General Notes

This Document contains an overall methodology of procedures & specifications generally used in College construction projects. While some sections may not apply to every project, coincidentally every possible detail or scenario may not be referenced. Contractors shall complete the work as necessary to demolish/renovate/ construct the area(s) as intended, by way of standard trade practices and processes, utilizing appropriate materials as acceptable by the College and Authorities Having Jurisdiction. Format is based on MasterFormat® 2012 publications.

Division 01

Section 01 00 00

Miscellaneous General Requirements

1.1 The Contractor is responsible for true and proper setting out of the work, and for the correctness of the cross fall, slope, width and dimensions through the entire course of the work.

1.2 All materials and products purchased for use in this project must be approved in writing by the College.

1.3 All work to be performed by trades specialized in the work and be in conformance with common trade practice and methods.

1.4 All work shall be completed to the satisfaction of the College, and to manufacturer's requirements, within the timelines of this contract.

1.5 All work to be performed shall not disrupt normal College activities or **work will cease until further notice.**

1.6 Required modifications to the existing structure or systems components, and all costs associated with such, shall be reviewed and approved by the College in writing prior to commencement of the work.

1.7 The Contractor is to verify all drawings and specifications for accuracy. Dimensions indicated are approximate only. The College will not be liable for any errors or omissions.

1.8 All surplus and unsuitable materials as a result of this contract shall be disposed of off-site, in the most environmentally conscious manner possible. Copy of waste manifest(s) must be produced at the College's request.

1.9 Requests for substitution of equivalent materials must be submitted in writing, including product specifications, and proposed cost revisions, and must be approved by the College prior to use.

1.10 Provide manufacturers specifications as required.

1.11 Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings and or specifications are reviewed by the College.

1.12 The College will not be responsible for new materials concerning this project delivered or left on site, or contractor's equipment left on site.

1.13 The Contractor shall submit a proposed work schedule to the College for approval, detailing all major operations, no later than five [5] days after notification of award.

1.14 Cover/protect all equipment, surfaces, trees, shrubs, vegetation and tributaries to prevent contamination and or damage.

1.15 The Contractor is responsible for obtaining locates for all buried or encased services, at no cost to the College.

1.16 The Contractor will be liable for any disruption in services, e.g.: electrical, water, communications, fire equipment, data. Damages are to be repaired immediately at the contractor's expense.

1.17 New construction shall carry a warranty against defect for a period of one [1] year.

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1.18 Clean entire area of all contaminants resulting from the work upon completion.

1.19 Any damages to adjacent areas, or damages to existing surfaces as a result of construction or equipment, shall be repaired to the College's satisfaction, at the Contractor's expense.

1.20 All work shall be performed in accordance with all applicable codes and regulations.

1.21 Accessibility:

i. Work completed under this contract shall be in compliance with the Accessibility for Ontarians with Disabilities Act (AODA), and Integrated Accessibility Standard Regulation (IASR). Info: http://www.e-laws.gov.on.ca/html/source/regs/english/2011/elaws_src_regs_r11191_e.htm

ii. The College supports the intent of the AODA and its goal of achieving accessibility for Ontarians with disabilities with respect to goods, services, facilities, accommodations, employment, buildings, structures and premises. Work is to be completed in accordance with this plan. Info: http://flemingcollege.ca/services/accessibility

iii. All work under this contract shall be performed in consideration of the draft Accessible Built Environment Standard. Info: http://www.cou.on.ca/policy-advocacy/accessibility/accessible-toolkit-homepage/built-environment-standard/built-env-pdfs/final-proposed-accessible-built-environment-standa

1.22 All areas targeted for construction shall undergo an inspection for existing conditions, by designates from the College and the Contractor, prior to commencement of any work under this contract.

1.23 Remove / re-install, as required and as directed, all signs, fixtures, amenities, fencing or other items that are impacted by the work.

1.24 Any requests for changes to the specification in standards, materials, equipment or installation techniques must be submitted for review prior to the close of the Question Period, and if applicable will be incorporated in an Addendum to the Specification.

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Section 01 30 00
Submittals

Submit the following:

1.1 Initial Construction Schedule in accordance with Section 01 31 00, within 5 days of receipt of Notice to Proceed with Work. Submit regular construction schedule updates as work progresses.

