

**G-WING & JW-WING INTERIOR ALTERATIONS  
OSHAWA COMPUS**

**FOR**

**DURHAM COLLEGE**

**ISSUED FOR TENDER  
20 APRIL 2022**

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**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**

## **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 Review of alternates or equals shall not be considered during the Bidding Period.
- .4 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 from 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.

**Section 01 25 00**  
**Substitution of Equivalent Products**

- .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**

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**



**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 01 33 00**  
**Submittal Procedures**

## **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**

**Section 01 40 00**  
**Quality Requirements**

- .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.

**Section 01 40 00**  
**Quality Requirements**

- .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**



## **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.
  - .3 Access to the site for all deliveries and removals shall be from Davenport Road only; access is not permitted from Designer's Walk Lane to the east.
  - .4 Contractor is responsible for obtaining municipal Street Occupation Permit to temporarily occupy any portion of the public right of way during the Work.
- .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 15<sup>th</sup> and April 30<sup>th</sup>, 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 (CO<sub>2</sub>) 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**

**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, the 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**

**PART 1 - GENERAL**

1.1 Section Includes

- .1 Progressive cleaning.
- .2 Final cleaning

1.2 Related Section

- .1 Section 01 77 00 - 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**

## **PART 1 - GENERAL**

### **1.1 Section Includes**

- 1 Administrative procedures preceding preliminary and final inspections of Work.

### **1.2 Related Sections**

- .1 Section 01 78 00 - 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**



## **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 in Supplemental Conditions 08800. 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 20 & 26.
- 4.6 The Consultant shall provide to the Contractor for a fee, a CD containing graphic (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**

## **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 Demolition requirements for existing and new work - Divisions 2 through 32.

### 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 and transport 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.

**Section 02 06 10**  
**Demolition & Removals**

- .8 If required, 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**

## **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 required to maintain fire resistance ratings of new/existing assemblies indicated on drawings and schedules.

### **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 01 33 00 – Submittals Procedures.
- .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, shaft, ceiling and roof assemblies involved.
- .2 Ratings of firestop assemblies for service penetrations shall be not less than the fire resistance rating of the floor, wall, shaft, 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 "Fire barrier 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 20 - Mechanical. Firestopping systems and products to be coordinated with this specification section.
  - .9 Firestopping around electrical assemblies penetrating fire separations by Division 26 - 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.**

**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 Siliconized 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 with 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 Junctions between 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 (walls).
  - .2 Between vanity and tile.
  - .3 Between vanity and mechanical fixtures/fittings.
  - .4 Between access panels and tile.
  - .5 Between tiles and adjacent materials/fixtures/fittings.
- .4 Sealant **Type C**:
  - .1 Perimeter of interior windows.
  - .2 Perimeter of firehose cabinets.
  - .3 Junction between drywall and masonry.
  - .4 Junction between interior door frames and adjacent partition.
  - .5 Junction between baseboards/trims/casings and adjacent partition.

**END OF SECTION**

## PART 1 - GENERAL

### 1.1 Work Included

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

- .1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.
- .2 Sound retardant steel frame products, including frames, transom frames, sidelight and window assemblies, glazed or paneled, fire-rated and non-rated, including frame gasketing system.
- .3 Steel panels, fixed or removable, flush or rabbetted, similar in construction to steel doors, for use in steel frame product.
- .4 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.

### 1.2 References

- .1 ANSI/NFPA 80-1999, Standard for Fire Doors and Fire Windows
- .2 ASTM A653/A653M-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- .3 ASTM C553-02, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications
- .4 ASTM C578-05, Specification for Rigid, Cellular Polystyrene Thermal Insulation
- .5 ASTM C591-01, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation
- .6 ASTM C592-04, Specification for Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction
- .7 ASTM C1289-05a, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- .8 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies
- .9 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies
- .10 CGSB 41-GP-19MA (1984), Rigid Vinyl Extrusions for Windows and Doors
- .11 CSA W59-2003, Welded Steel Construction (Metal Arc Welding)
- .12 CSDMA, Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000
- .13 CSDMA, Selection and Usage Guide for Steel Doors and Frames, 1990
- .14 CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products – 08 11 00, 2006

### 1.3 Submittals

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .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.

#### 1.6 Warranty

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

### **PART 2 - PRODUCTS**

#### 2.1 Materials

- .1 Acceptable Materials: Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.
- .2 Steel: Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".
  - .1 Interior Doors: Face sheets shall be 0.042 in. (1.0 mm) minimum thickness.
- .3 Door Core Materials
  - .1 Fiberglass: Loose batt type, density 24 kg/m3 (1.5 pcf) minimum, conforming to ASTM C553 or ASTM C592.
  - .2 Sound Retardant Composite: Core materials for such units shall be manufacturer's proprietary standard, tested as part of a fully operable assembly, including door, frame, and gasketing system, in accordance with ASTM E90 and ASTM E413 to provide the Sound Transmission Class (STC) and sound Transmission Loss (TL) values within the critical frequency range, as specified by the Consultant.
- .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.
  - .3 Frame Thermal Breaks. Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .7 Glazing
  - .1 As per Specification 08 81 00.

#### 2.2 Fabrication - Frame Products

- .1 Interior frame product shall be 16 gauge. Interior frames and window assemblies shall be welded type construction. Interior transom frames shall be welded type construction. Interior sidelight assemblies shall be welded type construction.

- .2 Frame product shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .3 Mortised cutouts shall be protected with steel guard boxes.
- .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 and as detailed. 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 (where applicable).

### 2.3 Welded Type Frames

- .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

#### 2.4 Acoustic Frames

- .1 Frame product shall be manufacturer's proprietary standard construction, tested as part of a fully operable assembly, including door, frame, glazing and gasketing system, in accordance with ASTM E90 and ASTM E413 to provide the Sound Transmission Class (STC) and sound Transmission Loss (TL) values within the critical frequency range, as specified by the Consultant.

#### 2.5 Fabrication – Doors

- .1 General
  - .1 Interior 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 Laminated Core Construction
    - .1 Both face sheets for interior doors shall be formed from a sheet of 16 gauge steel.
    - .2 Doors shall be reinforced with vertical stiffeners, securely laminated to each face sheet at 150 mm (6") on center maximum.
    - .3 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.
- 2.6 Acoustic Doors
- .1 Doors shall be manufacturer's proprietary construction, tested as part of a fully operable assembly, including door, frame, glazing and gasketing system, in accordance with ASTM E90 and ASTM E413 to provide the Sound Transmission Class (STC) and sound Transmission Loss (TL) values within the critical frequency range, as specified by the Consultant.

### **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".

**Hollow Metal Doors and Frames**

- .10 Grout guards and junction boxes are intended to protect hardware mortises and tapped holes from masonry grout of 4 in. (101 mm) maximum slump consistency that is hand troweled in place.
- .11 Frame products are not intended or designed to act as forms for grout or concrete. Grout hollow metal sections in "lifts" or take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.
- .12 Keep hollow metal surfaces free of grout, tar, and/or other bonding materials or sealers. Promptly clean grout, tar, and/or other bonding materials or sealers off of frame product and doors.
- .13 Remove wood spreaders after frames have been built-in.
- .14 Make allowance for deflection to ensure structural loads are not transmitted to frame product.
- .15 Install doors, and hardware in accordance with hardware templates and manufacturer's instructions.
- .16 Adjust operable parts for correct clearances and function.
- .17 Install louvers, glazing and door silencers.
- .18 Finish paint in accordance with Section 09 91 00.

**END OF SECTION**

**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 instructions including 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/Card reader | 43" | (1100mm) |
| Exit device          | 43" | (1100mm) |
| 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 Door Hardware

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Design, labour, Products, equipment, tools, and services necessary for glass and glazing Work in accordance with the Contract Documents.
- .2 Decorative surface glazing films.

### **1.2 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

### **1.3 Submittals**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures. Where indicated, Shop drawings shall be sealed by a qualified professional engineer licensed to design structures and registered in Place of the Work.
- .2 Samples:
  - .1 Submit following samples in accordance with Section 01 33 00.
  - .2 Submit one 300 x 300mm sample of ultra clear low iron glass

### **1.4 Closeout Submittals**

- .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.5 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 Glazing to be used for interior glass doors and partitions 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 Materials**

- .1 Ultra Clear Tempered Glass (**TGL**): Ultra clear, low iron glass, tempered for indoor use shall conform to ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3
  - .1 Type 1: 6mm thick TGL all interior glass screens up to 1200mm in height
  - .2 Type 2: 12mm thick TGL all interior glass screens over 1200mm in height
- .2 Laminated tempered glass (**LGL**): to CAN/CGSB-12.1, Category II:
  - .1 Consisting of one layer of minimum 4 mm thick tempered glass, .3mm thick clear PVB interlayer, and one layer of minimum 3 mm thick clear tempered glass.

### **2.3 Surface Glazing Films**

- .1 Acceptable product: Milky Milky SH2MAMM by 3M Window Film or equivalent per Specification 01 25 00.

## **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 fit 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 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
- .4 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.
- .5 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.
- .6 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 Installation of Glazing Film**

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Install in accordance with manufacturer's instructions.
- .4 Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
- .5 Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
- .6 Apply film to glass and lightly spray film with slip solution.
- .7 Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
- .8 Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
- .9 Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

**3.4 Finishing**

**Section 08 81 00**  
**Interior Glass Glazing**

- .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 damage.

**END OF SECTION**

## **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, 12.7mm (1/2" thick) or 15.9mm (5/8" thick) as scheduled, 1200mm (4'-0") wide x maximum practical length. Provide Type X where indicated/scheduled.
- .2 **Glass Matt Tile Backerboard** for use throughout washrooms and at all areas scheduled to receive ceramic tile finish: treated water-resistant gypsum core that is covered with a coated fiberglass mat facer and back and has a proprietary coating surface; to ASTM C1178, 12.7mm (1/2") thick, 1220mm (4'-0") wide x maximum practical length.

- .3 **Exterior Gypsum Sheathing Board:** fiberglass mat on face/back/long edges manufactured to ASTM C1177, 15.9mm (5/8") thick unless noted otherwise, 1200mm wide x maximum practical length. Score of 10 (no mould growth) as per ASTM D3273, Microbial Resistance: will not support microbial growth as per ASTM D6329.
- .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 Nicholson 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 to continue any existing base building control joints and/or where indicated on drawings.
- .10 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .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 backerboard 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<sup>2</sup> 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 junctures where 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.

**Section 09 21 00**  
**Gypsum Board Assemblies**

- .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.

**3.4 Schedules**

- .1 Construct fire rated assemblies where indicated on drawings

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Description of System**

- .1 Metal stud 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.). Systems shall be engineered to resist lateral loading and support adjacent building components where indicated.
- .2 Lightweight Steel Framing includes Lateral (Wind) Load-Bearing Lightweight Metal Framing System.
  - .1 Wall studs subjected to lateral loads
  - .2 Top and bottom connections to primary structural elements, including detailing to accommodate deflection

### **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 Lateral 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 Ontario Building Code.
  - .3 Resistances and resistance factors shall be determined in accordance with the Ontario Building Code and CAN/CSA-S136.
  - .4 Stud depths are shown on the drawings. Adjust stud material thickness and spacing as required by the design criteria. Use greater or lesser stud and joist depths only if approved by the Consultant.
  - .5 Maximum flexural deflections under specified wind loads shall conform to the following:
    - .1 Wall studs supporting other finishes,  $L/360$ .
  - .6 Design bridging to prevent member rotation and member translation perpendicular to minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to minor axis. Provide bridging at 1524 mm o.c. maximum. Space bridging at equal intervals over the span length of the member. Closer spacing may be required to satisfy structural requirements.
  - .7 Design anchorage and splice details for bridging.
  - .8 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where shown.

#### 1.5 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 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.



## 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 Wind Bearing Steel Stud Framing Members and Accessories
  - .1 Steel shall conform to the requirements of CAN/CSA-S136 and shall be identified as to specification, grade, mechanical properties, coating type and thickness.
  - .2 Steel shall have metallic coatings that conform to one of the following ASTM Standards:  
ASTM A653/A653M Standard Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process  
ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process  
ASTM A1003/A1003M Standard Specification for Sheet Steel, Carbon, Metallic and Non-Metallic Coated for Cold-Formed Steel Framing Members
  - .3 Wind bearing steel studs shall have a minimum coating of Z180 galvanizing in accordance with ASTM-A653/A653M. Other coatings (e.g. aluminum-zinc alloy to ASTM A792/A792M) providing equal or better corrosion protection may be used.
- .3 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.
- .4 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.
- .5 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.

**.6 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.

**.7 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 friction-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.
- .2 Coordination with Sprayed Fire-Resistive Materials
  - .1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling track to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 600 mm o.c.
  - .2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### **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 Erection of Lateral/Wind Bearing Framing

- .1 Fabrication and erection shall conform to the approved shop drawings. Modifications required to accommodate as-built conditions (other than minor dimensional changes) shall be submitted to Consultant for approval.
- .2 Methods of construction may be either piece by piece (stick-built) or by fabrication into panels (panelized) either on or off site.
- .3 Wind bearing studs shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the steel stud wall system may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the wall system. The erector shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and CAN/CSA-S136 exists in the uncompleted structure.
- .4 Erection Tolerances
  - .1 For the purpose of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.
  - .2 For wind bearing studs, out of plumbness shall not exceed 1/500<sup>th</sup> of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000<sup>th</sup> of the member length.
  - .3 For track, camber shall not exceed 1/1000<sup>th</sup> of the member length.
  - .4 Squareness of prefabricated panels shall be not more than 3 mm out of square within the length of that panel.
- .5 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 3.2 mm.
- .6 Align adjacent or abutting members in the same plane to within  $\pm 0.5$  mm maximum.
- .7 Spacing of studs shall not be more than  $\pm 3$  mm from design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.
- .8 Align web cut-outs in stud and joists as required for the installation of the through-the-knockout style bridging and services.
- .9 Make all field measurements necessary to ensure the proper fit of all members.
- .10 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- .11 Reinforce cut-outs where the distance from the centerline of the cut-out to the end of the member is less than 300 mm. Submit the reinforcing detail to the Consultant for approval.
- .12 Replace members with localized damage.
- .13 Unless a closer spacing is shown on the shop drawings, anchor top and bottom tracks securely to structure at 813 mm o.c. maximum. Place one additional anchor within 102 mm of the end of each piece of track and additionally as required by the shop drawings.
- .14 Install additional studs at abutting walls, openings, terminations against other materials and on each side at corners unless explicitly detailed otherwise on the shop drawings.
- .15 Insulation equal to that specified shall be placed in jamb and header assemblies that will be non-accessible after their installation into the wall. Ensure that insulation is kept dry and not compressed.
- .16 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

### 3.5 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 metal 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.

### 3.6 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.
    - .4 Radiused locations: 150mm o.c. or as recommended by drywall manufacturer.
- .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 due 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 Fire dampers: framing at fire dampers shall comply with manufacturer requirements as necessary to fulfill UL/ULC requirements for a complete installation capable of maintaining the scheduled fire resistance rating.
- .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 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**

## **PART 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 01 25 00 – Alternatives.
  - .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 01 33 00.
    - .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 01 78 00.

#### 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.

## **APRT 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Acceptable Manufacturer for Acoustical Ceiling (ACT): Armstrong World Industries. The following manufacturers may be submitted for evaluation by the architect by following the conditions of the Alternatives Section 01 25 00. 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 (ACT)**

- .1 Surface Texture: Smooth
- .2 Composition: Fiberglass
- .3 Color: White
- .4 Size: 610mm x 1220mm x 25mm (24in x 24in x 1in)
- .5 Edge Profile: Square
- .6 Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton .90
- .7 Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton 190
- .8 Flame Spread: ASTM E 1264; Class A (UL)
- .9 Light Reflectance (LR) White Panel: ASTM E 1477; 0.88
- .10 Dimensional Stability: HumiGuard Plus
- .11 Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
- .12 Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
- .13 Acceptable Product: Optima, 3353 as manufactured by Armstrong World Industries, or equivalent

### **2.3 SUSPENSION SYSTEM AT ACOUSTICAL CEILING**

- .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. 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 Intermediate Duty
  - .2 Color: White Aluminum and match the actual color of the selected ceiling tile, unless noted otherwise.
  - .3 Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- .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.
  - .2 Additional edge trim as detailed/scheduled.

## **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**

**Section 09 51 00**  
**Acoustical Ceilings**

- .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**

## **PART 1 - GENERAL**

### **1.1 Work Included**

- .1 Comply with Division 1, General Requirements and all documents referred to therein.
- .2 Provide all labour, materials, products, equipment and services to complete resilient flooring required and/or indicated on the Drawings and specified herein.

