of organizing, managing and dressing the cable bundle through the support system.

Cat 6 cables are engineered to have airspace in and around each cable. The random lay of the cable in the support system ensures there is minimal electrical influence between energized cables.

A nice, clean "computer room showcase" bundle of cable is not the goal, due to the physical changes tight bundles exert on the cable.

In Illustration 1 the cable is one large tightly groomed bundle, with the entire weight of the bundle suspended from the cable tray above. This removes the airspace and the random lay of the cable, increasing the potential of electrical influence between adjacent cables.

Illustration 1: DO NOT DO THIS!

5.6 CABLE TOPOLOGY

Horizontal wiring shall be configured in a star topology, with each WAO directly connected to the TR. The horizontal wiring should not contain any discontinuities, such as Consolidation Points, between the TR and the WAO; the "home run" method (except where indicated below for indoor to outdoor transitions). Splices or bridge taps are not permitted in the horizontal cabling.

Cable part number

Riser

Plenum

Plenum when necessary as per fire code

Part numbers

5.7 INDOOR/OUTDOOR CABLE

In conditions of high moisture, or exposure to the elements, outdoor cable shall be used. For the most common application of copper network communications, Belden DataTwist 6 OSP, Nonbonded-Pair, 4-pair, Category 6 cable (OSP6U0101000) shall be used. This cable will be terminated on both ends with

Belden Field Mod Plugs (CAPFMUL-S1). Upon entry to the facility/TER the cable type shall be switched to a CMP rated cable by use of a Belden Media Box (AX106512-EW).

5.7.1 Surge Suppressor / Arrestor

If during installation the cable is exposed to the outside, surge suppressor/arrestor shall be installed. For installations involving POE high-speed networks UTSC IITS recommends The DITEK DTK-MRJPOE Gigabit PoE surge protector. Please confirm exact location of surge suppressor with networking and facilities teams prior to installation.

Upon exit from the Belden Media Box or surge arrestor the cable should be terminated in the nearest TR GigaBIX panel/patch panel.

6.0 TELECOMMUNICATIONS CLOSET

6.1 DESIGN

Because of the highly specialized nature of the computer centre, along with its function and location in the enterprise and the hosting site LAN infrastructure, the space is identified as a TR (telecommunications room.)

For new and retrofitted TRs field cables will be terminated in a Belden/IBDN GigaBIX block. The field cables will be cross-connected to another GigaBIX

block, and pig-tails will be run through the cable management and terminated to length. Do not insert any network cables into network equipment; instead inform the Network Administrators when the work is complete.

In older, non-retrofitted, TRs, field cables will be terminated with MDVO jacks and placed into GigaFlex captured patch panels. Refer to the tender or explicit direction from the Network Administrators for exact details when working in these spaces.

6.2 GigaBix SYSTEM

All new network and telephone cables will be terminated in Belden/IBDN GigaBIX 72 port mounts (AX101472) inside the Telecommunications Closets (TR). The GigaBIX will be in a "Cross-Connect" layout. The cables will be cross-connected, and pig-tails will be installed, and labeled, into the cable management of the network equipment cabinets. If analogue phone lines are to be used, the regular BIX block will be installed on the wall as near to the GigaBIX as possible to facilitate cross-connections.

All GigaBIX installations will have cable management modules (AX101469) installed to provide a false wall for easier cable management and routing of cables. In between all GigaBIX panels a GigaBIX management ring (AX10178) will be installed to manage the cross connect wires this ring should be sufficient to manage 450 cross connect wires. GigaBIX retainer (AX101486) will be installed to protect connections from slipping out. Termination bars (AX101719) will be installed on all cables to prevent misalignment and unneeded pair untwisting.

In older existing TCs the contractor will contact the administrators for instructions on what method to use to terminate cables in telecommunication room.

GigaBIX fields to be installed according to Belden design and installation guide.

6.3 CABLE MANAGEMENT AND RACKS

UTSC has a standard rack that is available from Anixter, part numbers and details will be specified in the tender.

6.4 UPS AND EMERGENCY POWER

Power also should be conditioned and backed up. These should be worked out with an electrician and the local Site Facilities Manager to find the most economical solution based on price, space, maintenance and usability. Possible solutions are local UPS, building UPS, generators or a combination of both. A list of equipment that is critical shall be put together to size the units. A growth factor for future equipment should also be considered. UPS and Emergency power are required to support the installation of redundant power supplies.