1.2 Performance Bond and Labour and Material Payment Bond.

1.3 Certificate of Construction Insurances.

1.4 Contractor's Safety Policy.

1.5 Plan for mobilization and site logistics including site sign-in, traffic control, pedestrian and vehicular access.

1.6 Letter of Good Standing from Workplace Safety & Insurance Board (WSIB).

1.7 Schedule of Shop Drawing and sample submission.

1.8 Product delivery schedule.

1.9 Estimate of Monthly Progress Claims.

1.10 Comprehensive reports from the General Contractor for Health and Safety on a weekly basis.

1.11 Reports of any damage, unfavourable conditions or problems on site.

1.12 Product samples for each applicable trade section of the work. Unless specified otherwise make samples of adequate size to represent the material intended for use on this project. Where the degrees of marking or colour cannot be adequately shown in a single sample, submit a range of samples to show the extremes of colour and marking. Identify samples with project number, date, and name of Contractor. Materials used in building shall correspond to approved samples for quality, colour, texture, finish, and thickness.

1.13 Testing and inspection reports in accordance with Section 01 40 00.

1.14 List of paint materials in accordance with Section 09 90 00.

1.15 Material Safety Data Sheets (MSDS) where applicable for adhesives, paints, sealers, caulking compounds, primers and other off-gassing materials.

1.16 Prior to the issuance of the Contractor's last payment, and at any other time when requested to do so, a statement from the Workers' Safety Insurance Board that all of the assessments the Contractor, or any Subcontractor, is liable to pay under the Workers' Safety Insurance Board Act or successor legislation have been paid.

1.17 Upon commencement of the work, and thereafter at regular intervals until Total Performance of the Project, submit electronic progress photographs in the jpg format, minimum 4 megapixel resolution, in colour.

1.18 Shop drawings and Manufacturer's Data Books for equipment and materials used in the Project.

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1.19 Shop drawings shall consist of final shop drawings, on which corrections have been recorded of changes made during fabrication and installation of unforeseen conditions.

1.20 The Manufacturer's Data Book shall contain equipment and operating instructions on all operable equipment and all mechanical and electrical equipment, fixtures, and architectural hardware.

1.21 Maintenance instructions.

1.22 Original brochures on all equipment.

1.23 Parts lists on all equipment including a list of suppliers.

1.24 All additional material used in the project beyond that indicated by brochures listed under the various sections, showing manufacturers and sources of supply.

1.25 Names, addresses and telephone numbers of the designer(s) and major contractor(s) who worked on the building.

1.26 Record Drawings, including changes in construction documents, such as Site Instructions, Supplementary Instructions, Addenda, instructions by correspondence and Jurisdictional Authority approvals.

1.27 Final Inspection Certificates/Approval Certificates, such as ESA, Fire Alarm verification, Building Department, Fire Department, Engineers Certifications as applicable.

1.28 Warranty certificates and related information, complete with the College's name, address, work/materials covered and defined warranty period.

Section 01 31 00
Project Management and Coordination

1.1 Submit projected construction schedule for entire work. Revise schedule when it cannot readily be related to the actual stage of construction.

1.2 Prepare in form of horizontal bar chart or C.P.M. network. Provide separate horizontal bar column for each trade or operation, or separate activity for each operation that can be completed independently of other operations or trades.

1.3 Submit complete sequence of construction by activity, as follows: Shop Drawings, decision dates for products specified, selection of finishes and colours, etc., fabrication and delivery lead times, dates for beginning and completion of each element of construction, specifically: concrete placement, architectural/structural work, equipment installations and testing.

1.4 Update schedule as required, showing all changes occurring since previous submission of updated schedule.

1.5 Provide narrative report including discussion of problem areas, including current and anticipated delay factors and their impact; corrective action taken or proposed, and its effect; effect of change in schedules of any work being done by the Owner or other parties for him; and description of revisions (effect on schedule due to change of scope, revisions in duration of activities, and other changes that may affect schedule).

1.6 Distribute copies of reviewed schedules to subcontractors, and other concerned parties.

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Section 01 35 29
Health, Safety & Emergency Response

1.1 The Contractor shall perform the Work in a safe manner and shall comply with all applicable municipal, provincial, and federal legislation and any other regulation by authorities having jurisdiction of construction projects. In the event of conflict between any provisions on the above authorities, the most stringent provision shall apply.