### **1.1 References**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM F 1303-95, Specification for Sheet Vinyl Floor Covering with Backing.
- .2 Canadian Standards Association (CSA)
  - .1 ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
  - .2 ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
  - .3 ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
  - .4 ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
  - .5 ASTM F 1700 Standard Specification for Solid Vinyl Tile
  - .6 ASTM F 1861 Standard Specification for Resilient Wall Base
  - .7 ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
  - .8 ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

### **1.2 Submittals**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long.

### **1.3 Closeout Submittals**

- 1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.4 Extra Materials**

- .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 2% of each colour, pattern and type flooring material required for project for maintenance use. Provide one 3600mm length of each type and colour of resilient base.
- .3 Extra materials to be in one piece and from same production run as installed materials.
- .4 Clearly identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Client, upon completion of the work of this section.
- .6 Store where directed by Client.

**1.5 Environmental Requirements**

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20C for 48 hours before, during and 48 hours after installation.

**1.08 LIMITED WARRANTY**

- .1 Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
- .2 Limited Warranty Period:
  - .1 RES: 15 years.
  - .2 RES2: 10 years.
- .3 The Limited 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.

**PART 2 - PRODUCTS**

**2.1 Materials**

- 1 Resilient flooring must:
  - .1 meet or exceed all applicable governmental and industrial safety and performance standards; and
  - .2 be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising there from, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).
- .2 **Resilient Flooring (RES)**
  - .1 Manufacturer/Product: ShawContract, Surface and Strand Collection; or equivalent per Specification 01 25 00.
  - .2 Description: A layered construction consisting of a tough, clear, rigid vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a diamond-infused UV-cured polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors are insoluble in water and resistant to cleaning agents and light.
  - .2 Reference specification - ASTM F 1700, "Standard Specification for Solid Vinyl Tile", Class III, Type B. Meets requirements for size, squareness, thickness, thickness of wear layer, residual indentation, resistance to chemicals, resistance to light and resistance to heat.
  - .3 Pattern and Color: to be selected by Consultant from manufacturers full colour range. Allow for 4 colours.
  - .4 Size: 18 in. x 36 in. (457.2 mm x 914.4 mm).
  - .5 Wear layer thickness: 0.020 (0.5 mm)
  - .6 Thickness: 0.100 in. (2.5 mm)
- .3 Tactile Walking Surface Indicator Tile (TWIS)
  - .1 Flexible Polymer TWIS tiles shall be a double loaded, unglazed full body Flexible Polymer tile. Tiles consist of field tiles and tactile walking surface indicator (TWIS) domes or bars.
  - .2 The tile shall incorporate an in-line pattern of truncated domes measuring nominal 4mm height, 23mm base diameter, 12mm top diameter spaced center-to-center 60mm as measured on a diagonal and 42mm as measured side by side. For wheelchair safety the field

area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 1.2mm high, per square inch.

- .3 Manufacturer/Product: Eon Tile as manufactured by Kinesik; or equivalent per Specification 01 25 00.
  - .1 Colour: to be selected by Consultant from standard colour range
- .4 Rubber Wall Base:
  - .1 100% PVC free, continuous, top set, complete with premoulded end stops and external corners:
  - .2 Type: thermoset rubber.
  - .3 Style: cove (at RES floor locations)
  - .4 Thickness: 3.17 mm.
  - .5 Height: 101.6 mm.
  - .6 Lengths: cut lengths minimum 2400 mm.
  - .7 Colour: To be determined by consultant from full colour range
  - .8 Acceptable products/manufacturers: Baseworks thermoset rubber Type TS by Johnsonite, Pinnacle by Roppe or equivalent.
- .5 In the selection of resilient tile or sheet flooring and related coatings, adhesives, solvents, cleaners, and other fluids, select those with the following characteristics: zero VOC, manufactured without compounds which contribute to ozone depletion in the upper atmosphere, manufactured without compounds which contribute to smog in the lower atmosphere, does not contain methylene chloride, does not contain chlorinated hydrocarbons, recycled content and be recyclable.
- .6 Primers and adhesives of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .7 Sub-floor filler and leveler: as recommended by flooring manufacturer for use with their product.
- .8 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.
- .9 For edging between resilient sheet flooring and all other floor materials always use a flush anodized aluminum metal edging similar to Schluter Schiene. 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 Site Verification of Conditions**

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

#### **3.2 Preparation**

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Surface Preparation:
  - .1 General: Prepare floor substrate in accordance with manufacturer's instructions.

- .2 Floor Substrate: Floors shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
- .3 Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3,000 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials, and leveling compounds with portland cement based compounds.
  - .1 Reference Standard: Comply with ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- .4 Concrete Moisture Testing: Conduct moisture tests on all concrete floors regardless of the age, grade level or the presence of existing flooring. Conduct calcium chloride tests in accordance with ASTM F 1869. Measure the internal relative humidity of the concrete slab in accordance with ASTM F 2170. One test of each type should be conducted for every 1,000 square feet of flooring (minimum of 3). The tests should be conducted around the perimeter of the room, at columns, and anywhere moisture may be evident. Concrete moisture vapor emissions must not exceed 8.0 lbs. per 1,000 square feet in 24 hours when using Forbo L 885 adhesive. Concrete internal relative humidity must not exceed 85% when using Forbo L 885 adhesive. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor or End User. If the test results exceed these limitations, the installation must not proceed until the problem has been corrected.
- .7 Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 11, it must be neutralized prior to beginning the installation.

### 3.3 Installation: Resilient Flooring RES

- .1 Install flooring in strict accordance with the latest edition of flooring manufacturers written installation manual.
- .2 Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- .3 If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- .4 Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- .5 Roll with a 100-pound (45.36 kilogram) roller in the field areas. Refer to specific rolling instructions of the flooring manufacturer.
- .6 Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

### 3.4 Installation: Base

- .1 Ensure substrate/background meets the requirements of ASTM F1861 and Manufacturer Installation Instructions and Technical Data.
- .2 Fill cracks, holes, depressions and irregularities in the substrate/background to prevent transferring through to the surface of the resilient wall base.
- .3 Lay out base to keep number of joints at minimum.
  - .1 Select the appropriate adhesive for the application and job site conditions.
  - .2 Install material according to roll sequence or with like run numbers.



- .3 Ensure material is rolled appropriately into the adhesive using a hand roller.
- .4 Install straight and level to variation of 1:1000.
- .5 Scribe and fit to door frames and other obstructions.
- .6 Conduct initial maintenance prior to final usage per the Manufacturer Care & Maintenance Documents. Do not conduct initial maintenance until adhesive has cured per the adhesive technical data.

**3.5 Cleaning**

- .1 Remove excess adhesive from floor, base and wall surfaces without damage.
- .2 Conduct initial cleaning and maintenance, including removal of factory coatings and provision of initial seal and wax as per to flooring manufacturer's printed instructions.

**3.7 Protection**

- .1 Protect new floors from time of final set of adhesive until final inspection.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 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.

### **1.2 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 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

### **1.3 Environmental Performance Requirements**

- .1 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.

### **1.4 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.

### **1.5 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.

**1.6 Delivery, Handling and Storage**

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - 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.

**1.7 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
- 1.8 Extra Materials
- 1 Submit maintenance materials in accordance with Section 01 78 00 - 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 Owner 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., Pittsburgh 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, hexavalent 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 Hexavalent 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. Include for 25% dark tones.
- .3 Not used
- .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:

<b>Gloss Level</b>	<b>Description</b>	<b>Units @ 60 degrees</b>	<b>Units @ 85 degrees</b>
G1	Matte or 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 Concrete Unit Masonry: PT: Int 4.2A Latex (G3) finish.
- .4 Metal fabrications/trim: Int 5.1E (G5) finish.
- .5 Galvanized metal/zinc coated steel: Int 5.3L (G5) finish

- .6 Dressed lumber (including doors): INT 6.3T Latex (G5) finish over latex primer.
- .7 Use fire retardant paint on fire rated plywood sheets behind electrical panels.

**All Finishing System Codes are from the Ontario Painting Contractors Association.**

## 2.6 Exterior Painting Systems

- .1 Galvanized Metal (doors/frames/misc fabrications): EXT 5.3A Latex (G5) finish.
- .2 Wood paneling/soffits: EXT 6.4D semi-transparent stain finish.

**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] [Engineer]. 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.

**Section 09 91 00**  
**Painting**

- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

**END OF SECTION**

## **1.0 GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Manually operated, roll-up fabric interior window shades including mounting and operating hardware.
- .2 Opaque window shade system: Manually operated, roll-up fabric opaque window shade system for complete blackout of window opening including side and bottom channels, headbox, opacity plates, manual operator, and mounting hardware.
- .3 Motor operated fabric interior window shades.

### **1.2 REFERENCES**

- .1 All window coverings offered must meet the HAZARDOUS PRODUCTS ACT, Regulation SOR/2009-112, Sep 8, 2009 - Corded Window Covering Products Regulations
- .2 All window coverings offered must meet the CSA Z600-08 - Safety of Corded Window Covering Products standard including but not limited to meeting the product safety requirements of section 4 and the labeling and information requirements of section 5

### **1.3 SUBMITTALS**

- .1 Submit under provisions of Section 01 33 00 - Submittal Procedures:
- .2 Product Data: Manufacturer's data sheets on each product specified, including:
  - .1 Preparation instructions and recommendations.
  - .2 Installation and maintenance instructions.
  - .3 Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
  - .4 Storage and handling requirements and recommendations.
  - .5 Mounting details and installation methods.
- .3 Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.
- .4 Verification Samples: For each finish product specified, two complete sets of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.
- .5 Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- .6 Manufacturer's Certificates: Certify products meet or exceed specified requirements.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- .2 Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- .3 Label containers and shades according to Window Shade Schedule.
- .4 Store products in manufacturer's unopened packaging until ready for installation.

### **1.5 SEQUENCING**

- .1 Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

- .2 Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## 1.6 PROJECT CONDITIONS

- .1 Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

## 2.0 PRODUCTS

### 2.1 MANUFACTURERS

- .1 SOLARFECTIVE/LEGRAND.
- .2 HUNTER DOUGLAS CANADA.
- .3 Equivalent products as per 01 25 00.

### 2.2 MANUALLY OPERATED WINDOW SHADES

- .1 Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation.
  - .1 Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
    - .1 Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
    - .2 Bead chain loop: Stainless steel bead chain hanging at side of window.
    - .3 Idler Assembly: Provide roller idler assembly of molded nylon with adjustable length idler pin to facilitate easy installation, and removal of shade for service.
- .2 Mounting:
  - .1 Mounting brackets.
  - .2 Endcaps and headbox.
- .3 Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
- .4 Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.
  - .1 Endcap covers: To match fascia or headbox color.
- .5 Brackets: Plated stamped steel. Provide size compatible with roller size.
  - .1 Mounted to wall.
- .6 Coupling system: Provide system to operate shades from single crank by coupling shade rollers together. System to consist of endcaps, plus couplings to connect rollers.
  - .1 2 shades operated from single control when practical/indicated on drawings.
- .7 Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
  - .1 Attachment: Snaps onto endcaps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands.
  - .2 Finish: Clear anodized.

## **2.3 FABRIC**

- .1 Light Filtering Fabrics
  - .1 Shade cloth shall be woven of .018 opaque, vinyl coated polyester yarn consisting of approximately 79% vinyl and 21% 500 denier polyester core yarn. The fabric shall be tensioned in the finishing range prior to heat setting to keep the warp ends straight and minimize or eliminate weave distortion to keep the fabric flat. The fabric shall be dimensionally stable. Colour to be as selected from standard range.
  - .2 Average 3% open.
- .2 Not used.
- .3 Performance – As a “shade cloth” the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without raveling. An unguided roller shade Cloth shall roll true and straight, without shifting sideways more than +1/8” in either direction due to warp distortion, or weave design.
- .4 Flame Retardance - Fabric shall be certified by an Independent Laboratory to pass the Small Scale Vertical Burn Requirements test CAN and ULC-S109-M87 and NFPA 701.
- .5 The fabric supplied shall be GREENGUARD certified or approved equivalent.

## **2.4 Schedule**

- .1 As indicated in drawings.

## **3.0 EXECUTION**

### **3.1 EXAMINATION**

- .1 Do not begin installation until substrates have been properly prepared.
- .2 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- .1 Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

### **3.3 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Install roller shades level, plumb, square, and true. Allow proper clearances for window operation hardware.
- .3 Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
  - .1 Fascias.
  - .2 Closure panels.
  - .3 Endcaps.

### **3.4 TESTING AND DEMONSTRATION**

- .1 Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
- .2 During daylight hours, lower shades and turn off interior lights. Verify that there are no light leaks at perimeter or within shade assembly. Correct deficiencies.

### **3.5 PROTECTION**

- .1 Protect installed products until completion of project.

- .2 Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

1. Provide all labour, methods, Products, equipment and accessories for existing electrical conditions as shown on drawings, specified herein, and as required for the complete and proper execution of Work of this Section.

### **1.2 EXISTING CONDITIONS**

1. Examine the site and existing conditions prior to tendering on this work and make due additional allowance for these conditions in the Tender. Confirm locations and routings of existing services which might be affected by this installation and allow in the Tender for such additional work.
2. Indication on the drawings of existing conduit, outlets and other electrical apparatus is based on casual field observations and records of past contracts. As such, this information represents the best data available but is not guaranteed to be full or accurate. Allow in tender to verify that field measurements and circuiting diagrams are as indicated on Drawings and that abandoned wiring and equipment serve only abandoned facilities. Report discrepancies to the Designer before disturbing existing installation.
3. Submission of a Tender for this work indicates that the Subcontractor has made a thorough examination of the site and has accepted the existing conditions.
4. Permit no interruptions to the existing electric power, fire alarm, telecommunications, security, and other similar systems in the existing site during normal working hours where such systems service other sites. Advise the Designer in writing of any intended interruptions outside of these normal hours, including the time and duration of outage. Obtain permission from the Designer at least Five (5) days before partially or completely disabling any of the systems. The Designer may cancel such permission in emergencies at the last minute without penalty or extra cost. Minimize duration of outage.
5. All work that could affect existing operations can only be done afterhours and subject to acceptance by the Subcontractor. Make necessary allowance in the tender price.
6. Assume full responsibility for any disruption to existing services and systems. Should any temporary connections be required to maintain services during work in the existing buildings, the electrical subcontractor shall supply and install necessary material and equipment and provide labour at no extra cost. Include the removal of such temporary connections at completion of the work in the Tender price.
7. Where alterations and/or additions to existing equipment or apparatus are required to be made by these documents, it shall be assumed that any existing CSA certification may be in jeopardy. Ensure that all changes are made in accordance with the current edition of the OESC, obtain re-certification, and include re-certification costs in the tender.
8. Provide circuit breakers for all additional circuits as required and provide revised panel schedules. Where existing panels are affected by the scope of work, provide all necessary blank covers - under no circumstances shall breaker spaces be left open.

9. All systems such as power, lighting, fire alarm system, paging, security, communication, etc., shall be fully operational after renovation and be accepted by the Designer.
10. The Subcontractor shall remove all surplus electrical equipment, devices, sensors, wiring, and conduits, etc. from renovated areas and return to the Designer or dispose of as instructed by Designer unless otherwise noted.
11. The Subcontractor shall relocate, rewire or reroute all wiring which passes through renovated areas, or is in line or on the same circuit as the existing device to be removed to ensure continuity of proper operation of all electrical, fire alarm, security, communication systems, etc. in areas which are not renovated, or devices which are to remain operational. Provide blank covers on all removed devices as required.
12. The Subcontractor shall allow for adequate removal (without damage) of all fixtures, wiring devices, wires, etc. to facilitate renovation.
13. Any fixtures, wiring devices, etc. damaged during and after removal shall be replaced with new approved equipment at the Subcontractor's cost.
14. The Subcontractor is responsible for adequate protection of equipment, furniture, flooring, etc. (plastic covers, etc.) during the execution of the work.
15. The Subcontractor is responsible for cleaning up working areas each day before leaving the job site.
16. Allow for multiple verifications for systems dictated by phasing and scheduling as required for partial Substantial Performance inspections.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

1. All new equipment used in existing facilities shall be specified to match existing unless otherwise noted.

## **PART 3 - EXECUTION**

### **3.1 DEMOLITION**

1. Examine drawings of other trades and allow for all work such as the removal, temporary relocation, and re-installation of electrical equipment, wiring, raceways, etc., where such work is required due to alterations in or about existing site.
2. Where work requires modification, extension, and additions to power and low tension services within the existing building, the wiring required for this work shall be installed concealed wherever possible. In certain cases (e.g., where it is necessary to clear obstructions, or to avoid damage to existing structure and/or finish materials), concealed wiring may not be possible. In such cases, special wiring methods such as mineral-insulated cable or Wiremold surface mounted raceway shall be used, provided that, for each specific instance, approval for same is requested from and granted in writing by the Designer.