6.5 GROUNDING

Grounding to the nearest pipe or structural steel is not acceptable. A separate

Telecommunications grounding system should be installed within the space and connected to the main building ground. The electrician shall provide a ground bus bar connected to the telecom ground system in each closet. It is the cabling contractor's responsibility to attach the telecom equipment to the bar. All contractors shall provide grounding & bonding in accordance with good industry practices and in accordance with the following codes and standards.

CSA Standard C22.2 No.41-M1987 – Grounding & Bonding Equipment

ANSI/TIA -607 Grounding and Bonding

Ontario Hydro Electrical Safety Code

Ontario Building Code

Local Codes & Bylaws

BICSI requirements

7.0 INTER-BUILDING AND INTER-CAMPUS BACKBONE CABLING

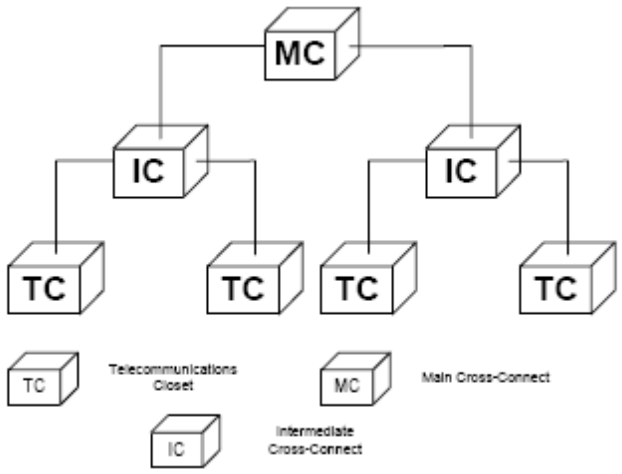
7.1 DESIGN

7.1.1 Inter-Campus Backbone

Inter-Campus Backbone will consist of two (2) 144-fiber single-mode cables (or as indicated on the tender docuements) running in paths as geographically diverse as possible. One (1) cable will be terminated in the campus data centre; one (1) cable will be terminated in a TR designated as the Campus Backbone Demarcation. In the case where a campus does not have a data centre there will be two (2) geographically diverse Campus Backbone Demarcation locations.

7.1.2 Inter-Building Backbone

Inter-Building Backbone will be single-mode fiber containing at least (2) 24 strand OS2 cables (or as indicated on the tender documents). Unless otherwise specified in the tender, inter-building fiber cable will be Corning Plug&Play(tm) Universal Std-Loss MTP(R) Trunk Cables, Single-mode (OS2). In situations where the Inter-Building Backbone runs in each building one TR will be designated as the Demarcation Point. From this Demarcation Point two (2) home runs will be made, first to the closest data centre, and then to the closest Campus Backbone Demarcation. Every effort shall be made to have the home runs follow separate paths. This will allow every building to have redundant connections to the Campus Backbone.



7.2 BACKBONE TOPOLOGY

All backbone cable shall be configured in a hierarchical star system as shown above. A backbone star topology should have no more than two levels of cross-connections. Connections between two telecommunication closets should pass through no more than three cross-connects not including the horizontal cross connects.

In installations where there is only a 2 hierarchy, such as locations with only one building (1 MC and zero ICs) then use the numbers for the HC to IC runs and disregard the IC to MC cable requirements.

8.0 BUILDING BACKBONE CABLING

8.1 DESIGN

From the TR designated as the building Demarcation Point to all other TR, there will be fiber optic cables run. Unless explicitly required by the tender, daisy-chaining of one TR to another is not allowed.

8.2 FIBER-OPTIC

All in building fiber-optic cabling will contain only Corning Plug&Play(tm) products including, but not limited to, glass, trunk cables, zip-cords, patch cables, modules, harnesses, jumpers, shelves, and housings.