References:

1.2 The Occupational Health & Safety Act - Occupational Health & Safety Legislation.

1.3 Ont. Reg. 213/91 - Regulation for Construction Projects.

1.4 Ont. Reg. 516/92 - Regulation for Industrial Establishment.

1.5 Ont. Reg. 357/91 - Regulation for Roll-Over Protective Structures

1.6 Ont. Reg. 523/92 - Window Cleaning Regulation

1.7 Ont. Reg. 860/90 - Work Place Hazardous Material Information System (W.H.M.I.S.)

1.8 The Environment Protection Act:

1.9 Ont. Reg. 347 - Waste Management

1.10 Ont. Reg. 346 - Air Emissions

1.11 Ont. Reg. 362 - PCBs

1.12 Ont. Reg. 630 - Spills

1.13 Ont. Reg. 403/97 - Ontario Building Code 2006

1.14 Transportation of Dangerous Goods Act

1.15 Workplace Safety & Insurance Board (WSIB)

1.16 CSA S269.1 - Falsework for Construction Purposes

1.17 CAN/CSA-S269.2 - Access Scaffolding for Construction Purposes.

1.18 FCC No. 301 - Standard for Construction Operations.

1.19 Canadian Electric Code, Part 1 CSA C22.1-98 (18th Edition).

1.20 CAN/CSA - W117.2 - Safety in welding, cutting and allied processes.

1.21 Prior to commencement of work, the Contractor shall provide an Occupational Health and Safety Policy and Procedures as described in the Occupational Health and Safety Act for review by the College.

1.22 The Contractor shall ensure and provide evidence that any individual with responsibility for the project's implementation is a competent worker as defined in the Occupational Health and Safety Act.

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1.23 The Contractor where required by the O.H.S.A. Regulations, shall register the project with the Director of Construction Health and Safety Branch of the Ministry of Labour within (30) thirty days of undertaking the project and prior to starting work on the site. A copy of the registration (Notice of Project) must be posted on a visible location on the site and a copy forwarded to the Consultant.

1.24 The Contractor shall propose the name of any competent worker as supervisor with accompanying qualification for approval by the College.

1.25 The Contractor shall draft and present to the College for review an emergency plan to be used in the case of a critical injury, accident or incident on site. This document must be kept up to date and must be discussed with all trades and Sub-Contractors working on site.

1.26 The Contractor shall provide to the College copies of all inspection reports including all accident/incident reports and associated documentation.

1.27 The Contractor shall conform to and enforce strict compliance with the Occupational Health & Safety Act and Construction Regulations, the Environmental Protection Act, Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods Act, and any other pertinent legislation for construction projects.

1.28 The Contractor for purposes of the Occupational Health & Safety Act will be designated as the constructor for this project and will assume all of the responsibilities of the constructor set out in that Act and its Regulations.

1.29 The Contractor shall monitor the Work to ensure that all applicable Health & Safety Regulations are followed. Violations will be documented, appropriate action taken, and records kept on file.

1.30 The Contractor shall be informed of any minor violations of the Occupational Health & Safety Act or its Regulations and shall correct such minor violations immediately.

1.31 The College or its authorized representative shall stop the Work immediately for any major violation of the Occupational Health & Safety Act or its Regulations. The Contractor shall not resume the Work until any such violation has been rectified.

1.32 The Contractor must comply with Regulation 1101 “First Aid requirements” as set out by the Workplace Safety and Insurance Board – Ontario.

1.33 The Contractor shall ensure, and provide documented evidence that the work is being inspected especially as it relates to temporary structures, bracing falsework, form work, scaffolds, work platforms, excavations, cranes and hoisting equipment or any other area requiring inspection under the Occupational Health and Safety Act.

1.34 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada.

1.35 Notwithstanding the requirements of preceding paragraphs, applications which might affect the well being of any occupants and workers on Site or disrupt work of other contractors may be rescheduled by the College for evening or week-end work.

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1.36 Contractor shall be responsible for ensuring that all information regarding the handling of all materials, avoidance of spills, cleanup, installation of materials, ventilation, smoking regulations and the like, designed to minimize the levels of indoor air pollution in the final work shall be communicated to all subcontractors and Safety Committees.

1.37 The Contractor shall provide evidence of competency with regards to the Environmental Protection Act, Bill 309.

1.38 The Contractor shall ensure and provide evidence that all hazardous waste removed from the site is sent to a licensed waste disposal site by a licensed carrier.

1.39 The Contractor shall retain copies of all hazardous waste manifests on file.

1.40 The Contractor shall ensure that appropriate handling of all waste materials occurs.

1.41 The Contractor shall inspect the project daily to monitor compliance with Designated Substances Regulations.

1.42 Personal Protective Equipment (PPE)-Comply with requirements of Section 21 - Ont. Reg. 213/91.

1.43 All visitors must wear safety helmets and approved safety boots and other equipment as required.

1.44 Fall protection-Comply with requirements of Section 26 - Ont. Reg. 213/91 and Section 85 - Ont. Reg. 516/92.

1.45 Housekeeping- Comply with requirements of Section 35-39 - Ont. Reg. 213/91 and Sections 52-58 - Ont. Reg. 213/91.

1.46 The Contractor shall implement a daily job site cleanup program for all trades to maintain the Work site in a tidy and safe condition.