3. Remove abandoned wiring to source. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
4. Disconnect and remove all existing and newly abandoned panelboards, distribution equipment, outlets and devices in the renovation areas. Remove abandoned outlets when servicing conduit is abandoned and removed. Blank off unused outlet boxes.
5. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
6. Clean and repair existing materials and equipment which remain or are to be reused, as described elsewhere in these Specifications.
7. The Designer is to be given first refusal on abandoned or deleted equipment or accessories.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

1. Provide all labour, methods, Products, equipment and accessories for electrical general requirements as shown on drawings, specified herein, and as required for the complete and proper execution of Work of this Section.

### **1.2 REFERENCES**

1. American Standards Institute (ANSI).
2. Accessibility for Ontarians with Disabilities Act (AODA).
3. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
4. Association Society of Mechanical Engineers (ASME).
5. Canadian Electrical Code, Part I and Part II,: Safety Standard for Electrical Installations (CEC).
6. National Electrical Manufacturers Association (NEMA).
7. Ontario Electrical Safety Code and Bulletins (OESC).
8. Underwriters' Laboratories of Canada (ULC).
9. Ontario Building Code (OBC).
10. The applicable City of Toronto Standards and By-Laws.

### **1.3 PERMITS, FEES AND INSPECTION**

1. Before starting work, submit the appropriate quantity of Drawings and Specifications to the Electrical Inspection Department and to other authorities having jurisdiction and obtain necessary installation permits. Include all costs of approvals and all permit fees in the tender.
2. The Designer will provide electronic copies in PDF of the Drawings and Specifications required by the Subcontractor for submission to the Electrical Inspection Department, the Supply Authority, and other authorities having jurisdiction, at no cost.
3. Arrange for inspection of the work as the installation progresses and as further required (as well as attendance during verification) by applicable authorities having jurisdiction.
4. Notify the Designer of changes required by Electrical Inspection Department prior to making changes.
5. Upon completion, and before final payment will be made, present to the Designer a certificate of approval for electrical work from the Electrical Inspection Department and other authorities having jurisdiction.

6. The Designer will carry out site visits from time to time to conduct a General Review of the work and document any noted deficiencies for corrective action by the Subcontractor, during construction and upon completion.

#### **1.4 SUBMITTALS**

1. General: The following submittal and project documentation requirements for electrical work are in addition to requirements of the Conditions of the Contract.
  1. All documentation shall be provided to the Designer in archive quality open standard electronic format, such as PDF. Documentation shall be transmitted via email or posted to a common share point site as may be provided. Electrical Subcontractor and Suppliers shall securely retain submitted documentation on their corporate servers.
2. Shop Drawings:
  1. Notwithstanding the above, submit a PDF document of all shop drawings to the Designer sufficiently in advance of requirements to allow time for review and comment. These will be retained by the Designer for their office use and will be marked and returned to the Electrical Subcontractor for correction if necessary, further reproduction, and distribution as required.
  2. Shop drawings shall be neatly drafted and shall be complete and detailed and shall be provided as stipulated elsewhere in these Specifications. This requirement is mandatory for such items as switchboards; custom-fabricated equipment panels, consoles, or racks; and custom-fabricated lighting, Transformers, Battery packs and communication systems.
  3. All Shop Drawings shall use metric dimensions. Scaled drawings shall use metric scale.
  4. Shop Drawings shall bear specific names for each and every unit assembly defined thereon, the name of the project where installation is to take place, the name of the manufacturer, and the date of the drawing including notation of latest revision, if any.
  5. Except as may be necessary to indicate operation of switchgear and similar apparatus and to show field interconnections, detailed wiring diagrams of component assemblies need not be included with Shop Drawings unless requested by the Designer. However, such wiring diagrams shall be included as part of the Maintenance Manual as required by these Specifications.
  6. Indicate details of construction, dimensions, locations of cable pits and trenches, capacities, weights and electrical performance characteristics of equipment and materials.
  7. Shop Drawings may be prepared by the Electrical Subcontractor or manufacturer's drawings will be accepted. All drawings required for one and the same system shall be submitted as a complete package. Incomplete system packages will not be reviewed and will be returned unmarked.
  8. Shop Drawings shall be reviewed by the Electrical Subcontractor prior to submission to the Designer. Shop Drawings not bearing Electrical Subcontractor's approval stamp, approval date, signature, and project name will be returned without comment.

9. Manufacturers' brochures (product data) submitted as shop drawings shall clearly indicate type (i.e., lighting luminaire type F1) and all features as specified as part of the unit(s).
  10. PDFs shall be minimum 600 dpi quality. Scanned documents will be rejected if information is unclear or illegible.
  11. Review of Shop Drawings by the Designer is for the sole purpose of ascertaining conformance with the general design intent. The review shall not mean approval of the detail design inherent in the shop drawings, responsibility for which shall remain with the Electrical Subcontractor submitting same and such review shall not relieve the Electrical Subcontractor of his responsibility for errors or omissions in Shop Drawings or of its responsibility for meeting requirements of Contract Documents. The Electrical Subcontractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes and to techniques of construction and installation, and for coordination of work of sub-trades.
  12. Ensure that copies of all approved Shop Drawings are available at job site.
3. Maintenance Manuals:
1. Provide final searchable electronic file, including one (1) draft copy of the Maintenance Manual to be prepared specifically for this project.
  2. Provide all data, after making all necessary corrections. Provide final Shop Drawings, wiring diagrams, equipment brochures, etc., required for inclusion with the Manuals. Include all costs in the tender price associated with assisting the Agency and in providing all data, drawings, diagrams, brochures, etc.
  3. The draft copy referred to above shall include only descriptions of the systems, together with operating and maintenance instructions, and shall be delivered to the Designer for review and comment no later than one (1) month prior to the date of Substantial Performance. This copy may be in a loose-leaf ring binder.
  4. Final Maintenance Manuals shall include:
    1. Cover: Sturdy black hard cover expandable post binder(s) with stamped white letters on the binding of the cover showing the following:
      1. Name of Project.
      2. Type of Manual (i.e., Maintenance Manual for Electrical Systems).
      3. Listing (Company names only) of Designer, Electrical Consulting Engineer, Electrical Subcontractor, and name of Agency that prepared the Manual.
    2. Introduction Page:
      1. Name of Project.
      2. Type of Manual (i.e., Maintenance Manual for Electrical Systems).
      3. Listing (Company names, addresses, email addresses and telephone numbers) of Designer, Electrical Consulting Engineer, General Subcontractor, Electrical Subcontractor, including his Subcontractors (i.e., Communication Systems Subcontractor,

Testing Agency, etc.), and name of Agency that prepared the Manual.

3. Instruction Page:
  1. Step-by-step instructions on how to use the Manual.
4. Index Page
  1. List equipment, systems and special references such as conduit colour coding schedule, applicable Test Reports, Certificates, etc. The Index shall be arranged in the same order as the Specifications.
  2. List Electrical Record Documents including drawings issued during the tender period and the construction stage.
5. Equipment/System Pages:
  1. Tabbed Dividers: Provide, between each piece of equipment/system, divider pages complete with plastic tabs with large numbers corresponding to the Index listing.
  2. Index Sheets: After each divider page, include a "local" Index Sheet as per the following example. (Provide "local" divider pages complete with smaller plastic tabs corresponding to the "local" Index Sheet).

#### NAME OF PROJECT

#### INDEX SHEET TOPIC

Heading	Bulletin/drawings	Pages
Description		A1
Maintenance Instruction		B1
Renewal Parts		C1
Shop Drawings/Brochures		
Identification/Colour Coding		
Supplier/Manufacturer/Distributor		

3. The above Index Sheet shall be used for all equipment/systems.
4. Under Description: Include a brief description and sequence of operation of equipment/systems and manufacturers' published technical literature. For major pieces of equipment such as generator, switchgear, communication systems, etc., include complete parts/component lists. Include revised and updated typewritten copy of all Schedules (motor, panelboard, feeder, lighting fixtures, receptacles, switchboard, equipment, etc.) in the applicable section of the Maintenance Manual.

5. Under Maintenance Instruction: Describe manufacturer's recommended maintenance program. (Describe on Index sheet if space permits).
6. Under Renewal Parts: List Renewal Parts if applicable. (List on Index Sheet if space permits).
7. Under Shop Drawings/Brochures: Include a copy of reviewed and corrected shop drawings (reduced scale) and brochures. Also include final and detailed wiring diagrams (reduced scale) when applicable. If space permits, show listing of drawing numbers and brochures in the Index sheet; otherwise, include the list in the front part of the drawings and brochures. Shop drawings shall be so arranged that they can be removed directly from the Manual without undoing the pin-bars.
8. Under Identification/Colour Coding: Outline method used for identifying equipment. Method used for Identification/Color Coding shall be according to the appropriate Specification Section. Colour coding used for identification of outlet boxes, raceways, etc., shall be shown with a coloured label glued to the page. All identification and colour coding information may be shown on the Index sheet if space permits.
9. Under Supplier/Manufacturer/Distributor: List source of supply for replacement parts, including name, address, and telephone number. This information may be shown on the Index sheet if space permits.
6. Guarantees and Warranties:
  1. Include applicable guarantee and warranty information,
7. Test Reports and System Demonstration:
  1. Include copies of all applicable Test Reports (refer to Testing and Adjusting this Section) and manufacturers' letters verifying test completion.
  2. Include signed statement from the Designer regarding systems demonstrations (refer to Demonstration this Section).
  3. Provide a training session to the client operator for the installed system operation.
8. Certificates:
  1. Include a copy of Final Certificates from Electrical Inspection Department, Fire Chief, and other authorities having jurisdiction over the work.
9. Drawings:
  1. Include all small format drawings issued during Maintenance Manuals have been delivered to the Designer.
5. A holdback will be in effect until required copies of approved Maintenance Manuals have been delivered to the Designer.

6. A sample copy of a typical Maintenance Manual is available for review at the Designer's office.
4. Electrical Record Documents and As-Built Documents:
  1. Record documents are defined as documents prepared by the Designer.
  2. As-built document are defined document prepared by the Subcontractor.
  3. The Subcontractor shall maintain at job site office in up-to-date condition, one (1) complete set of whiteprints of each of the Electrical Contract Drawings and one (1) set of Specifications, including Revision Drawings, marked clearly and indelibly in red, indicating "As-Built" conditions where such conditions deviate from the original directions of the Contract Documents, and indicating final installation of feeders and branch circuits.
  4. "As-Built" drawing markings shall include but shall not be limited to the following:
    1. Changes in circuiting.
    2. Size and routing of conduits for branch circuits including power, lighting, and systems. Accurately record on "As-Built" drawings the size and routing of installed raceways and cables.
    3. Number and size of conductors (#10 AWG and larger) in raceways and cables. Provide updated conduit and cabling schedules.
    4. Location of junction and pullboxes.
    5. Location of conduit or duct stubs, installed equipment, devices, and fixtures.
    6. Locations of access panels.
    7. Changes to electrical installation resulting from Addenda, Change Orders, and Field Instructions (Architectural Instructions).
    8. Exact location of services left for future work.
    9. Location by accurate horizontal and vertical dimensions of the routes and terminations of raceways and cables installed underground beyond the building.

#### **1.5 QUALITY OF WORK**

1. Unless otherwise indicated, materials supplied shall be new and of the quality indicated in these Specifications. Otherwise, they shall be of the best commercial quality obtainable for the purpose.
2. Manufacturers' directions shall be followed in all cases where the manufacturers of equipment or materials used in this work furnish directions covering points not shown on the Drawings or Specifications.
3. Unless otherwise directed, installed materials or equipment exposed to view shall be plumb, true, square, and/or level as the case directs and, where applicable, located symmetrically to the features of the building.
4. Submit a monthly progress construction schedule for review.

#### **1.6 QUALITIFICATION OF TRADESMEN**

1. The work shall be performed by qualified and certified tradesmen as set out in the Electrical Safety Regulation within the Electrical Safety Act.
2. Submit list showing names and qualifications of key supervisory personnel.

#### **1.7 CARE, OPERATION, AND START UP**

1. Instruct operating personnel in the operation, care, and maintenance of equipment. Refer to additional commissioning requirements contained in the individual system specifications.
2. Arrange and pay for services of manufacturer's factory service engineer to supervise start up of installation, and to check, adjust, balance, and calibrate components.
3. Provide these services for such period and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

#### **1.8 RESPONSIBILITY AND COORDINATION**

1. Supply labour, materials, equipment, tools, and incidentals necessary to provide a complete electrical installation as indicated on the Drawings and as set out in these Specifications.
2. The Electrical Subcontractor shall advise the Designer during the tender period of any specified material or equipment which is either no longer available from manufacturers or whose delivery is likely to exceed the requirements of the anticipated Construction Schedule. Failure of the Electrical Subcontractor to perform the above shall cause the Electrical Subcontractor to supply, at its own expense, alternate material or equipment as selected by the Designer at a later date. Alternatively, the Electrical Subcontractor shall procure the specified material or equipment at his own additional expense by means of air freight or other special means of transportation.
3. The Drawings and Specifications complement each other and what is called for by one is binding as if called for by both. If there is any doubt as to the meaning or true intent due to a discrepancy between the Drawings and Specifications, obtain a ruling from the Designer prior to tender closing. Failing this, the most expensive alternative is to be allowed for.
4. Advise the Designer of any specified equipment, material, or installation of same which appears inadequate or unsuitable or which is in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction. Provide labour and materials which are obviously necessary or reasonably implied to be necessary to complete the work as if the work was shown on the Drawings and/or described in the Specifications.
5. Check Drawings of other trades and coordinate the installation of material and equipment to ensure adequate space and free access, and to maintain headroom limitations for new and indicated future work. Work out jointly, with other trades on site, solutions to interference problems. Coordinate work before fabricating or installing any material or equipment. It is incumbent on all trades on site to ensure that materials and equipment fit into the allocated spaces and that equipment can be properly inspected, serviced, and replaced if and when required. Advise the Designer of space problems before fabricating or installing material or equipment. Demonstrate to the Designer on completion of Work that equipment and material installed can be properly and safely serviced and replaced. Make no deviations



from intent of design, or any involving additional cost, without the Designer's written direction.

6. Manufacturers' directions shall be followed in all cases where the manufacturers of equipment or materials used in this work furnish directions covering points not shown on the Drawings or Specifications.
7. The Electrical Subcontractor is solely responsible for ensuring that product dimensions accommodate spatial allowances.
8. Where electrical work and materials are noted as being provided by "Others" or under other Divisions of these Specifications, be responsible for integrating, to the extent required, such work and materials into the complete installation. Coordinate with others for equipment locations and dimension.
9. When introducing equipment, ensure that building structure temporarily loaded, enroute to final location, is sufficient. If not, allow to temporarily strengthen and distribute loads appropriately, via shoring, jacks, steel plates, etc.

#### **1.9 PROTECTION**

1. Protect exposed live equipment during construction for personnel safety.
2. Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.
3. Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

#### **1.10 VOLTAGE RATINGS**

1. Operating voltages: to CAN3 C235 (current edition).
2. Motors, electric heating, control, and distribution devices and equipment are to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment is to operate in extreme operating conditions established in above standard without damage to equipment.