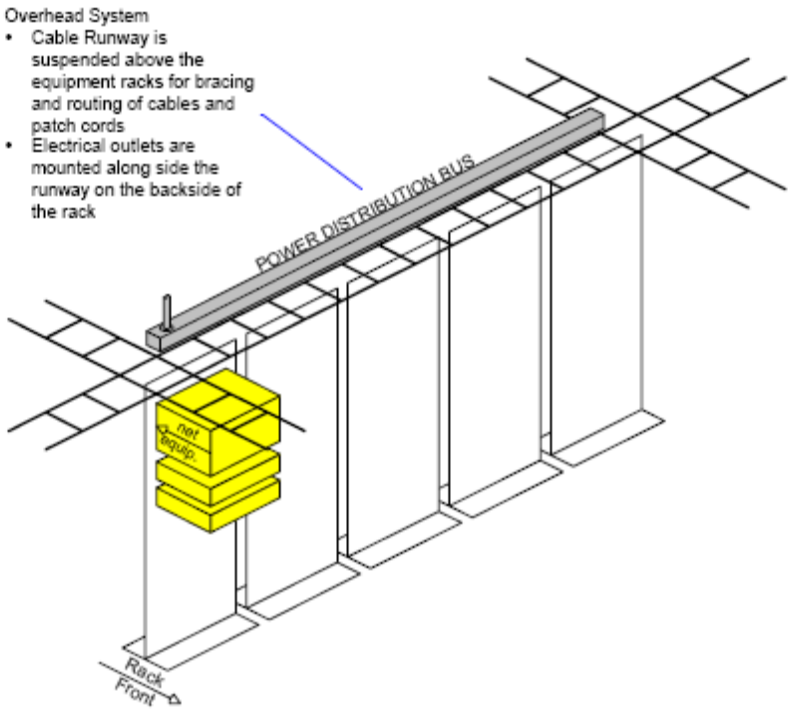
Each TR will be connected to the building Demarcation Point by one (1) 12-strand single-mode, and one (1) 12-strand multi-mode Plug&Play(tm) Universal Systems MTP(r) Connector Trunk.

8.3 COPPER

Copper cabling is not allowed for building backbone cabling unless indicated on the tender documents.

9.0 PATHWAYS AND SPACE

Overhead cabling is the preferred method of cable distribution at the University of Toronto Scarborough campus. When designing the cable tray system, the tray should not exceed the UTSC's recommended fill ratio of 25%. The cable tray shall consisting of CABLOFIL tray manufactured by CABLOFIL/Legrand.



10.0 CABINETS AND RACKS

UTSC has a standard rack that is available from Anixter, part numbers and details will be specified in the tender.

11.0 ADMINISTRATION

11.1 LABELING

The Cable Contractor, per the examples given in this document, will provide and install labels.

All labeling should be unique across the entire wiring infrastructure within a building and between buildings on a campus.

Each label shall be self-adhesive with 10 or 12-point black printing on a white background. Labeling tags and markings should be permanent enough to last the life of the component to which it is attached. This can range from a few years for telecom equipment up to 50 years for parts of the building such as closets and pathways. Cables should be labeled at both ends and use the same alphanumeric identifiers.

11.2 WORK AREA AND HORIZONTAL CABLE LABELING

Cable and WAO labels will be as follows:

<TR Designation>-<Room #>-<punch down location>

Where:

TR Designation: is a 2 or 3 character identifier for the TR in which the horizontal cable is terminated.

Room #: is the official room number for the Work Area where the horizontal cable is coming from

Punch Down Location: contains 1 letter identifying the patch panel of gigabix block in the TR, and 2 digits indicating which position the cable is in. (01-24 or 01-48 in the case of a patch panel, or 01-72 in the case of a GigaBIX block)

Examples:

5R-551-E06: A cable starting in room 551 and terminated in telecom room 5R, patch panel E, jack 6

3A-427B-C70: A cable starting in room 427B and terminated in telecom room 3A, GigaBIX block C, position 70

11.3 PIG-TAIL LABELING

Each pig-tail will be labeled with the Punch Down Location as specified in the previous section.

11.4 PATCH PANEL AND GIGABIX LABELING

Patch panels and GigaBIX blocks shall have labels affixed that correspond with the horizontal cable or pig-tail terminated at that position.