1.47 Keep work areas, stairways, walkways, clean of obstruction, scrap materials, lumber, rags and other debris.

1.48 Pile or stack materials in an orderly manner; wedge or block materials to prevent rolling.

1.49 Provide fire extinguishing equipment in sufficient numbers. Have equipment inspected regularly and recharge when necessary.

1.50 Ventilation and Respiratory Protection- Comply with requirements of Section 46 to 47 - Ont. Reg. 213/91 and Section 127 to 128 - Ont. Reg. 516/92.

1.51 Signs- Comply with requirements of Section 44 - Ont. Reg. 213/91.

1.52 The Contractor shall post signs in prominent locations and in sufficient numbers to warn workers of a hazard on a project.

1.53 The Contractor shall post signage restricting access to authorized personnel only. Ensure that site access is strictly controlled.

1.54 Confined Space- Comply with requirements of Section 60 to 63 - Ont. Reg. 213/91 and Section 67 to 71 - Ont. Reg. 516/92.

1.55 The Contractor shall ensure, if the Work involves entering a confined space, procedures as laid out in Sections of Ont. Reg. 213/91 are followed.

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1.56 Public Way Protection- Comply with requirements of Section 64 to 66 - Ont. Reg. 213/91.

1.57 The Contractor shall ensure that every measure foreseeable is taken to protect the general public.

1.58 Access/Egress- Comply with requirements of Section 70 to 72 - Ont. Reg. 213/91.

1.59 Stairs/Landings-Comply with requirements of Section 75 to 77 - Ont. Reg. 213/91.

1.60 Ladders-Comply with requirements of Section 78 to 84 - Ont. Reg. 213/91 and Section 18, 19 and 73 - Ont. Reg. 516/92.

1.61 Guardrails/Protective Coverings- Comply with requirements of Section 85 and 86 - Ont. Reg. 213/91 and Section 14 and 15- Ont. Reg. 519/92.

1.62 Forms, Formwork, Falsework- Comply with requirements of Section 87 to 92 - Ont. Reg. 213/91.

1.63 Design and construct falsework in accordance with CSA S269.1.

1.64 The Contractor shall ensure that no part of the Work is subjected to a load which will endanger its safety or cause permanent deformation. Load no part of structure, falsework, formwork or scaffolding during construction with a load greater than it is calculated to bear safely. Make every support as strong as a permanent support.

1.65 For all framework, falsework and reshoring, ensure that it is built to meet working loads, stresses, etc. and provide evidence of verification by a professional engineer.

1.66 Welding and Cutting- Comply with requirements of Section 122 to 124 - Ont. Reg. 213/91.

1.67 Welding and cutting tasks, "hot work", shall be carried out in accordance with CAN/CSA 117.2 - M94, noting particularly the safety, training and supervisory requirements.

1.68 When welding or cutting must be done in a location not designated for such purpose, inspection and authorization shall be required in writing ("Hot Permit") before any such operations commence. The permit shall be issued by an experienced fire safety supervisor, or their appointee, who shall have inspected the work area and confirm that precautions have been taken to prevent fire. For an elaboration of basic and special precautions, see NFPA pamphlet 51B. This document contains an illustration of a typical permit.

1.69 Scaffolding and Work Platforms- Comply with requirements of Section 125 to 142 - Ont. Reg. 213/91.

1.70 Design and construct scaffolding in accordance with CSA S269.2.

1.71 The Contractor shall ensure that all scaffolding over 15 m or 10 m, if shell and tube, is designed and inspected by a Professional Engineer. Maintain documents on site throughout the project.

1.72 Elevating Work Platforms- Comply with requirements of Section 143 to 149 - Ont. Reg. 213/91 and Sections 51 to 54 Ont. Reg. 516/92.

1.73 Cranes, Hoisting, and Rigging- Comply with Requirements of Section 152 - Ont. Reg. 213/91.

1.74 The Contractor shall retain copies and make available for inspection all log books, inspection records detailing repairs, modifications and tests for cranes or similar hoisting devices.

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1.75 Electrical/Mechanical Hazards and Lockout-Comply with requirements of Section 45 and 181 to 195 - Ont. Reg. 213/91 and Sections 40 to 44 - Ont. Reg. 516/92. Comply with requirements of Sections 48, 60 and 188 - Ont. Reg. 213/91 and Sections 46, 72, 78 to 82 - Ont. Reg. 516/92.