#### **1.11 DRAWINGS AND MEASUREMENTS**

1. Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work. Do not scale the Drawings.
2. Consult Architectural and other Drawings and details for exact locations of outlets, luminaires fixtures, devices and equipment prior to installation. Obtain this information from the Designer where definite locations are not indicated.
3. Drawings show approximate locations of outlets, equipment and apparatus but the right is reserved by the Designer to make changes in location before installation of the Work as may be necessary to centre lights or meet exigencies of construction in any way. No extra costs will be allowed and conversely, no credit shall be expected for such changes unless for each item of work the distance moved exceeds 3 m prior to final installation of same

4. Take field measurements where equipment and material dimensions are dependent upon building dimensions.

#### 1.12 APPROVALS

1. Submissions shall include the following information:
  1. Name and identification of specified item.
  2. Manufacturer, brand name, and catalogue number of the alternative item proposed.
  3. Detailed technical data and characteristics of alternative item such as dimensions, voltage, power requirements, performance characteristics, etc.
  4. Request for lighting fixture substitutions must be followed by photometric data and proper shop drawings.
  5. Substitution of materials, equipment, apparatus, light fixtures, or products following Construction Contractor's review of Shop Drawing for same shall not be permitted. Where such a substitution is unavoidable (for example, an approved material is no longer commercially available), and which may cause reduction of the Project Agreement performance requirements, the substitution shall follow provisions of the Project Agreement.
2. Materials, equipment, apparatus, light fixtures, or other products specified by manufacturers' brand name, type, or catalogue number are so specified in one of two ways:
  1. Specified Item followed by the Words "or equal" or "or approved equal" or preceded by the Words "equivalent to" or "equal to".
    1. When the Specification is so worded, it is intended to establish a specific standard of quality and style but the item may be substituted for, provided written approval is stated in the form of an Addendum. It is the responsibility of the Electrical Subcontractor to ensure that features of specified items are supplied as part of substitute item. If written approval of a substitute item is not issued in the form of an Addendum, the item shall be supplied precisely as specified.
    2. Substitution of materials, equipment, apparatus, light fixtures, or products following Construction Contractor's review of Shop Drawing for same shall not be permitted. Where such a substitution is unavoidable (for example, an approved material is no longer commercially available), and which may cause reduction of the Project Agreement performance requirements, the substitution shall follow provisions of the Project Agreement and Shop Drawing shall be resubmitted
  2. Specified Item not Followed or Accompanied by Qualifying Phrases:
    1. When Specification is so worded, item shall be supplied as specified, and no approved alternatives shall be allowed.
3. Review by the Designer of alternate materials as permitted above is only a general approval in principal and shall not relieve the Electrical Subcontractor of its responsibility to ensure that any approved alternate materials perform in the same manner and with the same intent as the originally specified material would have otherwise performed.

4. Where such substitutions alter the design or space requirements indicated on the Drawings, include material, labour, design, and engineering costs for the revised design and construction including costs of other trades affected and those incurred by the Designer and its Consultants.
5. It is the Electrical Subcontractor's responsibility to ensure that substituted products are approved and that suppliers have written approval indicating conditions of any such approval. Alternate manufacturers who do not have such approval shall not be used in the work. If requested by the Designer, the Electrical Subcontractor shall submit for review, samples of both the specified and the proposed substitute items on short notice.
6. Advise all sub trades of any required changes to the installation as a result of using alternative equipment.

#### **1.13 DELIVERY AND STORAGE**

1. Store electrical equipment and devices other than conduits, fittings, boxes, and ducts in a heated and ventilated space, and protect from construction damage. Include in Tender price costs related to such storage.
2. Conduits, fittings, boxes, and ducts may be stored outside if properly protected against the weather.
3. Ship and store floor mounted equipment in upright position.
4. Ship equipment in adequate containers to ensure it arrives undamaged at the site.
5. Keep equipment doors locked. Protect equipment from moisture, damage and dust.
6. Block moving parts when necessary to prevent damage during movement and shipment of equipment.
7. Remove from the site and replace with new, all materials showing evidence of damage or rust.

#### **1.14 CLEANING AND REPAIR**

1. At the conclusion of the job and before the building will be accepted by the Designer, lighting fixtures, lenses, panelboards and other electrical equipment shall be clean and free of dust, plaster, paint and other foreign materials.
2. If, in the opinion of the Designer, lighting fixtures require cleaning, this cleaning shall be done by a firm regularly engaged in this type of work. Plastic diffusers shall NOT be wiped. They shall be dipped in an approved anti-static hot detergent solution and drip-dried before installation. Reflectors shall be properly cleaned to remove dust, finger marks, etc.
3. Repair, at no cost to the Designer, any equipment or structures damaged by the execution of Contract to its original condition.
4. Replace, at no cost to the Designer, any equipment or structures damaged by the execution of Contract which is not reparable.

5. Openings and cutouts shall not be burned into panels. Oversized openings shall not be patched up with loose plates or oversized washers. Oversized openings shall be considered damage to the equipment and shall be replaced.

#### **1.15 GUARANTEE / WARRANTY**

1. Use of installed equipment during construction, when permitted by the Designer, shall not shorten or alter the guarantee period as specified within the General Conditions or Supplements thereto.
2. Unless otherwise noted, the warranty period for equipment shall commence on the date of Substantial Performance for the entire Construction Contract.
3. Refer to other sections of these Specifications for extended warranty requirements (fire alarm, communication systems, etc.).
4. Within a period of two (2) years from the date of substantial completion, replace or repair at own expense any defect in workmanship or material.

#### **1.16 SUBSTANTIAL PERFORMANCE SITE REVIEW**

1. Before the Designer is requested to make a Substantial Performance site review, submit written confirmation that:
  1. Electrical equipment, wiring devices, coverplates, motor controls, lighting fixtures, and other equipment are operational, plumb, clean, and correctly labelled.
  2. Electrical equipment has been commissioned completely and put into service.
  3. Factory finished equipment has been cleaned, touched up, or refinished as necessary to present a new appearance.
  4. All previously submitted corrective instructions have been completed.
  5. Loose equipment including spare parts and replacement parts have been turned over to the Designer and receipts obtained for same.
  6. Test and Commissioning reports have been submitted.
  7. Certificates of final acceptance from the authorities having jurisdiction have been received and submitted to the Designer.
  8. Verification letters from others have been received:
    1. Fire alarm verification certificate from Fire Alarm System Technician.
    2. Additional verification certificate as listed in respective specification sections.
  9. Demonstrations and instructions to the Designer have been completed.
  10. Draft copy of the Maintenance Manual has been submitted.
  11. As-built Drawings have been submitted to the Designer.
2. Provision of the above shall not be construed as compliance with all administrative documentation required within the Conditions of the Contract.

3. Notwithstanding any other provisions of the Contract, failure to complete all of the above shall give cause to deny the issuance of a Substantial Performance Certificate.

**END OF SECTION**

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# **Durham College**

## **Communication Cabling Specification**

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## PART 1 – GENERAL CABLING STANDARDS

### 1.1 GENERAL SCOPE OF WORK

- .1 This document describes the requirements for furnishing and installing a certified telecommunications horizontal cabling, copper and fiber backbone infrastructure for Durham College. The client will be installing a VoIP system at this location. A balanced plenum Cat6 utp twisted-pair cabling system capable of supporting a minimum **250MHz** of bandwidth as described in this document.
- .2 The cabling system shall provide data cables from each of the telecommunications outlet/connector (TO) in each work area (WA) back to the LAN Room (TR) location in the basement. All runs will terminate in LAN room. No permanent link shall exceed 90 m (295 ft), as measured from the cable termination point at each end. An additional 10 m (33 ft) is allowed for cordage at both ends, for a maximum allowable end-to-end or channel length of 100 m (328 ft). See drawing for exact quantities and locations.
- .3 Supply and install one 19" 4 post data rack with two (2) vertical wire managers in the LAN room.
- .4 Cable to be terminated on BIX type hardware in the electrical room and on GigaBIX hardware in the LAN room location.
- .5 Fibre to be terminated in a patch panel in the LAN room.
- .6 Fibre between the data center location and the existing LAN room in the DC campus building. Cable to be terminated in a fibre patch panel in the LAN Room and in a rack mount fiber patch panel in the data center location.
- .7 Supply and install 12" x 4" overhead basket cable tray within the LAN room to support the Cat6 pigtail cables to the backboard (refer to drawing for info).
- .8 Supply and install one Cat6 pigtails for each data cable that is indicated on the drawing from the data rack via overhead basket cable tray to the furred out backboard and terminate on GigaBIX type hardware. Cat6 pigtails are to be installed in the clients network switches (size of switches to be determined). (round up to the nearest 24 or 48 switch port count)
- .9 Supply and install one piece of fire treated plywood (8'-0" w x 8'-0" h x  $\frac{3}{4}$ ") on six inch furred out studs in LAN room. Contractor to include all material and cutting of all holes in the plywood for all GigaBIX mounts.
- .10 Contractor to cross connect (all pairs) and provide an excel spread sheet listing the switch name, port and cable ID.
- .11 All cables and related support, termination, and grounding hardware shall be furnished, configured, installed, tested, labeled, and documented by the successful bidder as detailed in this document.
- .12 The Communications Cabling Contractor is responsible for providing pathways through the block walls (sleeves, core holes etc) and the floor slab for all horizontal and backbone type cabling including all fire stopping.

- .13 General product specifications, design considerations, drawings and installation guidelines are provided in this package. In case of conflict, this document shall take precedence. The successful bidder shall meet or exceed all requirements for the cabling system described in this document.

## 1.2 REGULATORY REFERENCES AND STANDARDS

- .1 All workmanship and materials supplied shall be in full conformance with applicable building, electrical, and other codes, as determined by the authority having jurisdiction (AHJ).
- .2 All cabling system components shall be Underwriters Laboratories (UL) Listed and shall be marked as such. In cases where UL has no published standards for a component, any equivalent national independent testing standard shall apply and the item shall be appropriately marked. Where UL has an applicable system listing and label, the entire system shall be labeled.
- .3 The product specifications, design considerations, and installation guidelines provided in this document are in part derived from recommendations found in recognized telecommunications industry standards. The following are used as reference:
  - .1 Spaces and Pathways  
ANSI/TIA-569-B (2004) – Commercial Building Standard for Telecommunications Pathways and Spaces
  - .2 Grounding  
ANSI-J-STD-607-B (2011) – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
  - .3 Cabling Systems  
ANSI/TIA 568-C.0 Generic Telecommunications Cabling for Customer Premises.  
  
ANSI/TIA 568-C.1 Commercial Building Telecommunications Cabling Standard.  
  
ANSI/TIA 568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standards.  
  
ANSI/TIA 568-C.3 Optical Fiber Cabling Components Standard.
  - .4 Cabling Administration  
ANSI/TIA -606-B (2012) – Administration Standard for Commercial Telecommunications Infrastructure
  - .5 Networking  
IEEE Standard 802.3an (2506) – *10GBASE-T*
  - .6 Design  
BICSI Telecommunications Distribution Methods Manual (TDMM) – 12<sup>th</sup> edition (2006)
  - .7 Installation  
BICSI Information Transport Systems Installation Manual (ITSIMM) – 6<sup>th</sup> edition (2012)
  - .8 In cases where product specifications, design considerations, and installation guidelines provided in this document are in conflict with the references listed above, the more stringent requirements shall apply. All references listed above were current during development of this publication.
  - .9 This document does not take precedence over any code, either partially or wholly.

- .10 The Communications Cabling Contractor shall ensure that any local permits that are required to be obtained are obtained prior to starting any activity on the client's site and that any labour fair wages and union affiliation requirements are met.
- .11 The Communications Cabling Contractor is to read and comply with all sections of this document.

### 1.3 CABLE MANUFACTURE

- .1 The approved cabling manufacture is Belden for horizontal Cat6 (2413) cabling, copper and fiber along with associated terminating hardware (no substitutes will be allowed).
- .2 The bidder must have successfully completed all design and installation training provided by the manufacturers and is able to document successful completion of such training upon request.
- .3 The bidder shall demonstrate proven expertise in the implementation of network cabling. Expertise can be illustrated through the inclusion of details of at least two projects involving the design and installation of a minimum 250MHz balanced (2413) utp twisted-pair cabling systems within the past two-year period.
- .4 Names and contact information for each of the two projects shall be included in their bid response.
- .5 The successful bidder shall hereinafter be referred to as the Communications Cabling Contractor.
- .6 The Communications Cabling Contractor shall accept complete responsibility for the installation, acceptance testing, and certification of the successful 250MHz system.
- .7 The Communications Cabling Contractor shall provide proof of its current manufacturer status and shall deliver a minimum **250MHz System Certification** for this project.
- .8 All manufacturers' products must meet or exceed the specifications in this document. No alternatives will be accepted except where noted. Bidders must identify alternative products with their bids, including the manufacturer and part number.
- .9 All manufacturers products installed must meet or exceed all local, provincial and federal building, fire, health, safety and electrical codes.
- .10 The successful cabling contractor and their manufacture must be able to install and support the 25 year warranty.

### 1.4 APPROVED INSTALLERS

- .1 The installation of the 250MHz (2413) system shall be performed by an **authorized contractor from Belden.**
- .2 The Communications Cabling Contractor may not assign or sub-contract any work without the prior written consent of the Client or their designated representative.
- .3 All installation and testing shall be performed by a certified and supervised by individuals qualified to install and test the 250MHz system, in accordance with manufacture requirements. The supervisor(s) shall have successfully completed the manufacture training courses and be able to document successful completion of such training upon request.
- .4 The Project Manager and lead tech that start the project must remain on the project until its competition. Changes to the Communications Cabling Contractor's project team may only occur with the prior consent of the client and the Communications Consultant.

- .5 The Communications Cabling Contractor must comply with all job-site requirements (including fair wage requirements) for the duration of the project. The Communications Cabling Contractor shall make all necessary precautions, allowances and pre-cautions to comply with labour requirements of all unions on site to ensure that there will not be any disruption of work arising from the successful bidders work or workers.
- .6 The Communications Cabling Contractor must comply with all requirements of the Occupational Health & Safety Act.
- .7 It shall be the Communications Cabling Contractor responsibility to be aware of all current or impending legislation relating to employees, safety and fire regulations and shall be further required to acquaint their staff with this information. The Communications Cabling Contractor shall be responsible for being aware of all governing local municipal regulations and the Provincial Employment Standard concerning minimum wages, vacation pay, termination of employment etc.
- .8 The Communications Cabling Contractor must be in good standing with the Workplace Safety and Insurance Board and the successful bidder will be required to provide to the client a certificate (Workers Compensation) to this effect.
- .9 The Communications Cabling Contractor agrees to use only tradesman who are fully trained, qualified and experienced on the installation, termination and testing of a Certified Communication Cabling System. The installer must be an approved installer of the specific cabling system.

#### 1.5 WORK INCLUDED

- .1 The work included consists of all labor, equipment, products, and supplies required installing, testing, and certifying the 250MHz solution in compliance with the project specifications.
- .2 The work included consists of (but is not limited to) the following:
  - .1 Pre-registration of the project with the successful manufacturer's Certified Project. A copy of the pre-registration request and manufacturer's approval shall be provided prior to project starting.
  - .2 Furnishing and installation of a complete balanced utp twisted-pair telecommunications cabling infrastructure capable of supporting 2 Gb/s networking.
  - .3 Furnishing, installation, termination, labeling and testing of all utp horizontal cabling.
  - .4 Furnishing, installation, termination, labeling and testing of the fiber backbone.
  - .5 Furnishing of any other material required to implement a complete system.
  - .6 Furnishing all test and labeling information in both electronic and paper formats.
  - .7 Providing training and complete documentation, including the Manufacturer's User Manual, Application Guidelines, and as-built drawings within [10] business days of project completion.

#### 1.6 DELIVERY, STORAGE AND INSTALLATION INFORMATION

- .1 Delivery and receipt of project materials shall be at the site, Whitby, Ontario and it will be the sole responsibility of the Communications Cabling Contractor to receive, move, secure and store all equipment and material. All delivery costs are to be included in the Communications Cabling Contractors proposal.

- .2 All cable to be used in the project shall be stored according to manufacturer's recommendations. In addition, all cable must be stored in a protected area. If cable is stored outside, it must be covered with opaque plastic or canvas for protection from the elements, with adequate ventilation to prevent condensation. If air temperature at the cable storage location will be below 4.4 °C (40 °F), the cable shall be moved to a heated location [minimum 10 °C (50 °F)]. If necessary, cable shall be stored off-site at the Communications Cabling Contractor's expense.
- .3 The Communications Cabling Contractor is allowed one (1) standard size job box on the site during construction. All tools, material and the job box are the sole responsibility of the Communications Cabling Contractor. The Communications Cabling Contractor is responsible for the complete storage, handling, moving, delivery and installation of all materials used in the performance of the work.
- .4 The client is not responsible or liable for any missing material and/or tools belonging to the Communications Cabling Contractor.
- .5 The Communications Cabling Contractor is responsible for keeping the workspace clean, safe and free from debris at all times. All debris must be removed from the site on a weekly basis. Costs associated for keeping the area clean is the responsibility of the Communications Cabling Contractor.
- .6 Cleanliness of the site to be governed by the General Contractor/Construction Manager who may, after proper notice back charge the Communications Cabling Contractor for site clean up.
- .7 It is the responsibility of the Communications Cabling Contractor to perform all cutting, patching and repair related to the communications cabling work.
- .8 The Communications Cabling Contractor is responsible for the removal and re-installation of all ceiling/floor tiles in the areas affected by its work. This is to be completed on a daily basis for the areas affected.
- .9 Any damage to ceiling tiles during the completion of any work outlined in this document is the responsibility of the Communications Cabling Contractor. Damage includes breaking, chipping or fingerprints. The decision with respect to any damage will be made by the General Contractor Project Manager and the Communications Consultant.
- .10 The Communications Cabling Contractor is responsible for the storage and protection of the floor ceiling tiles that are removed for cable installation.