11.5 TELECOMMUNICATIONS CLOSET

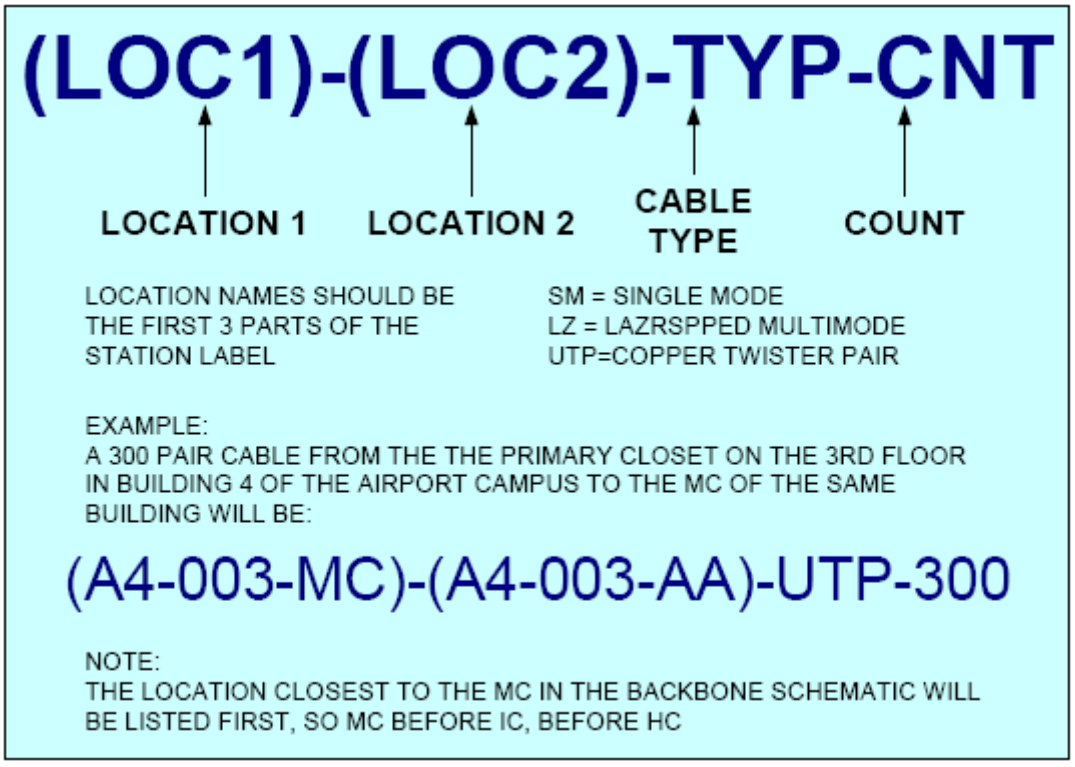
Each rack in each closet shall be labeled from 1 to 6. The rack in the front row on the left is rack 1 and proceeds to the right. The left most rack in row 2 (if a second row is present) continues with the numbering sequence until a maximum of 6.

11.6 BACKBONE CABLE

Backbone cable will be labeled as follows:

Starting location to ending location, cable type and pair or fiber count.

<Location 1>-<Location 2>-<Type>-<Count>



12.0 PROJECT COMPLETION

12.1 TESTING

All testing shall be done using level 3e testers when applicable. The Viavi Certifier40G or Fluke DSX CableAnalyzer shall be used for all testing of station cable. If the Cable Contractor does not own a level IIIe handheld tester they shall purchase or lease one for testing. Tester must be in manufacturer recommended condition, and must have a valid calibration within 6 months of the use date.

12.1.1 COPPER CABLE

All cable station channels from the outlet patch cord to the data room patch cord shall be tested to the Category 6 specifications.

All Copper connections shall be tested as an entire channel, including a patch cord in the data room and a patch cord at the station, as well as the proper GigaBIX probes as required.

Test results must be submitted in electronic format (native to the tester) along with a summary of all test results in PDF format.

12.1.2 FIBER-OPTIC CABLE

All fiber optic cable links shall be tested with an OLTS (Optical Loss Test Set) as per ANSI/TIA-568.3. Tester must be in manufacturer recommended condition, and must have a valid calibration within 6 months of the use date. Approved fiber optic test cords, and reference cords must be used for the project. Testing shall be completed using the 1-jumper reference method, and OLTS equipment shall be referenced at the beginning of each shift and/or testing batch (whichever is the highest frequency). Test results must be submitted in electronic format (native to the tester) along with a summary of all test results in PDF format. The test results shall include the loss generated by each connector. Loss should be stated in dB. No fiber optic link will be accepted with a loss greater than the calculated value based on the table below.

(Multimode) Fiber Link Loss

LC Connector Pair	0.2dB
Multimode Cable	
Wavelength (nm)	(Maximum Attenuation dB/km)
850	3.5
1300	1.5

Example link with 3 connectors and a total length of 500m should have a maximum attenuation of

- 2.35dB at 850nm
- 1.35dB at 1300nm

3 connectors at 0.2 dB loss each = 0.6dB

500metres at max attenuation per KM = 0.75dB

Max attenuation = 1.35 dB

Single Mode Fiber Link Loss

LC Connector Pair	0.2dB
Single Mode Cable	
Wavelength (nm)	(Maximum Attenuation dB/km)
850	0.4
1300	0.3

All Outside Plant fiber shall be traced with an Optical time-domain reflectometer (OTDR) after installation to ensure compliance. Test results must be submitted in electronic format (native to the tester) along with a summary of all test results in PDF format.

13.0 PRODUCTS

The Cabling Contractor will provide and install all items necessary, stated herein or not, to furnish the owner with a functional telecommunications cabling system.