1.76 Roofing- Comply with requirements of Section 207 to 211 - Ont. Reg. 213/91.

1.77 The Contractor shall follow the Safety Guidelines for Roofers issued by the Construction Safety Association of Ontario.

1.78 Demolition- Comply with requirements of Section 212 to 221 Ont. Reg. 213/91 and Section 72 - Ont. Reg. 516/92.

1.79 Excavations and Trenches- Comply with requirements of Section 222 to 242 - Ont. Reg. 213/91.

1.80 The Contractor shall coordinate and monitor the Work of all trades involved in trenching related work on the project.

1.81 If an excavation affects the stability of adjacent structures, the Contractor shall obtain the services of a Professional Engineer at his own cost who will specify in writing precautions to be taken to protect the structure affected. This record shall be maintained on site and strictly adhered to during the work.

1.82 Prefabricated, hydraulic or engineered support systems shall be designed by a Professional Engineer and a record shall be maintained on site which includes the capability of each device.

1.83 Tunnels, Shafts, Caissons & Cofferdams- Comply with requirements of Section 243 to 331 - Ont. Reg. 213/91.

1.84 Work in Compressed Air- Comply with requirements of Section 332 to 399 - Ont. Reg. 213/91.

1.85 The Contractor will ensure all supplemental Safety Regulations specific to the College are implemented and followed. Information may be obtained at: http://fleming0.flemingc.on.ca/ff/safety/safety-welcome.html

Division 01

Section 01 40 00
Quality Control

1.1 The Contractor shall be responsible for quality assurance, and how it is to be met.

1.2 Obtaining and payment of inspections, tests, or Engineer's stamps required by Code or Ordinances, or by a plan approval authority and made by a legally constituted authority, shall also be the responsibility of the Contractor, unless otherwise provided by the Contract Documents.

1.3 The Contractor shall be responsible for inspection or testing performed exclusively for his own quality control and convenience, including but not limited to testing, adjustment and balancing of mechanical and electrical systems, and to pay all costs associated therewith.

1.4 Employment of inspection/testing agencies does not relax the responsibility of the trades to perform quality work.

1.5 Where factual evidence exists that defective workmanship has occurred or that work has been carried out incorporating defective materials, the College may have tests, inspections or surveys performed, analytical calculation of structural strength made and the like in order to help determine whether the work must be replaced. Tests, inspections or surveys carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the College’s opinion, the work may be acceptable.

1.6 All testing shall be conducted in accordance with the requirements of the Ontario Building Code.

1.7 Materials or workmanship which fail to meet specified requirements may be rejected by the College whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work incorporating defective materials or workmanship shall be promptly removed and replaced or repaired to the satisfaction of the College, at no expense to the College.

1.8 Take all precautions necessary to eliminate the possibility of mould and mildew growth, and damage caused by moisture to cellulose containing materials and various other materials and finishes, including but not limited to gypsum board, glass fibre and mineral fibre insulation, lumber, carpet, paint and plywood.

1.9 Do not allow the installation of gypsum board or other products that would be affected by moisture until the chance of wetting is eliminated, and the temperatures are appropriate to control mould and mildew propagation.

1.10 Schedule work in such a manner that materials affected by moisture are protected as soon as possible.

1.11 Immediately remove and replace any materials damaged by moisture, at no cost to the College.

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Section 01 50 00
Temporary Facilities and Controls

1.1 The Contractor shall provide a secure, weather tight office for own use.

1.2 The Contractor shall provide secure, weather tight sheds for storing materials that require protection.

1.3 The contractor shall be responsible for telephone and fax services, pay full charges for them until project completion, and have them removed at that time. Telephone shall be available to all trades. All costs for these services shall be borne by the Contractor.

1.4 All costs for temporary heat shall be borne by the Contractor.

1.5 Supply water for all construction requirements. All costs for installation, water supply, maintenance and removal shall be borne by the Contractor.

1.6 Supply electrical service and wiring for all construction requirements. Arrange for connection with the utility company.

1.7 Provide temporary lighting throughout the building(s). Maintain not less than 160 LUX level (15 FC).

1.8 Provide all necessary connections and extensions from temporary source to locations of work.

1.9 All costs for temporary electrical service and energy including power requirements in excess of normal electrical loads shall be borne by the Contractor.

1.10 Temporary power distribution wiring shall comply with the Ontario Hydro Electrical Safety Code. Obtain inspection certificates and approvals for temporary electrical work.