## 1.7 DRAWINGS

- .1 All drawings and plans provided with this document are diagrammatic. They are included to show the scope of the project in order to assist in the development of bid documents. The Communications Cabling Contractor shall make allowances in the bid proposals to cover the work required to comply with the intent of the drawings, plans and all site conditions.
- .2 The Communications Cabling Contractor shall verify all dimensions at the site and is responsible for their accuracy.
- .3 Prior to submitting a bid, the Communications Cabling Contractor shall indicate:
  - .1 Any specified materials the Communications Cabling Contractor believes to be inadequate.
  - .2 Any necessary items of work omitted from the bid specification.

## 1.8 BID RESPONSE AND PRICING

- .1 The Communications Cabling Contractor shall have a proven track record in cabling projects of a similar size to the one being tendered. The letter must include names, address and phone numbers of references for the two projects.
- .2 Prices to be submitted are for a complete and functioning twisted-pair cabling system as intended in this specification. Prices are to include incidental fees and other fees for items required (that may or not be indicated in this document) to successfully install the cabling system. A successful installation of the cabling system is one that meets the requirements of this document, meets all local, provincial and federal building, safety fire and electrical codes, as well as all manufacturer's recommended guidelines.
- .3 The Communications Cabling Contractor is required to report all errors and omissions in this document to the Communications Consultant with their Bid submission.
- .4 Prices included in the bid response shall include a breakdown for labour and material.
- .5 The bid response shall include a detailed list of all material and part numbers in accordance with Appendix "A" in this document. Failure to do so will result in immediate disqualification.
- .6 The bid response shall include the Unit Price Schedule in accordance with Appendix "B" in this document. Failure to do so will result in immediate disqualification.
- .7 Bidders who find discrepancies or omissions in this RFP, or who have any doubt as to the meaning or intent of any part of this RFP, shall direct their questions or other inquiries in writing to the RFP Contact.

All questions will be answered and distributed to all bidders within 24 hours of receipt. Oral questions will not be answered. Questions will not be accepted or answered within 48 hours prior to the closing of the bid.
- .8 As part of the bid submittal respondents must include a detailed list of material BMO to be used on this project.
- .9 The detailed material list will contain material description and supplier part number.
- .10 The detailed material list will be used to verify material compliance to the approved design and will not represent quantities of items purchased.

## 1.9 PAYMENT

- .1 The value for testing and documentation shall be set at 15% of the contract price for payment purposes. This amount will be withheld from the Communications Cabling Contractor until the testing and the correction of all deficiencies are 100% complete and all specific documentation has been handed over to the Communication Consultant. This amount will be in addition to any standard construction holdback that is withheld from the Communications Cabling Contractor.

## PART 2 – PRODUCTS

### 2.1 SYSTEM OVERVIEW

- .1 The Belden 2413 balanced utp twisted-pair cabling system shall be available in bonded pair and/or non-bonded pair configurations.
- .2 The balanced twisted-pair cabling system shall provide guaranteed performance up to a minimum of 250MHz and shall meet the specifications listed below for a 4-connector, 100 m (328 ft) channel.
- .3 Test each Belden singlemode strand of fiber with a Power Meter/Light Source combination operating at wavelengths of 850nm and 1300nm for the Singlemode fibers. Perform these tests in both directions. Tabulate and include test results with documentation.

### 2.2 BALANCED TWISTED-PAIR CABLES

- .1 The Belden 2413 4-pair balanced utp twisted-pair cables shall be available in bonded pair and/or non-bonded pair configurations. The characteristics listed below shall apply to both configurations.
  - .1 The cables will be plenum rated (CMP). The minimum recommended installation temperature shall be 5 °C (40 °F). The temperature rating shall be 60 °C (140 °F).
  - .2 The colour of the horizontal 250MHz data cable shall be **BLUE**.
  - .3 The cables shall have randomization elements along their lengths and on their cross-sections to minimize alien near-end crosstalk (ANEXT) coupling.
  - .4 The cable conductors shall be 23 AWG solid copper.
  - .5 The minimum bend radius shall be no greater than four times the OD of the cable.
  - .6 The transmission characteristics of the cable will be guaranteed to a minimum of 250 MHz. The guaranteed values will be as follows:

Maximum DC resistance (at 20 °C)	7.4 ohms/100 m (328 ft)
Maximum DC resistance unbalance	3 %
Maximum mutual capacitance	5.7 nF/100 m (328 ft)
Maximum capacitance unbalance (pair to ground)	50 pF/100 m (328 ft)
Maximum propagation delay skew	35 ns/100 m (328 ft)
NVP – plenum	72% @ 10 MHz
NVP – non-plenum	68% @ 10 MHz

DC = Direct current

NVP = Nominal velocity of propagation

## 2.3 UTP CONNECTORS

- .1 The connectors used to terminate the 4-pair balanced twisted-pair cable shall have the characteristics listed below.

- .1 The KeyConnect connectors shall be modular in form, with available mounting options for TOs. The dimensions of the connectors shall be as follows:

- 19.8 mm (0.78 in) in height
- 16.3 mm (0.64 in) in width
- 29.0 mm (1.14 in) in depth

- .2 The PSANEXT isolation between modules must be greater than 70dB @ 100MHz when connectors are mounted side by side, top to bottom in a 48 ports 1U configuration.

- .3 When mated to cordage, the transmission characteristics of the connectors will be guaranteed to 250 MHz. The minimum guaranteed values at 250 MHz will be as follows:

2	NEXT	3	38.1 dB
4	PSANEXT	5	54.1 dB
6	Return loss	7	12.1 dB

NEXT = Near-end crosstalk

PSANEXT = Power-sum alien near-end crosstalk

- .4 All data KeyConnect RJ45's modules in the faceplate will be **BLACK**.
- .5 Confirm all part numbers and colours before ordering with communication consultant.

## 2.4 UTP PATCH CORDS

- .1 The work area cords, patch cords, shall have the characteristics listed below.

- .1 The cordage shall use 23 AWG solid or stranded copper conductors in a bonded pair configuration for reliable long-term channel performance to 250 MHz.
- .2 The nominal cable diameter of the cordage shall be no greater than 6.62 mm (0.26 in). The minimum bend radius shall be 26.5 mm (1.04 in).
- .3 The cordage shall be available in multiple colors. Quantities listed below. **Supply only the utp patch cords listed below.**



CAT6 PATCH CORDS	LENGTH	QUANTITY
Blue (workstation)	7'-0"	One per data cable
Blue (wireless)	4'-0"	One per data cable
Blue (projector)	4'-0"	One per data cable
Blue (monitors)	4'-0"	One per data cable

- .4 When mated to a connector, the transmission characteristics of the cordage will be guaranteed to a minimum 250 MHz. The minimum guaranteed values at 250 MHz will be as follows:

NEXT	38.1 dB
PSANEXT	54.1 dB
Return loss	12.1 dB

NEXT = Near-end crosstalk

PSANEXT = Power-sum alien near-end crosstalk

## 2.5 FACE PLATES

- .1 Decora style faceplates equipped with three (3) ports, which will accommodate, RJ45 KeyConnect, type jacks.
- .2 Faceplates equipped with three (4) ports, which will accommodate, RJ45 KeyConnect, type jacks.
- .3 Faceplate colour to match electrical.
- .4 Where applicable, use recessed blanks for all unused ports.
- .5 Visible screws to Compatible with housings or plates with the decora style aperture.
- .6 Two port side entry box.
- .7 Compact in size for installation in confined areas.
- .8 Can be mounted on flat surfaces.

## 2.6 CAT6 PIGTAILS

- .1 Pigtail assemblies to be made of unshielded twisted pair cordage with 8-23 AWG thermoplastic insulated, solid copper conductors formed into individually twisted pairs and enclosed in a CMR rated thermoplastic jacket.
- .2 Pigtails are to be factory assembled and not site prepared.

## 2.7 GIGABIX HARDWARE

### GIGABIX MOUNT

- .1 Twelve connector mount to accommodate Cat6 cables.
- .2 Sturdy plastic strips for easy snap in snap-out of the connectors.
- .3 Plastic strips with keying features to prevent connector orientation mistakes.

### GIGABIX CONNECTOR 6 PORT

- .1 Gas tight connection.
- .2 200 insertions of any combination of wire gauge.
- .3 Built in colour coded pair splitters to facilitate wire insertion and prevent termination errors

### GIGABIX TERMINATION BAR

- .1 Clear plastic component that is used to position the wires when terminating on a GigaBIX connector.

### GIGABIX CONNECTOR 25 PORT

- .1 Gas tight connection.
- .2 200 insertions of any combination of wire gauge.
- .3 Built in colour coded pair splitters to facilitate wire insertion and prevent termination errors

### GIGABIX WIRE GUARD

- .1 Designed to protect minimum bend radius of twisted pairs.

### GIGABIX MANAGEMENT RING

- .1 Interlock with GigaBIX mounts for quick and easy installation.
- .2 High capacity allows for easier management using GigaBIX cross connect wire.

## 2.8 DATA RACK

- .1 Frames are to be constructed of rugged 11 GA (0.120") steel and rigid.
- .2 Frames are to be standard height of 7'-0" with 44 U of useable space and with 19" EIA 10-32 tapped mounting holes with permanently marked U-spacing identification.
- .3 Frames to have a 5/16" sturdy steel base with anchor holes for mounting to floor.
- .4 Rack is standard with 1 copper 10-32 x 0.5" L ground stud.
- .5 The four post frame to be expandable up to a minimum of 42 inches.
- .6 Approved manufactures are Netversity, RF Mote and Hammond.

## 2.9 VERTICAL WIRE MANAGERS

- .1 Frame black smooth paint finish.
- .2 Fabricated of 16 GA (0.060") steel
- .3 Channel style supports heavy cable load, while maintaining clean concealed appearance.
- .4 The vertical cable manager shall have a hinged door(s) with a positive locking mechanism (non-magnetic)
- .5 The vertical wire manager shall have stiffeners welded inside for additional strength.
- .6 The openings for cable routing shall have grommets to ensure a smooth transition of the patch cords.
- .7 Both vertical wire managers shall be a minimum of 8" w x 6" d.
- .8 Approved manufactures are Netversity, RF Mote and Hammond.

## 2.10 VERTICAL POWER BAR

- .1 Fabricated from 18 GA (0.048") steel.
- .2 Slim profile power bars mount into 19" EIA cabinet frames or network racks.
- .3 Features breaker protection with reset button, three-stage surge protection, three-prong power cord and power outlets.
- .4 Illuminated power switch showing power "ON".
- .5 Comes standard with a 6-10' power cord.
- .6 Comes standard in 15 amp capacity.
- .7 Comes with a minimum of 10 outlets.
- .8 A minimum 2 inch standoff brackets are required for each power bar on the data rack.
- .9 Approved manufactures are Netversity, RF Mote and Hammond.

## 2.11 FIBER PATCH PANEL

- .1 The rack mountable fiber patch panels shall be used for cross-connecting or interconnecting purposes.
- .2 The fiber optic patch panel shall be mounted in a 19" (482mm) rack.
- .3 The fiber optic patch panel shall be 1U high and be black in colour.
- .4 The unit shall have a patch cord routing guides that allow a transition and segregation for fiber optic patch cords to exiting the sides of the fiber patch panel.
- .5 The fiber optic patch panel allows for splicing with optical pigtails using a splice organizer tray.
- .6 The small wall mount fiber patch panel shall be used for cross-connecting or interconnecting purposes.
- .7 The small wall mount fiber patch panel shall have independent doors, flexibility custom configuration through universal adapter strips and key lock.

## 2.12 OPTICAL FIBER ADAPTER STRIPS

- .1 An adapter strip is defined as a modular removal plate containing fiber optical connectors.
- .2 The adapter strip shall utilize a single mounting footprint and the colour shall be black.
- .3 The adapter strip shall be attached with two push-pull latches to allow for quick installation and removal.
- .4 The double density six (6) "LC" adapter strip shall be Phosphor Bronze for multimode and Zirconia Ceramic for Single mode fiber.

## 2.13 SINGLEMODE "LC" FIBER CONNECTORS

- .1 The fiber optic "LC" connector shall be field installable 09/125µm connectors for singlemode type fiber.
- .2 The connector shall provide a strain relief mechanism for installation of a single strand of fiber that contains strength elements. The fiber within the body of the connector shall be isolated mechanically from cable tension bending and twisting.
- .3 The connector must be capable of mounting on either 900 micron tight buffered fiber, 3.0mm jacketed fibers and 250 micron loose tube fibers.
- .4 The connector shall have a ceramic ferrule and a factory PC polish.
- .5 The connector must have a locking feature to the coupler.
- .6 LC connector to perform to the following design requirements:
  - Maximum Attenuation of 0.3dB
  - Typical Attenuation of <0.2 dB
  - Connector Durability 0.2dB/1000 insertions

## 2.14 OPTICAL FIBER PATCH CORDS

- .1 Duplex fiber optic patch cords, Singlemode 9/125µm equipped with LC to LC connectors.
- .2 Cables are to meet the same performance criteria for Singlemode 9/125µm type fiber.
- .3 Patch cords are to be factory assembled and note site prepared.
- .4 LC to LC patch cords shall be 7'-0" in length (LAN, electrical room & data center). (quantity is 6)
- .5 Confirm with the IT consultant before ordering on the type of connectors.

## 2.15 COPPER BACKBONE CABLING (OUTDOOR)

- .1 The 25pr copper backbone voice cable shall be 24 AWG solid copper and meet or exceed Category 3 requirements per ANSI/TIA/EIA-568C series of standards.
- .2 The copper cable is filled with waterproofing compound and wrapped with a non-hygroscopic core tape.
- .3 The copper cable shall have a flooding compound applied over the core and all surfaces of the shielded armour to resist moisture entry and corrosion.
- .4 The copper cable shall have a black polyethylene jacket which is sequentially printed with footage marker at regular intervals.
- .5 The copper cable shall be terminated in protector type housings at each end of the cable and all copper pairs terminated on BIX type 1A connectors in BIX10A mounts at each end on plywood.

## 2.16 COPPER BACKBONE CABLING (INDOOR)

- .1 The backbone voice cable shall be distribution 24 AWG solid copper and meet or exceed Category 3 requirements per ANSI/TIA/EIA-568C series of standards.
- .2 The copper cable shall be distribution type non plenum rated cable.
- .3 The copper cable is to be terminated on BIX type 1A connectors in BIX10A mounts at each end and labeled.

## 2.17 FIBER BACKBONE CABLING (OUTDOOR)

- .1 Backbone cables shall be 12 strands Singlemode 9/125µm fiber in a loose tube (Campus) armour optical fiber cable.
- .2 Groups are to be assembled to form a single compact core and covered by a protective sheath.
- .3 Gel filled buffer tube prevents water migration.
- .4 Full dielectric construction, no grounding required.
- .5 Distribution fiber optic cables to meet or exceed performance standards as established by ANSI TIA 568-C series of standards.

## 2.18 FIBER BACKBONE CABLING (INDOOR)

- .1 Backbone cables shall consist of distribution type cable non plenum rated 12 strand 9/125µm single multimode fibers into groups of 6 fiber sub-units.
- .2 Groups are to be assembled to form a single compact core and covered by a protective sheath.
- .3 Full dielectric construction, no grounding required.
- .4 Length markings in meters.
- .5 Distribution fiber optic cables to meet or exceed performance standards as established by ANSI TIA 568-C series of standards.

## 2.19 OVERHEAD CABLE TRAY

- .1 The successful Communications Cabling Contractor is responsible for the **overhead basket cable tray system** that responsibility includes grounding, bonding, supply and installation of the tray system based on the information provided within this document.
- .2 The Communications Cabling Contractor is to report back to the Communications Consultant and or GC any concerns related to the installation of the tray.
- .1 The Communications Cabling Contractor must be fully trained and authorized on either CER (Canadian Electrical Raceway), Flex Tray, Cablofil or WBT overhead cable tray products.
- .2 The following two methods will be allowed to support the cable tray (Profile or Trapeze) type hardware.
- .3 Drop-Outs shall be incorporated in the overhead cable tray and at the backboard in the LAN room for the horizontal, pigtails and backbone type cabling.