The materials list, stated herein, does not contain everything needed to complete a structured cabling system. Bidders are assumed to have tools to complete the job and to have a certain amount of "consumables" such as nuts, breakout kits, epoxy etc. It is responsibility of the contractor to have everything needed to complete the job to the spirit of this specification and adhere to the manufacturer's guidelines.

13.1 CABLE RUNWAY – TELECOM ROOM

CABLOFIL/Legrand CABLOFIL – Part number selection and mounting options will depend on the application, location and cable volume. Overhead cable pathways are the preferred method of cable distribution.

13.2 COPPER HORIZONTAL SUPPORT TRAY

CABLOFIL/Legrand CABLOFIL – Part number selection and mounting options will depend on the application, location and cable volume. Overhead cable pathways are the preferred method of cable distribution.

Wiremold Raceway systems - Part number selection and mounting options will depend on the application, location and cable volume. Plastic or metal raceway can be used depending on the application. Metal raceway is preferred in applications involving power and separate channels should be built into the design to accommodate power and data cabling.

13.3 RELAY RACKS AND CABINETS

UTSC has a standard rack that is available from Anixter, part numbers and details will be specified in the tender.

13.4 COPPER CABLE

TWISTED PAIR (COPPER) STANDARDS – ALL CABLE SHALL MEET THE REQUIREMENTS OF TIA/EIA568-C.3.

All horizontal channels shall contain only Belden IBDN System 4800 components, including cables, jacks, patch cords, patch panels, cross-connects, and workstation outlets. All cable MUST be WHITE colour.

13.4.1 COPPER TERMINATIONS

All Copper terminations should be done using Modular Jacks, in the case of an old TR or at a WAO, or in Belden GigaBIX blocks, in the case of all new and retro-fitted TRs. Icons will be used to distinguish Voice and Data connections

13.4.2 PATCH PANELS

The use of patch panels is now DEPRECATED except where explicitly listed in the tender and only in TR spaces with no GigaBIX components.

13.4.3 COPPER PATCH CORDS

The UTP patch cables will be Belden GigaFlex PS6+ Modular cords. The contractor will consult the tender document and IITS Network Administrators for exact numbers, lengths, and colours.

The maximum length of the channel link shall not exceed 100 meters or about 327 feet. The line cord between the WAO and the attached device shall not exceed 3 meters, (9.8 feet) leaving 7 meters of cord in the TR -- end-to-end allowing for 100 meters in the channel -- the horizontal link (90m) and the two cords (10m) combined.

13.5 FIBER-OPTIC CABLE

FIBER-OPTIC STANDARDS – ALL CABLE SHALL MEET THE REQUIREMENTS OF TIA/EIA568-B.3.

All proposed fiber-optic cabling will contain only Corning products including, but not limited to, glass, trunk cables, zip-cords, patch cables, modules, harnesses, jumpers, shelves, and housings.

All cable and fiber that originate or terminate in the computer room shall be plenum rated excluding jumper cords.

All fiber runs shall be installed in plenum rated innerduct or conduit.

All fiber-optic cable will be single-mode OS2 cables installed in the building backbone. The distribution panels and fiber ends will be LC connector/couplers as specified in the standard unless specified on the detailed drawings or in the case of pre-terminated solution that use factory terminated MTP(r) ends.

No cable may be run under-floor unless explicitly called for.

Every run is either Corning ALTOS(r) or FREEDM(r) for inter-campus backbone cable, or Corning Plug&Play(tm) Universal Systems for inter-building and in building backbone cable

13.5.1 FIBER OPTIC TERMINATIONS

The fiber optic connectors shall be either field installable single-mode connectors, in the case of inter-campus backbone cable, or factory terminated MTP(r) connectors

The connector shall provide a strain relief mechanism for installation on a single fiber cable that contains strength elements. The fiber within the body of the

connector shall be isolated mechanically from cable tension bending and twisting.

The connector shall have a ceramic ferrule and a factory PC polish.

The connector shall have a locking feature to the coupler.

Meet EIA and IEC standards for repeatability.

Required connectors are Corning Unicam LC Fiber Optic Connectors for field-terminated cable and Corning MTP(r) for factory terminated cable.

13.6 GROUNDING

Contractors should follow the ANSI/TIA- 607 grounding standard for all Closet/Computer Room/Data center installations

13.7 UPS

Eaton Powerware UPS are the preferred devices for backup power. Please consult with the university's IT administrators to confirm sizing and product selections.