1.11 Provide portable washroom units of the chemical type for use during construction. Maintain in clean condition.

1.12 All costs for washroom units and their maintenance shall be borne by the Contractor.

1.13 Work shall include temporary enclosure for the building as required to protect it, in its entirety, or its parts, against all vandals, the elements, and to maintain temperatures which ensure conditions for installation that prevent harm to all materials.

1.14 Any and all ditches, drainage channels and/or storm /sanitary sewer systems, which may be affected by construction, shall have their flow maintained at all times during construction, unless permission to the contrary has been obtained from the College.

1.15 Prevent nuisance to adjacent properties near the works from dust rising and mud deposits, by taking appropriate anti-dust and mud measures, at such times as found necessary, and as directed by the College, or at any other times complaints of dust or mud are received from the public by either the Contractor, the College, or the Municipality.

1.16 Keep walkways free of snow and ice, both on and adjacent to site. Replace grass and landscaping damaged by use of rock salt.

1.17 Remove mud deposits from all pavement.

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1.18 Provide mechanical hoarding complete with truck gates and pedestrian gate. Maintain until Substantial Performance, or when directed by College to remove.

1.19 Equip gates with locks and keys.

1.20 Provide hoarding of sufficient strength and stability to safely withstand wind pressures unbalanced loading, impact and other horizontal forces to which it may be subject during the course of construction.

1.21 Take necessary precautions and provide and install required coverings to protect existing building from contamination and damage from construction operations and weather conditions.

1.22 Make good any damage or replace damaged material as directed and at no cost to the College.

1.23 Work shall include all temporary roads and walks required for construction purposes. Remove them when no longer required, or at project completion. Completely restore all surfaces disturbed by temporary roads and walks.

1.24 Provide adequate temporary bridges and crossings over water mains, sewers, heating lines, telephone and electrical conduits, and any other buried services.

1.25 Include temporary culverts and ditches to provide adequate site drainage within the site, and to maintain existing drainage without the site.

1.26 Provide for access of emergency vehicles to premises at all times.

1.27 Provide a project sign complete with supporting structure incorporating project name, College name and logo, and Contractor's name. Sign shall be printed by a professional sign maker. Locate sign where directed by the College.

1.28 Only the project sign and notices regarding safety, caution, or instructions shall be erected on or near the site.

1.29 In addition to the requirements of the Occupational Health and Safety Act, provide temporary safeguards and protection adequate to maintain standard safety practices and to protect against accident or injury to any worker and other persons on the site, damage to any part of the work and to any adjoining or adjacent structure, property, pavement, walks, services and other similar items by frost, weather, overloading, and any other cause resulting from the execution of the work.

1.30 Particular attention shall be paid to the prevention of fire and elimination of fire hazards which would endanger the work or adjacent buildings and premises.

1.31 Particular attention shall be paid to the prevention of spills or releases of asbestos, PCB's or mercury which would endanger the work at the site and at adjacent buildings and premises.

1.32 Should any part of the work or any buildings, pavements, trees, poles, hydrants, cultivated or grassed areas, etc., on or surrounding the site and adjacent to any road leading thereto, become damaged or disfigured due to lack of failure of such protection, make good with material identical with existing and adjoining surfaces, or compensate the College for value of same.

1.33 Provide all necessary temporary enclosures, hoardings, fences, gates, guardrails, cranes, hoists, stairs, ladders, scaffolding, staging, runways, night-lights, and barriers as necessary for the work. Conform to all such requirements of the Labour Laws and other Provincial or local labour safety

Division 01

laws, applicable thereto. Be responsible for all scaffolding, formwork, or other temporary supports used during the work. Where such structures are of a complicated nature, employ the services of a Registered Professional Engineer to design such scaffolding, framework, or other temporary supports. Support all scaffolding independently of the building's finished surfaces. Arrange to avoid when not in use to permit work to proceed unimpeded, and promptly remove when no longer required.

1.34 Use temporary fire standpipes and hose, or other approved fire extinguishing equipment in the building(s) until the permanent fire protection system in the building(s) is available.

1.35 Keep all portions of the work properly and efficiently drained during construction and until completion, and the Contractor will be held responsible for all damage which may be caused or result from water backing up or flowing over, through, from, or along any part of the works, whether such damage is to the works, to the existing building, or to neighbouring properties. Provide means of controlling sediment run-off. Material shall trap fine grade sediment and allow storm water run-off.