Cable Tray

## PART 3 – EXECUTION

### 3.1 WORK AREA INSTALLATION

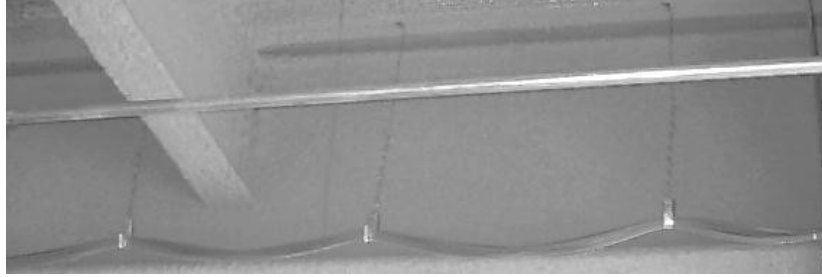
- .1 Work area TO's (Telecommunication Outlet) shall be installed in accordance with:
  - .1 Standards-based recommendations.
  - .2 The manufacturer's recommendations and installation guides.
  - .3 Industry best practices.
- .2 Cables shall be dressed and terminated in accordance with:
  - .1 Standards-based recommendations.
  - .2 The manufacturer's recommendations and installation guides.
  - .3 Industry best practices.
- .3 Slack cable to be coiled if adequate space is provided to house the slack cable without exceeding the manufacturer's installation guidelines. Include 10 feet of slack at the location for the workstation (stored in accordance with manufacturer's installation guidelines) to allow for future outlet relocation.
- .4 For all wireless include 30 feet of slack for future relocation.
- .5 Pair untwist at the termination point shall not exceed 13 mm (0.5 in).
- .6 Bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.
- .7 The data RJ45 KeyConnect connector at the outlet will be **BLACK** in colour and shall occupy the top position of the decora (minimum 3 holes) type white faceplate (top to bottom). The 1<sup>st</sup> data RJ45 connector in the horizontally oriented faceplates shall occupy the top left-most positions. Use blanks for all unused ports. Blanks to match faceplate color
- .8 Contractor to supply and install all faceplates that are ganged with electrical.
- .9 Contractor to cut drywall large enough for the 2 port surface box to be removed if required.
- .10 Faceplate colour to match electrical.
- .11 Refer to faceplate drawings in this document for more information.
- .12 Wireless data KeyConnect RJ45 connectors will be **BLACK** in colour and shall occupy a two port white side entry box.
- .13 Where communications is ganged with electrical decora type inserts are to be used and the colour is to match electrical.
- .14 Cabling contractor to supply cover plates for electrical and communications.
- .15 Include all necessary furniture adapters/spacers etc in your pricing to ensure the faceplate can be properly installed in the furniture type inserts while maintaining a proper bend radius.

### 3.2 HORIZONTAL CABLE INSTALLATION

- .1 Cable shall be installed in accordance with:
  - .1 Standards-based recommendations.
  - .2 The manufacturer's recommendations and installation guides.
  - .3 Industry best practices.
- .2 All cable ties shall be black Velcro style. **Plastic cable ties are not allowed**. If found on site during any phase of the project, the plastic cable ties will be removed, along with all cabling components contained within them, and the removal and the re-cabling shall be at the Communications Cabling Contractor's expense.
- .3 All exposed cables in the LAN room are to be placed in a neat and professional manner and routed in accordance with the specifications and drawings provided.
- .4 Use cable tray pathways, J hooks and conduits for all horizontal and backbone cabling.
- .5 All exposed cabling at the workstation between the wall/floor and the furniture access locations is to be wrapped with black split loom tubing manufactured by PANDUIT Canada, size and length as required to suit.
- .6 No cable shall exceed 90 meters. Any cables longer than 90 meters shall be reported immediately to the Client or their representative.
- .7 Cable raceways shall not be filled greater than the TIA/EIA-569-B recommended maximum fill for the particular raceway type, or 40% whichever is less.
- .8 ***At no point shall cable(s) rest on acoustic ceiling grids, water pipes, HVAC, metal conduits, t-bar hanging rods or ceiling panels.***
- .9 **As applicable – to be determined by site.** Horizontal cables shall be supported with **Cat6 "J" hook** cable type products and bundled in groups of no more than 15 cables from the workstations to the overhead basket cable tray or conduit. Cable bundle quantities in excess of 15 cables may cause deformation of the bottom cables within the bundle, which will degrade the performance of those cables.
- .10 Cable shall be installed above fire-sprinkler systems and shall not be attached to such systems or any associated ancillary equipment or hardware. The cabling system and its associated pathways shall be installed so that they do not obscure any valves, fire alarm conduit(s), boxes, or other control devices.
- .11 Cable shall not be attached to ceiling grid support rods, conduits, water pipes HVAC ducts or lighting fixture wires. Where support for horizontal cable is required, the Communications Cabling Contractor shall install appropriate carriers to support the horizontal voice and data cabling listed in this document.
- .12 The overhead cabling infrastructure shall be self-supporting.
- .13 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the communication contractor prior to final acceptance at no cost to the owner of the cabling system.







"J" Hook Cable Supports

- .14 All cables shall be identified by a self-adhesive label in accordance with the System Documentation section of this document and TIA/EIA-606-B standard.
- .15 The data cable label shall be applied within four inches on the cable behind the faceplate, within four inches of the data patch panel termination.
- .16 Balanced utp twisted-pair cable shall be installed so that there are no bends smaller than 4 times the OD of the cable at any point in the run.
- .17 The Communication Cabling Contractor is responsible for supply and installation of all split faceplates for wall or floor fed locations for furniture.
- .18 The Communication Cabling Contractor is responsible for cleaning all conduits prior to pulling any cable.
- .19 To minimize any possibility of disruption, maintain the following minimum clearances from electrical and heat sources when routing cables:

<b><i>CLEARANCES TABLE</i></b>	
<b>Item</b>	<b>Minimum Clearance</b>
Motor	1.2 m ( 4'-0" )
Transformers	1.2 m ( 4'-0" )
Conduit and cables used for electrical distribution less than 1kV	0.3 m ( 1'-0" )
Conduit and cables used for electrical distribution greater than 1kV	1.0 m ( 3'-0" )
Fluorescent Luminaires	12 cm ( 5" )
Pipes ( gas, oil, water, etc )	0.3 m ( 1'-0" )
HVAC ( equipment, ducts, etc	15 cm ( 6 " )

### 3.3 FIBER BACKBONE INSTALLATION (OUTDOOR)

- .1 Fiber backbone shall be installed and terminated in a fiber patch panel using fiber breakout kits at the top of the data rack located in the LAN room and in a wall mount fiber patch panel in the new electrical room in the existing campus building.
- .2 Terminate the fiber optic cable in the appropriate rack mounted fiber patch panel located at the top of the LAN data rack using adapter strips with "LC" type connectors.
- .3 Fiber backbone will be installed in conduit between the two building locations to permit future use of the conduit.
- .4 Terminate, test, label and document all strands as specified in this document.

### 3.4 FIBER BACKBONE INSTALLATION (INDOOR)

- .1 Fiber backbone shall be installed and terminated in a fiber patch panel in a data rack in the clients existing data center and in a wall mount fiber patch panel in the new electrical room in the existing campus building.
- .2 Terminate the fiber optic cable in the appropriate rack mounted fiber patch panel located in a data rack using adapter strips with "LC" type connectors.
- .3 Fiber backbone will be installed in conduit between the electrical room and the data center to permit future use of the conduit.
- .4 Any exposed fiber to be protected using yellow innerduct.
- .5 Terminate, test, label and document all strands as specified in this document.

### 3.5 COPPER BACKBONE INSTALLATION (OUTDOOR)

- .1 Copper backbone to be installed in conduit between the LAN room in the new building and the new electrical room at the existing campus building.
- .2 Copper backbone cabling is to be protected at each building location using either of the two products:
  - Circa Telecom Building Entrance Products.
  - Coring QTPET Building Entrance Products.
- .3 **All copper cable pairs** are to be protected 100% using solid state protection modules at each end of the cable.
- .4 The copper stub cabling from the protectors is to be terminated in BIX10A type hardware on BIX1A wafers with associated designations strips with proper coloured labels on the fire treated plywood in the electrical room and on GigaBIX type hardware in the LAN room.
- .5 The metallic sheath of all backbone cables shall be grounded using the appropriate manufacturer's bond clamp for the specific size of cable and a green #6 ground wire.

### 3.6 COPPER BACKBONE INSTALLATION (INDOOR)

- .1 The distribution non-plenum 25pr cable is to be installed through a one inch conduit between the new electrical room and the Telecom room (143) on the 1<sup>st</sup> floor at the existing campus.
- .2 The 25pr cable to be terminated on BIX type hardware (BX10A mount, QCBIX1A wafer, BIX D rings, BIX designation strip and appropriate labels) in both locations.
- .3 Terminate, test and label as stated in this document.

### 3.7 DATA CABLE INSTALLATION

- .1 Cables shall be dressed and terminated in accordance with:
  - .1 Standards-based recommendations.
  - .2 The manufacturer's recommendations and installation guides.
  - .3 Industry best practices.
- .2 All horizontal data cabling shall be 4pr (2413) plenum rated cable and shall be BLUE.
- .3 At the workstation faceplate, terminate each data cable on 250MHz type, 8 RJ45 position KeyConnect jack wired 568A ISDN standard.
- .4 In the LAN room the data cabling will be terminated on GigaBIX type hardware (GigaBIX mounts, 6 port connectors, termination bars, wire guards, designation strips and labels)
- .5 In the LAN room the pigtail cabling will be terminated on GigaBIX type hardware (GigaBIX mounts, 6 port connectors, termination bars, wire guards, designation strips and labels)
- .6 The pair untwist at the termination point shall not exceed 13 mm (0.5 in).
- .7 The bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.
- .8 Cables shall be neatly bundled, dressed, and routed to their respective termination connectors.
- .9 Each utp and pigtail cable shall be clearly labeled on the cable jacket within 4 inches of the termination behind the terminations at each end. Labels obscured from view will not be acceptable and will be replaced by the Communications Cabling Contractor at no cost to the client.
- .10 The Communication Cabling Contractor is to follow section (horizontal cable installation) and other sections outlined in this document.

### 3.8 DATA RACK INSTALLATION

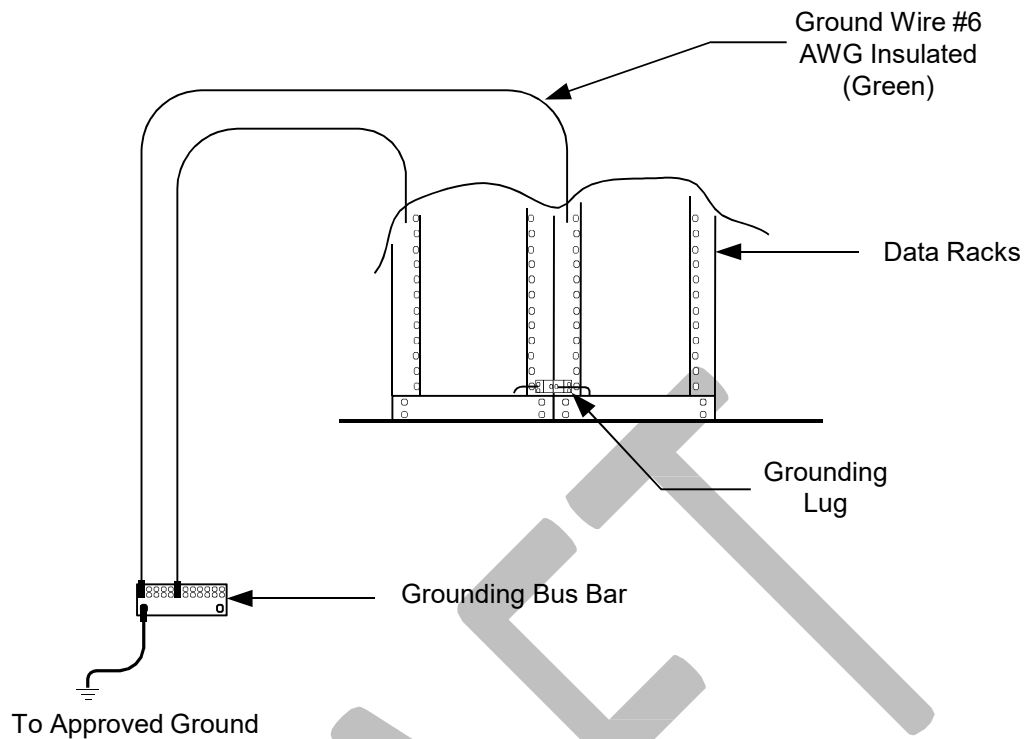
- .1 Locate rack as shown in this document so the water fall brackets from the overhead pigtail cable tray allow the cables to fall into the vertical wire managers.
- .2 Anchor racks securely to floor and level rack appropriately.
- .3 Ground rack to the busbar located in the LAN room using #6 AWG insulated ground wire.

### 3.9 POWER BAR INSTALLATION

- .1 The two (2) power bars shall be installed on the data rack and not to interfere with cabling.
- .2 Two 2" standoffs are to be installed on each power bar to allow for proper cable routing. See section 2.10 for more information.
- .3 The power bars are to be connected to the rack mounted UPS system.
- .4 Include in your quote costing to change the electrical plugs if required.

### 3.10 GROUNDING AND BONDING SYSTEM

- .1 The telecommunications bonding backbone (TBB) shall be designed and/or approved by a qualified Professional Engineer (PE), licensed in the jurisdiction where the work is to be performed. The TBB shall adhere to the recommendations found in ANSI-J-STD-607-B and shall be installed in accordance with industry best practices.
- .2 A licensed electrical contractor shall perform the installation and termination of the main bonding conductor to the building service entrance ground.
- .3 The grounding and bonding approach recommended in this specification shall meet the requirements of all current Canadian codes and standards and is intended to work in concert with the cabling topology as specified in this document.
- .4 The telecommunications grounding and bonding infrastructure supports a multivendor, multiproduct environment as well as the grounding practices for various systems that may be installed on the customer premises.
- .5 A separate ground shall be established for the telecommunications system. Where this is not possible the telecommunications system ground shall be tied into the building/electrical ground.
- .6 Grounding to the conduit system or cold water pipes will not be permitted.
- .7 One #6 AWG ground wire shall be installed with proper mounting hardware from the data rack to the busbar located in the LAN room by the cabling contractor.
- .8 One #6 AWG ground wire shall be installed with proper mounting hardware from the overhead basket cable tray to the busbar located in the LAN room by the cabling contractor.
- .9 The grounding and bonding of the telecommunications system shall meet all local, provincial and national codes and bylaws.
- .10 The grounding and bonding of the telecommunications system shall meet all BICSI and JSTD-607-B requirements.
- .11 Ensure that metal to metal contact is made when grounding to paint or powder coated surfaces for all patch panels.



**Equipment Rack Grounding Configuration**

### 3.11 FIRE STOPPING

- .1 All fire stop systems shall be installed in accordance with the manufacturer's recommendations and installation guides and shall be available for inspection by the [AHJ] prior to acceptance.
- .2 All fire stopping must meet applicable federal, provincial and local building codes.
- .3 Supply and install non-permanent CSA approved intumescent fire stopping, cap all empty sleeves, conduits, slot and penetrations and around cabling passing through sleeves, cable trays, slots and penetrations located in the telecommunications room on both sides of the wall.



**Fire Stop Application**

### 3.12 IDENTIFICATION AND LABELING

- .1 Labeling shall be in accordance with:
  - .1 The recommendations found in TIA/EIA-606-B.
  - .2 The manufacturer's recommendations and installation guides.
  - .3 Industry best practices.
- .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 Cable Labels shall be 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.
- .4 Labels are to be mechanically printed using a laser printer and are to follow the guidelines in TIA/EIA-606-B for colour coding.
- .5 ***Hand written labels are not permitted on any horizontal or backbone cabling, faceplates, GigaBIX labels etc.***
- .6 Label all cables in accordance with this document and 606-B Standards. One label should be attached to the front of the workstation faceplate, one to the front of the patch panel, and one within 4 inches of each end of the horizontal utp cable.
- .7 The labeling scheme for this project is as follow: floor number and jack number: (3D-001 to 3D-999) (3-WAP-001 to 3-WAP-999).
- .8 The labeling scheme for the pigtails is as follows: switch number, port number (S#--P01 to S#-P048 or 96 depending on switch type)
- .9 Leave 25% growth for utp (cable wraps, faceplate and GigaBIX labels) and two sets for switch growth.