UTSC WIRELESS SPECIFICATION

SITE DESIGN CRITERIA

RF DESIGN REQUIREMENTS

Valid starting April 21, 2017

VERSION 1.0

Network Administrators

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RF requirement guidelines for new APs

1. AP antenna installations must be in line of sight of the intended clients. IITS will not accept AP installations that:

- Do not cover the intended area
- That are hidden from view (external antennas or disabling LEDs are acceptable)
- Mounted on or within 2 feet of a metal object (duct-work, cabinets, etc)
- Located closer than 10 feet to another AP in freespace

All physical installations will be accompanied by our Wireless Network Administrator.

At any time it is noted that a physical change will be required then IITS will immediately disable the affected AP(s). AP to be re-enabled only after an authorized party has relocated the AP and the Wireless Network Administrator has verified the new location is acceptable.

2. 5Ghz 802.11ac first deployment with an optimal cell edge of -65 dBm or better as measured by the client devices expected.

Measurements must be from expected client devices and NOT specialized adapters such as Ekahau NIC300. As there is a large variation between device capabilities a minimum of 3 different device data points required (ex. iPhone, Dell Laptop, Samsung Note).

3. IITS requires the below to create a Wi-Fi capacity report and determine the number of APs required:

- Client device type(s)
- Expected peak #s of associated clients
- Number of SSIDs (including 3rd party networks heard during local survey)
- Expected client data traffic category (email, web browsing, video, etc).

This process is dependent on the information highlighted above as well as the original location survey. These 2 steps (location survey and AP capacity report) must be completed and documented at the start of the project or task without exception. Project manager (or Wireless Admin for smaller installs) will notate and save the original survey, pictures, and capacity plan for future reference.

4. Clients to be load-balanced across radios in any area with a client density of >50.

5. Average channel utilization should be <40%.

If average channel utilization exceeds 60% immediate adjustments to channel plan, power levels, or # of available radios are likely required. This information can be validated from the AP radio interfaces remotely but if possible a site visit is preferred to also obtain the noise-floor measurements using Metageek WiSpy chanalyzer.

6. Maintain a minimum Signal to Noise (SNR) of 25 for 2.4Ghz clients and 29 for 5Ghz clients.

A detailed explanation of SNR and expected MCS (modulation coding scheme) data rates can be found below for interested readers.

Ex: (-65 db RSSI) - (-93 db Noise Floor) = 28 SNR. Please note that the Noise Floor level required will be based on the original location survey notes and if it's likely that the environment has changed a follow-up check should be arranged to ensure accuracy.

7. Areas with a Noise Floor >-85 db should be investigated and re-mediated whenever possible.

High noise floor significantly impacts the health and performance of associated devices (on our and other Wi-Fi networks). Sources of noise aren't limited to other Wi-Fi transmitters can also be microwave ovens (2.4ghz), electromagnetic equipment (labs), drones, faulty radios, etc. If a high noise floor is observed during a location survey or new AP install a channel modification will be made. If this work-around isn't available the APs will remain off until the source of the problem is isolated and re-mediated.

8. 802.11 retransmissions should be <15%. Automatic health checks should alert to high retransmission rates. Antenna / physical AP health and the physical environment are common causes of high retransmission rates (broken antennas or suboptimal AP mounting etc).

9. Wi-Fi health network verification to be performed on installation, during periodic reviews, and on any new complaints with the following criteria:

- Packet loss <1% and jitter (variance in latency) <100ms

This will be measured using Ekahau on an active survey during normal hours of operation. Any changes required will be logged in a project or ticket (depending on scope) and dealt with on a priority basis by the IITS networking team as directed by the Wireless Network Administrator.

UTSC Coverage Requirements

IITS Networking builds a 5 GHZ only coverage design when producing initial designs for future buildings or refresh of existing infrastructure.

Exceptions to the 5 GHZ only coverage design will be necessary in some physical environments (outside, heavy concrete with no available cable trays, etc). However, exceptions will only be agreed by networking if alternative approaches (such as changing antenna types) have been assessed and ruled out for reasons other than additional cost. In other words networking will always recommend a 5 GHZ solution over a 2.4 GHZ if the requirement can be filled with a reasonable change to equipment or cable pathways.

Gathering Spaces (Classrooms, Meeting Rooms, Lounges, lobbies with seating, etc.) with seating for >15 people should have at least one AP inside the space. A possible exception would be in buildings with many adjacent classrooms separated by drywall.

APs outside gathering spaces should be located so they only cover the gathering space. Areas outside classrooms where students gather should be covered by separate APs from the classrooms. It is appropriate for a classroom AP to also cover light foot traffic.

Gathering spaces with seating for less than 15 people should have an AP located no more than one drywall wall away. For high-loss walls (Block, Concrete, Brick, etc.) the AP must be located inside the gathering space.