Section 01 74 00
Cleaning and Waste Management

1.1 Maintain project in accordance with the latest edition of The Occupational Health and Safety Act.

1.2 Provide on-site containers for collection of waste materials, debris and rubbish.

1.3 Where local recycling facilities are available, provide on-site containers for the collection of recyclable materials.

1.4 Store volatile wastes in covered metal containers, and remove from premises daily.

1.5 Prevent accumulation of wastes which create hazardous conditions.

1.6 Provide adequate ventilation during use of volatile or noxious substances.

1.7 Comply with local ordinances and anti-pollution laws.

1.8 Do not burn or bury rubbish and waste materials on project site.

1.9 Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

1.10 Do not dispose of wastes into streams or waterways.

1.11 Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off College property.

1.12 Remove recyclable materials from site and legally dispose of at a public or private recycling facility off College property.

1.13 Use only cleaning materials recommended by manufacturer of surface to be cleaned.

1.14 The Contractor shall ensure that his forces maintain the project and premises free from accumulations of waste material, rubbish, surplus materials and the like.

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1.15 Remove on a daily basis all labels, scrap, droppings and spatters of excess and foreign materials.

1.16 Remove excess and foreign matter resulting from his work and from all surfaces on which the execution of later work would be harmed, and from all finished surfaces. He shall tidy his work area at end of each day's work and remove all scrap. He shall leave work in specified new condition.

1.17 Dust producing operations are to be carried out particularly carefully, in a manner which will ensure that there is no infiltration, contamination or accumulation on equipment, material or other surfaces, or to any occupied areas of the building.

1.18 Vacuum-clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until site is ready for Substantial Performance or occupancy.

1.19 Obtain from each Subcontractor, instructions which designate proper methods and materials to be use in final cleaning. Include instructions in Manufacturer's Data Book specified in Section 01300.

1.20 Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

1.21 Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.

1.22 At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all surfaces exposed to view; leave project clean and ready for occupancy.

1.23 Employ experienced workers, or professional cleaners, for final cleaning.

1.24 In preparation for Substantial Performance or occupancy, conduct final inspection of interior and exterior surfaces exposed to view, and of concealed spaces.

1.25 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from all sight-exposed interior and exterior finished surfaces.

1.26 Clean and polish all interior & exterior windows, glass, and mirrors.

1.27 Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

1.28 Broom-clean paved surfaces; rake clean other surfaces of grounds.

1.29 Clean bulbs and lamps and replace those burned out.

1.30 Remove snow and ice from access to building.

1.31 Maintain cleaning until project, or portion thereof, is occupied by Owner.

Division 02

Section 02 41 00

Demolition

1.1 Maintain and preserve Owner's access requirements to and from existing building(s) in areas where demolition and removal work is being carried out.

1.2 Do not close, obstruct, place or store material in Owner's driveways and passageways.

1.3 Conduct operations with minimum interference with roads, streets, driveways and passageways.

1.4 Haul and move machines, vehicles and equipment over designated route and within work areas.

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

1.6 There will be absolutely no interruptions to College operations in adjoining areas permitted. Therefore, it is imperative that operations and machine and equipment movements, deliveries and removals are executed at time or times that will permit uninterrupted College's operations in and around building(s), including parking, deliveries and site access and egress.

1.7 Protect work to remain against damage of any kind. Repair or replace damaged work, at no cost to the College.

1.8 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, parts of existing building to remain. Provide bracing, 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 shoring and underpinning as required. Make good damage caused by demolition.

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

1.10 Take every possible precaution to prevent dust and dirt resulting from the contract operations from entering the College's operational areas. Adjust and relocate such partitions (screens) as required for the various operations under the contract.

1.11 Provide protection in the form of tarpaulins, plywood or polyethylene for temporary roof and wall openings and other exposed areas such as during removal of windows, doors or parapets, equipment to be relocated, etc., before final construction is in place.

1.12 During demolition operations, keep work wetted down with fog sprays to prevent dust and dirt rising.

1.13 Perform required cutting using power operated cutting devices. Chipping will not be allowed. Breaking out shall commence only after sawcutting of the cut-off points has been performed in order to prevent damage to remainder.

1.14 Demolish masonry and concrete in small sections.

1.15 Stockpiling of surplus materials on site will not be permitted.

Division 02

1.16 Rubbish and debris resulting from execution of the work shall be cleaned up as they are generated. Dispose of same at end each day's work or place in waste disposal bins which must be emptied on a regular basis. Stockpiling of rubble and debris will not be permitted.