<b><i>COLOR</i></b>	<b><i>BELDEN PART #</i></b>	<b><i>TERMINATION TYPE</i></b>
Orange	AX101534	Demarc Point (Central office termination)
Green	AX101537	Network Connection to Equipment
Purple (USA)	AX101539	Common Equipment (PBX), Computers, LANs and multiplexers
White (Canada)	AX101533	
Silver (Canada)	AX101541	
White (USA)	AX101533	1st Level Backbone (ER to TR)
Purple (Canada)	AX101539	
Gray	AX101532	2nd Level Backbone (TR to TR)
Blue	AX101538	
		Termination of workstation cabling in the TR and equipment room, not at telecommunication outlet
Brown	AX101540	Interbuilding Backbone
Yellow	AX101536	Miscellaneous
Red	AX101535	Key Telephone Systems

### 3.13 TESTING AND ACCEPTANCE

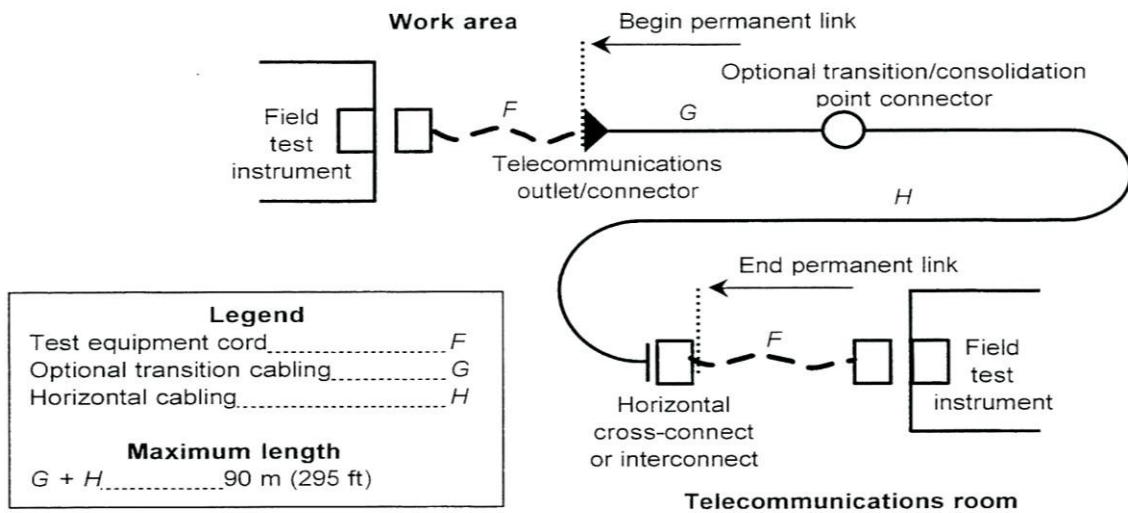
#### .1 General

- .1 All terminated horizontal and fiber backbone cabling runs shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements found in the TIA/EIA-568-C series of standards. All pairs in each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation, including (but not limited to) cables, connectors, and cordage shall be repaired or replaced in order to ensure 100% usability of all installed runs.
- .2 Acceptable testers are as follows:  
  
Wirescope 350  
Fluke DSP 4000  
Microtest Omnicanner  
HP/Agilent
- .3 Upon completion of the testing by the Communications Cabling Contractor, the Communications contractor may be ask to submit the test results for the various work activities to the client or their designated representative within two business days.
- .4 Failure to provide test results upon request will require the communication cabling contractor to retest the all horizontal cabling related to the project with no cost to the client.
- .5 All horizontal permanent link tests are to be performed using a LEVEL IIIe tester equipped with the most recent version of its firmware and in accordance to ANSI/EIA/TIA-568-C series standard.
- .6 Testing includes all horizontal cabling including pigtails (Faceplate RJ45 to the end of the pigtail including cross connects).

#### .2 Copper Channel Testing

- .1 All balanced twisted-pair cable links shall be tested for basic continuity and length, as indicated below. Additional testing parameters to verify compliance with the 250MHz performance are listed in the System Overview section of this document (Section 2.1.).
- .2 Of the parameters listed in [Section 2.1.], it is understood that PSANEXT requires more elaborate measurement instruments and this feature may not be available using current field test equipments. If this feature is available such test will be done on a sampling basis, and analyzed using statistical techniques.
- .3 Continuity – Each pair in every installed cabling run shall be tested using a test set that detects and identifies opens, shorts, polarity and pair reversals, crossed pairs, and split pairs. The results shall be recorded as Pass/Fail (as indicated by the test set) and referenced to the appropriate cable identification number and circuit/pair number. Any fault shall be corrected and the run re-tested prior to final acceptance.
- .4 Length – Every installed cabling run shall be tested for installed length. The cable length for a permanent link shall not exceed 90 m (295 ft). The cable length shall be recorded, referencing the cable identification number and circuit/pair number.





**Figure 11-2 Schematic representation of a permanent link test configuration**

NOTE – If cross-connections are used, then channel testing is recommended.

### 3.14 SYSTEM DOCUMENTATION

- .1 Upon completion of the installation, the Communications Cabling Contractor shall provide **two (2) marked up cable drawings** indicating all cable drops ID's within four **(4) business days of completing the work**.
- .2 The report will indicate for each horizontal cable when it was tested successfully, the result and the length.
- .3 There shall be a copy of this communication specification along with all drawings on the job site at all times during the length of the project.

### 3.15 SITE CLEAN-UP

- .1 The Communication cabling contractor is responsible for removing all trash including, cabling, cardboard boxes and all other cabling debris to outside garbage containers on a daily basis by the end of each day or as needed during the course of the day. No trash or debris is to be left in any of the telecommunications rooms. This includes removing trash cans or other forms of garbage collection devices at the end of each day. Communication Cabling Contractor shall provide a complete clean up of the rooms.
- .2 Workstation outlet location areas shall be cleaned on an on-going basis each time the Communication Cabling Contractor completes any activity in the area.

### 3.16 AS-BUILT DRAWINGS

- .1 The Communications Cabling Contractor shall provide **two (2) marked up cable drawings** for the floor indicating all cable drops ID's **five (5) business days prior** to the cutover weekend.
- .2 Once the cutover has been completed the Communications Cabling Contractor will provide two (2) soft copies in AutoCAD Release R2500 or better format and a total of two (2) plotted sets of drawings for the client after the Communications Consultant review of the drawings.
- .3 All documentation must be submitted to the Communications Consultant within ten (10) business days of the completion of the project. The documentation (test results, drawings) will be reviewed and, once approved by the Communications Consultant, the holdback will be released.
- .4 At the completion of the cabling project a copy of the floor plan will be left in the TR room by the Communications Cabling Contractor. This floor plan is to accurately reflect the final cabling system including tray routing and cable workstation identification numbers. The floor plan 24" x 36" is to be hung on the wall behind Plexiglas along with the cross connect sheets by the Communication Cabling Contractor within 2 weeks of migration.
- .5 Once approved by the communications consultant, the Communications Cabling Contractor will to provide the client with the following:
  - .1 Two sets of drawings for the client.
  - .2 One set of drawings for the Communications Consultant.

### 3.17 TEST RESULTS

- .1 Test documentation shall be provided on permanent media within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or connector) ID, measurement direction, reference setup, and technician name(s). The test equipment name, manufacturer, model number, serial number, software version, and last calibration date will also be provided. Unless the manufacturer specifies a more frequent calibration cycle, proof of annual calibration must be documented for all test equipment used in this installation.
- .2 The test equipment shall meet the requirements found in the TIA/EIA-568-C series of standards.

- .3 Printouts generated for each cable by the test equipment shall be submitted as part of the documentation package. Alternately, the Communications Cabling Contractor may furnish this information in electronic format on permanent media. The media shall contain the electronic equivalent of the test results as defined by the bid specification, in a file format compatible with Microsoft Word (version 6.0).
- .4 When repairs and re-tests are performed, the problem(s) found and the corrective action(s) taken shall be noted. Both the failed and passed test results shall be documented and provided with the final test results. No penalties will be applied for corrective action prior to substantial completion of the project.

### 3.18 CHANGE NOTICES

- .1 All change notice pricing will include a detailed breakdown including the following:
  - Part number
  - Unit Cost
  - Labour Costs as per APPENDIX B
  - PST
  - Mark ups for overhead and profit as per APPENDIX B of this document
  - Total price of the Change Notice

### 3.19 CUTOVER SUPPORT

- .1 Two (2) technicians will be on site the day after the cutover (8am to 5pm). Refer to construction schedule for more information.
- .2 The Communications Cabling Contractor's technicians will be required to be on site equipped with all necessary tools, including test equipment, answer questions and test any cables identified by the client or the Communications Consultant. Repair any deficiencies that arise from the weekend of the cutover.
- .3 All work activity will be updated on the As Built drawings after the weekend cutover.

## PART 4 – WARRANTY AND SERVICES

### 4.1 QUALIFICATION OF SYSTEM

- .1 The installed horizontal cabling system shall be covered by the Manufacturer's Certification, issued by the successful manufacture and delivered by the Communications Cabling Contractor to the client.
- .2 The installed horizontal cabling system shall conform to all applicable local building and electrical codes.
- .3 The manufactures representative shall attend the site, as appropriate, in order to inspect the installation of the various phases of the project and to confirm that the installation is being performed in accordance with the manufacturer's installation guidelines. The manufacture shall provide documentation, if required, evidencing the date and time that such inspections were performed and the results of such inspections.

## 4.2 25-YEAR COMPONENT WARRANTY

- .1 The manufacture shall provide a minimum twenty five (25) year warranty for all manufactured passive components used in the installation of the 250MHz cabling system. Defective and/or improperly installed products shall be replaced and/or reinstalled at no cost to the client.

## 4.3 CERTIFICATION

- .1 To qualify for System Certification, the manufacture of the 250MHz system shall be designed, installed, and tested by the Certified Communications Cabling Contractor for this project.
- .2 To qualify for System Certification, the installed cabling system shall fully comply with all relevant manufacturer design and applications guidelines, including any pre-approved deviations as specified in the latest release of the manufacture Certification Guide.
- .3 To qualify for System Certification, only products made or approved by the cabling manufacturer shall be used to ensure the end-to-end performance of the manufacturer's cabling system. The manufacturer's minimum 25-Year Component Warranty and Lifetime Application Assurance can only be provided to installations consisting of products supplied by the manufacture of the cabling system.
- .4 The successful manufacturer will not provide certification or warranty coverage for products manufactured by other entities.
- .5 The Communications Cabling Contractor will provide a pre-approved draft of the manufacturer's Letter of Certification within two weeks of award of this project. The document must include the following:
  - .1 Verification of the performance of the installed cabling system.
  - .2 Manufacturer's Certification Number.
  - .3 Identification of the Installation by location and project number.

**APPENDIX A:**  
**PRODUCT LIST**  
**BILL OF MATERIAL**

Please submit a **detailed Bill of Materials** with the proposed components as indicated below. The cabling contractor is to provide a Bill of Materials (BOM) with their project pricing that reflects the following format:

Cable Information	Quantities
Total number of data cables (workstations)	
Total number of data cables (wireless)	
Total number of data cables (projectors)	
Total number of data cables (monitors)	
<b>Grand Total of data cables</b>	

Product Description	Part Number	Quantity

Total Material Cost	\$
Total Labour Cost	\$
Total Misc. Cost	\$
Total Project Cost (excluding HST)	\$

## APPENDIX B:

### UNIT PRICES

The unit prices supplied below will be used for all additions, deletions and/or changes to the enclosed Scope of Work. The contractor will include all materials, labour, testing, overhead, profit, permits and incidental fees to supply and/or install the items listed for a 250 MHz cabling solution. All components used in the Unit Pricing shall be the same as specified in this document.

ADD

DELETE

Supply, install and test one additional wall/floor/furn outlet complete  
with one (1) 250MHz-4pr CMP cables.  
Cable length to be 275 feet.

\_\_\_\_\_/each \_\_\_\_\_/each

Supply, install and test one additional wall/floor/furn outlet complete  
with two (2) 250MHz -4pr CMP cables.  
Cable length to be 275 feet.

\_\_\_\_\_/each \_\_\_\_\_/each

Supply, install 24 Cat6 pigtails to GigaBIX hardware.

\_\_\_\_\_/each \_\_\_\_\_/each

Supply, install 48 Cat6 pigtails to GigaBIX hardware.

\_\_\_\_\_/each \_\_\_\_\_/each

Supply only, one 7 foot LC to LC fiber patch cord

\_\_\_\_\_/each \_\_\_\_\_/each

Supply only, 250MHz patch cables at 4 feet.  
(Blue)

\_\_\_\_\_/each \_\_\_\_\_/each

Supply only, 250MHz patch cables at 7 feet.  
(Blue)

\_\_\_\_\_/each \_\_\_\_\_/each

Supply only, 250MHz patch cables at 10 feet.  
(Blue)

\_\_\_\_\_/each \_\_\_\_\_/each

***Note: The data cables will be terminated on GigaBIX type hardware (include the RJ45 module in the unit pricing for the data cable). Include all necessary hardware, labels, labour and testing in your unit pricing for complete a complete termination.***

Indicate the profit percentage and overhead that will be used  
for material on all changes, not covered under unit prices, for the duration of the project.

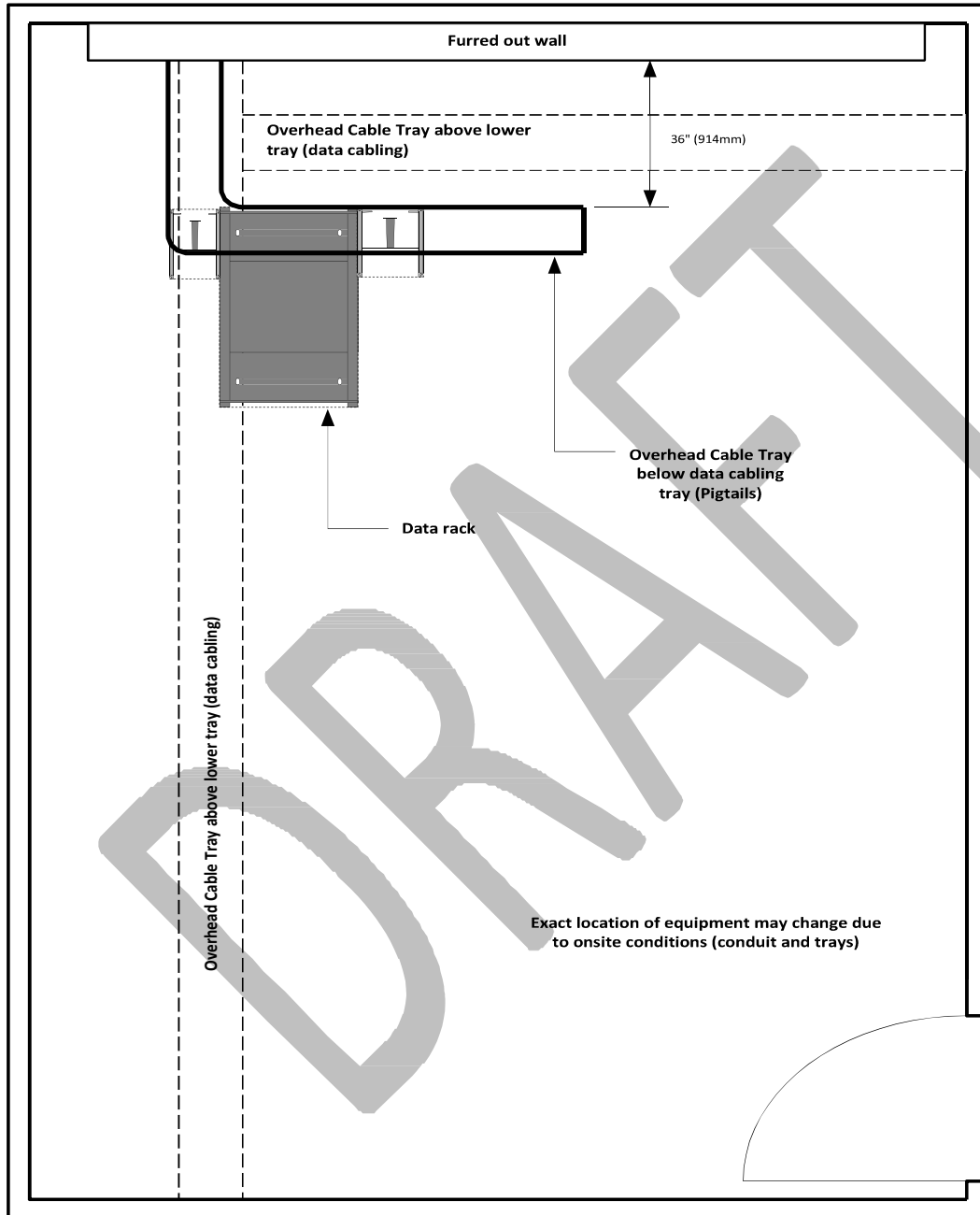
\_\_\_\_\_%Overhead \_\_\_\_\_% Profit

Indicate the labour rate that will be used on all changes, not  
covered under unit prices, for the duration of the project. This rate includes all overhead and profit.