Capacity for gyms and large auditoriums must be designed for capacity and careful attention to device type and traffic load must be taken. Ekahau Site Survey can plan for capacity but information from those hosting reoccurring events will be required.

APs should not be located in corridors. This is critical in long corridors or when corridors are stacked on different floors. An exception can be considered when the purpose of the AP is to cover the corridor.

APs should not be obstructed with furniture, ceiling tiles, metal duct work, or any other object that causes a db loss from area the clients are located.

Avoid placing APs in the same locations on each floor of a multi-story building (aka, stacking). This is less important in 2-story buildings, and buildings where the path loss two floors from an AP is 50dBm or greater. In all cases APs should only be stacked when there is a compelling reason to do so.

APs must be located at least 10 feet apart in free space, and 25 feet is preferred.

Rooms >300 occupants require creative AP placement to minimize co-channel interference. This is critical when multiple such venues are adjacent to each other in the same building. When the signal from more than 9 APs will be detected (RSSI>=-83dBm) in a space, APs should be installed with narrow-beam directional antennas pointing downward towards the client devices. Take note that the APs should be no greater than 25 feet from clients but antennas should be 15-20 feet apart in free-space. Creativity in shadowing signal using the physical environment (pillars, stairwells, etc) can provide exceptions to increase AP count without increasing ACI and CCI (adjacent and co-channel interference)

No more than (3) 2.4Ghz radios to be enabled in a space.

The lowest possible power level to service the area must be deployed on both 2.4 and 5Ghz radios.

Dynamic Frequency Selection (DFS) channels

DFS is a technology process that protects the channels by removing Wi-Fi devices in the event of required use by weather or military radar. When an AP detects DFS transmissions it must move off the channel so as to not interfere with the radar transmission. The use of DFS channels is only recommended in high density indoor deployments. For the purposes of this document high density areas include any space with expected associations greater than 50 per AP (or channel).

DFS channels have a variety of caveats including:

1. DFS client adoption rate is still low (as of April 2017)

2. Client devices don't typically send probe requests on DFS channels so deploying them in a standard channel plan could cause coverage loss or drops. The probing on DFS channels varies by client device and OS considerably but all will favour non-DFS channels while mobile. DFS channels should be deployed in areas considered static (labs versus hallways)

3. In the event of an AP detecting radar on the DFS channel the back-down and channel change is disruptive to the client and false triggers are a possibility that we cannot avoid.

Dual 5 GHZ APs

Channel plan to use non DFS and DFS channels with the DFS channel being on the inner cell (assuming one radio uses 7 DBi antenna and the other 3 DBi). Use 802.11v or other load balancing to hand-off the client to the DFS channel when they are in range of the inner cell (3 DBi antenna radio).

U-NII-1 and U-NII-2 Channels Plan	U-NII-3 and U-NII-2 Channel Plan
36/100	149/116
40/104	153/132
44/108	157/136
48/112	161/140

DFS fallback channel for this setup can be 165 assuming an indoor auditorium deployment not near any wireless P2P bridges.

Channel Planning

2.4 Ghz Channel	5 Ghz Channel(s)
1	36/40
6	44/48
11	149/153

2,3,4,5,7,8,10,11+ * UNUSABLE U-NII-2 channels except 120, 124, and 128

Channels 1,6 and 11 will only be used on 2.4 GHZ and channel 157+ reserved for outdoor APs and bridges.

2.4 Ghz radios not required to provide -65 db coverage disabled or moved to a Rogue or Spectrum scanning state.

If significant peer to peer Wi-Fi communication is required (University or approved 3rd party vendor supplied) channels 149 and 153 can be made available.

As there are a limited number of available 2.4 GHZ channels 3rd party vendors will need to coordinate with networking an appropriate channel for their venue/location and operate at the lowest possible power level that provides them SNR of 25 without causing unnecessary interference with existing wifi networks.

Channel Widths

20mhz only channels are mandatory on UofT operated and authorized Wi-Fi networks. Networks found operating with 40mhz bonded on 2.4 GHZ channels will be removed as they are not for use in shared environment.

20mhz channels are, by default, used for 5 GHZ channels to allow efficient re-use of channels. Also, the larger the channel width the higher the minimum noise floor becomes so for instance a device connecting to 20mhz channel 48 might need to have a noise floor of -97 or better whereas 40mhz channel 46 might required -94. This 3 db difference might seem inconsequential but remember that's double! See Appendix A for more details if desired.

Data Rates and SNR

See attached MCS spreadsheet that maps 802.11 standard, channel width, and SNR to MCS rate. The higher the MCS rate the more throughput and the higher the throughput the less time the device requires on the air which improves performance for all devices sharing the same channel as well as improves battery life and user experience.