\$\_\_\_\_\_/hr Regular Time \$\_\_\_\_\_/hr Overtime \$\_\_\_\_\_/hr Shift Premium



## PART 5 SKETCHES



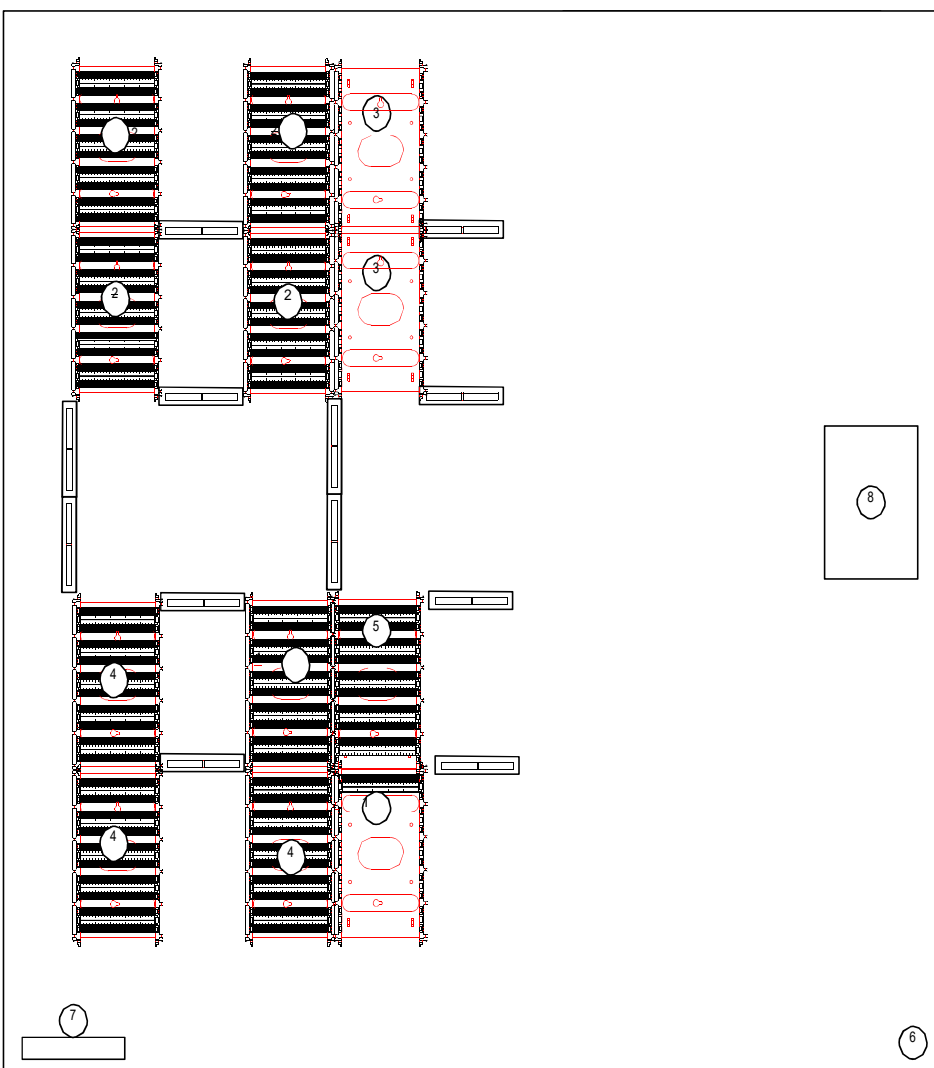
LANROOMLAYOUT

Not To Scale



- ① Cat3 Voice Backbone cabling from building entrance terminal
- ② Horizontal Cat6 UTP
- ③ Future GigaBIX mounts Installed
- ④ Cat6 Pigtails Network Switches
- ⑤ Cat6 Pigtails ServerSwitches
- ⑥ Voice Backboard (2400 x 2400mm x 19mm) Fire Rated plywood secured to furred out 6 inch wall.
- ⑦ Grounding Bus Bar
- ⑧ Building Entrance Terminal

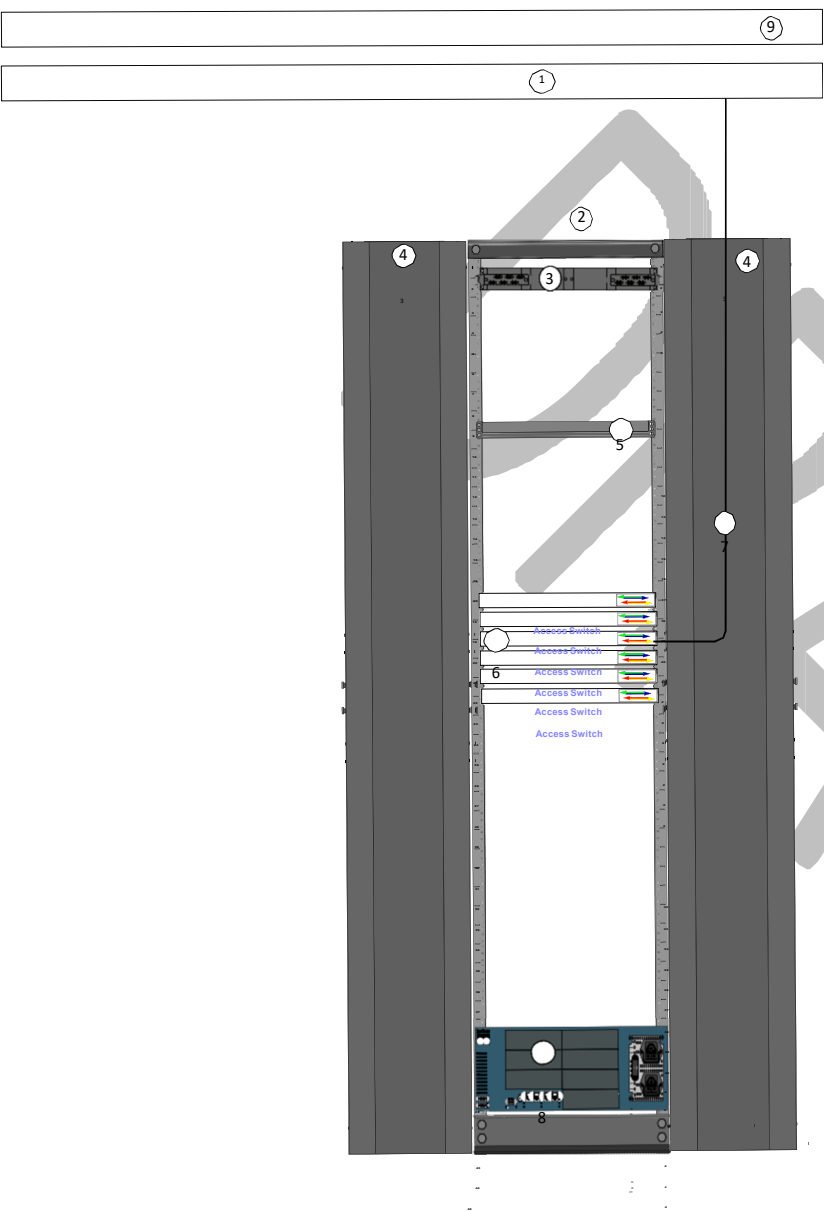
Communication contractor to supply and install the six inch furred out wall including the fire treated plywood and cut all holes for equipment



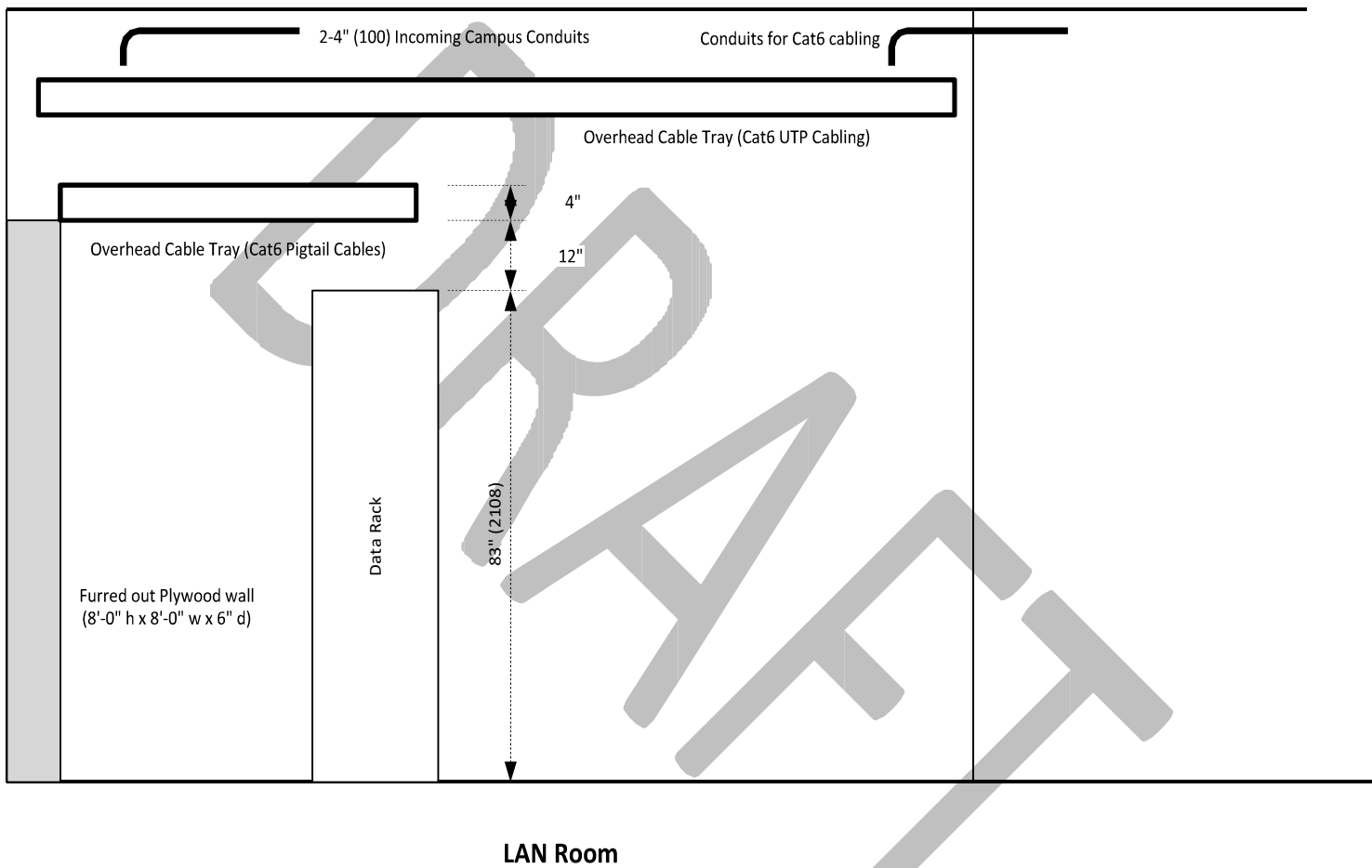
LAN ROOM BACKBOARD LAYOUT

*Drawing is for demonstration purposes only (Contractor to review floor drawings for quantities)*

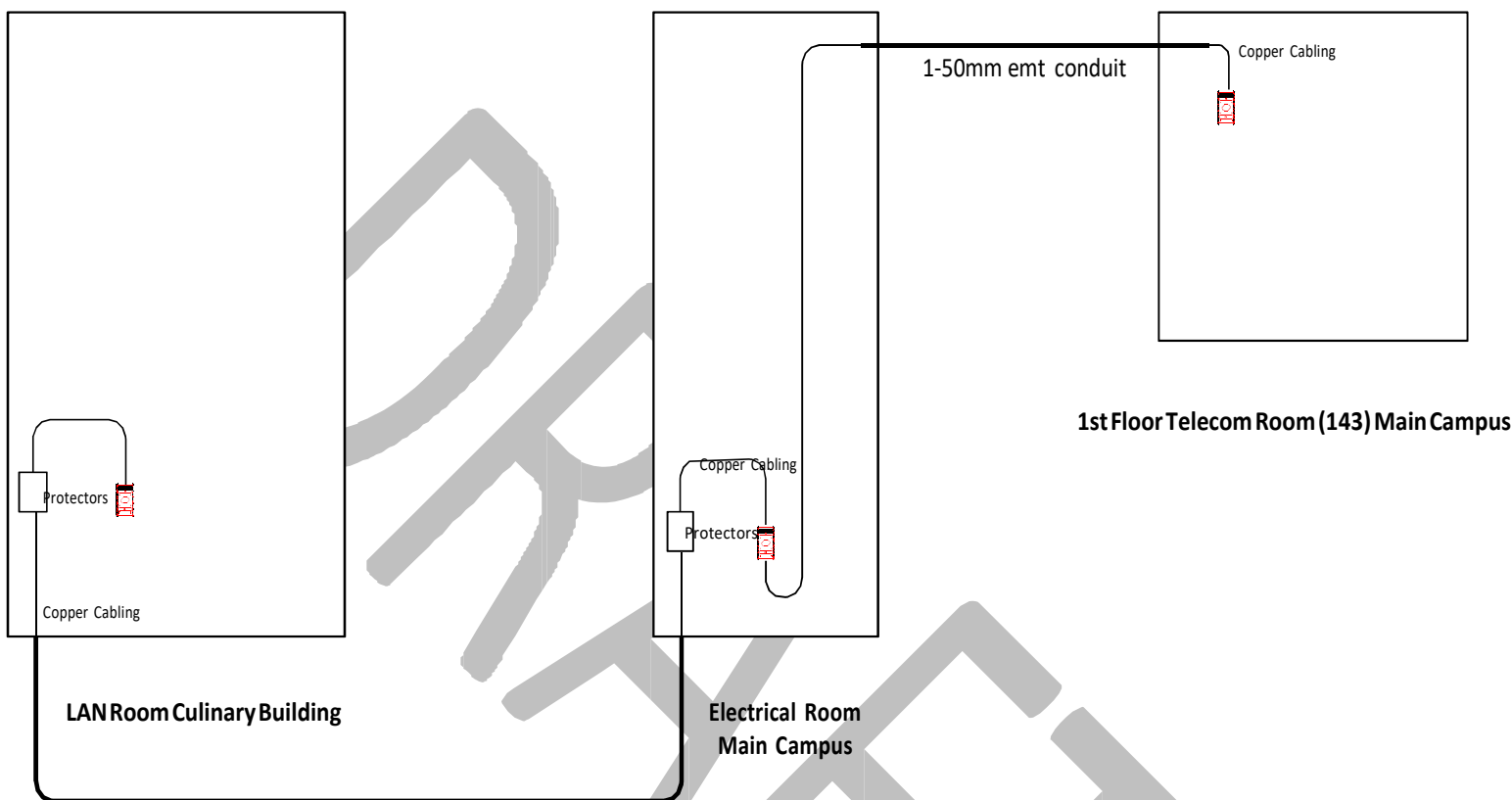
- ① Overhead Cable Tray (12" x 4") Cat6 Pigtails
- ② Data Network Rack
- ③ Fiber Patch Panel
- ④ Vertical Wire Managers with doors
- ⑤ 19" Modem shelf
- ⑥ Network Data Switch (by College IT Staff)
- ⑦ Cat6 Pigtail Cord (Data Connections to Plywood)
- ⑧ Network UPS (by others)
- ⑨ Overhead Cable Tray (12" x 2") Cat6 cabling







LAN ROOM CABLE TRAY LAYOUT



COPPER BACKBONE CONNECTIVITY