802.11b data rates have been disabled on UofT operated networks (1, 2, 5.5, and 11mbps). It is required that authorized APs must also disable b data rates as these non-ofdm rates dramatically reduce airtime and aren't required on any current devices. Exceptions will be not permitted.

Base data rates are responsible for beacons and other control traffic and the rate that multicast traffic is transmitted.

Base data rates for AN/AC (5 GHZ) set to 12 mbps with 24 mbps supported. Beacons are sent at 12 mbps and acks can be sent at 24 mbps

Base data rates for BGN (2.4 GHZ) set more conservatively at 9mbps and 12 mbps

2.4 GHZ Power Levels (Indoors/Outdoors)

The default is rarely an appropriate power level in our 5 GHZ based deployments and Meru's default of 24 is particularly high.

Acceptable power settings are divisible by 3 and levels higher than 18 should be avoided:

27 (outdoor only), 24, 21, 18, 15, 12, 9, 6, 3, 0

The UTSC approach is to match the power level to that of the capability of the weakest client in the area of coverage. This range is typically 12 - 18 and can be found here http://clients.mikealbano.com/.

For high density environments start with the lowest power and increment in 3 db until the RSSI and SNR levels are met for the area and the cell edge is @ -65 or better. Unnecessarily "boosting" the power will interfere with nearby access points and cause sticky client issues so work "up" to get the best results.

Unauthorized APs (Rogue APs)

IITS Networking reserves the right to disconnect, without warning, devices reported or observed to be advertising a University of Toronto Wi-Fi connection

Ad-hoc Wi-Fi as seen on common consumer devices such as printers, tvs, etc should be turned off unless approved by the networking team. Networking will request ad-hoc networks to be disabled if it's suspected to be causing connectivity issues with any UofT Wi-Fi services.

Authorized APs must adhere to channel and power plan guidelines outlined by the networking team and this document. Networking reserves the right to change power and channels to account for RF conditions or environment changes and will note exceptions in their documentation.

AP Naming Convention

The APs are named: utsc-buildingcoderoomnumber

Ex. utsc-ev303k would be 3rd floor ESCB in the hallway.

The naming convention is important as our business analytics use the radius accounting logs (specifically the AP name reported) to correlate # of users to location.

Wireless Bridges

Unlicensed wireless bridges should utilize 5Ghz spectrum (channels 149+) and an appropriate channel and power plan to be determined on installation and alignment. DFS channels are to be avoided (if an unlicensed spectrum P2P bridge) and a utility like RadioMobile is useful to assess the appropriate mounting height and tilt of the antennas to guarantee a line of sight connection with no fresnel zone obstructions. It is essential than an appropriate lightning arrester be installed along with water proofing all external connection points and entry points to internal structures and enclosures.

Appendix A // RF Math

To understand the impact of the RF designs outlined in this document it's important to go over the basic math involved.

Power is measured in milliwatts but often discussed in db. The conversion makes it much easier to compare values quickly.

Rules of 3s and 10s:

For every 3dB of gain, double the absolute power (mW)

For every 3dB of loss, half the absolute power (mW)

For every 10dB of gain, multiplie the absolute power by 10 (mW)

For every 10dB of loss, divide the absolute power by 10 (mW)

A calculator such as http://rfcalculator.mobi/convert-eirp-dbm.html can be used to easily calculate the power output of an AP radio (dBm to mW) and can be used to show the 3 dB difference.

The same log math applies for RSSI measurements.

Example: RSSI of -65 is 3 db better than an RSSI of -68. -65 measurement indicates the device received DOUBLE the amount of power (milliwatts).

It might be helpful to highlight that closer the number to 0 the stronger the signal. 0 dBm = 1mw of power

RSSI Scale

0 to -30 = Too loud

-40 to -50 = Great

-50 to -65 = Good

-70 to -75 = Average

-75 to -80 = Poor

Most devices will roam if there is a 10db difference on another received beacon - aka announcement - once they hit the -75 threshold.

-80 - 90 = Very poor

-90 - 100 = Noise floor aka the device cannot distinguish the signal from the other rf energy

Despite this handy chart RSSI is only valid when compared to the Noise Floor and the SNR calculated.

The greater the SNR the greater the modulation rate and higher throughput / less airtime used.

Noise Floor:

Maxwell & Boltzmann: -174 dBm noise per Hz of bandwidth.

20 MHz is +73 dB to 1 Hz (x10 7 times, x2 once)

20 Mhz channel noise is at least -101 dBm

Add system EMF noise, typically 5 dB so the noise floor is about -96 dBm