1.17 Do not burn material on site.

1.18 The Demolition and Excavation Dust Control Plan shall identify measures that will be taken to control dust during demolition, related soil excavation or during soil remediation/excavation activities:

i The daily, or more frequently if required, wetting of all soft and hard surfaces and any excavation face on the site, with the addition of approved dust suppressant, if required.

ii The daily cleaning of the road pavement and sidewalks for the entire frontage of the property to a distance of 25 metres from the property line.

iii The designation of truck loading points to avoid trucks tracking potentially contaminated soil and demolition debris off the site. Such loading points should be on a gravel base to minimize tracking of the soil onto the sidewalk and the street. If the loading point becomes contaminated it should be cleaned and replaced.

1.19 All trucks and vans leaving the site should be cleaned of all loose soil and dust from demolition debris including the washing of tires and sweeping or washing of exteriors and tailgates.

1.20 Tarping all trucks leaving the site which have been loaded with indigenous soil or demolition debris.

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

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

Division 03

Section 03 30 00

Cast in Place Concrete

1.1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 All codes, standard specifications and by-laws referred to in this specification shall be current editions including all revisions, addenda and supplements.

1.3 Conform to the Ontario Building Code and the Occupational Health and Safety Act.

Conform to the following CSA Standards:

1.4 A23.1-09 Concrete Materials and Methods of Concrete Construction.

1.5 A23.2-09 Methods of Tests and Standard Practices for Concrete.

1.6 A23.3-04 Design of Concrete Structures.

1.7 A3000-08 Cementitious Materials Compendium

1.8 A283-06 Qualification Code for Concrete Testing Laboratories.

1.9 A23.1-09 Concrete Materials and Methods of Concrete Construction.

1.10 S269.1-1975 (R2003) Falsework for Construction Purposes.

1.11 S269.3-M92 (R2008) Concrete Formwork

Conform to the following ASTM Standards:

1.12 C309-07 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

1.13 C1116-09 Standard Specification for Fiber Reinforced Concrete.

1.14 C94/C94M-09 Standard Specification for Ready-Mixed Concrete.

1.15 Conform to ACI 214R-02 Evaluation of Strength TestResults of Concrete.

1.16 In the event of conflict between referenced standards, codes, drawings and specifications, the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.

1.17 The Contractor hereby warrants the concrete finishes against dusting, disintegration or any other defect.

1.18 Calcium chloride or chloride-based admixtures **SHALL NOT** be used.

1.19 Chemical Additives, where permitted shall conform to CSA-A23.1.

1.20 Al admixtures shall be used in strict accordance with the Manufacturer's instructions.

1.21 Salt or other chemicals shall not be used to reduce the freezing point of the concrete.

1.22 Provide a moisture barrier cover over the prepared base material below slabs- on-grade. Use only material which is resistant to decay when tested in accordance with ASTM E 154-99.

Division 03

1.23 Other materials or products which are not listed herein shall comply with the latest CSA, ASTM, C.G.S.B., or A.C.I., Standards appropriate to those materials.

1.24 When the air temperature is at or below 5°C or when there is a probability of its falling to that limit within 24 hours of placing (as forecast by the nearest official weather office), conform to the requirements of CSA Standard A23.1. This requirement also applies for hot weather placement.

1.25 Cement finishing of floors shall be by a specialist sub-contractor thoroughly experienced in this type of work and a member in good standing with the Concrete Floor Contractors Association of Ontario (CFCAO).

1.26 All floor slabs and all EXPOSED concrete surfaces, such as walls, beams, columns, etc., are to receive a minimum of one coat of curing and sealing compound unless not compatible with architectural finishes.

1.27 Apply specified compounds in strict accordance with manufacturer's directions.

1.28 Electrical conduit and other services embedded in the concrete shall not be of a material harmful to the concrete, and shall not pass through or be embedded in a column, not be a larger outside diameter than one-third the thickness of the slab, wall or beam in which they are embedded, not be spaced closer than 3 diameters on center, have a concrete covering of not less than 25 mm (1"), and be so installed that it will not require cutting, bending or displacement of the reinforcement or impair the structural strength of the system.

1.29 Provide a competent and experienced supervisor or foreman who shall be present on the site continuously throughout each placement operation.

1.30 Inspect the ready mix plant and truck mixers and ascertain that good quality control practices are followed in accordance with CSA-A23.2 and ASTM C-94.

1.31 Perform random standard slump tests, to conform with CSA-A23.2.

1.32 Where concrete is specified to be air entrained, perform random standard air entrainment tests, to conform with CSA-A23.2.

1.33 Upon satisfactory completion of the work, clear away from the building and site, excess or waste materials and debris and leave the premises in an acceptable condition.

1.34 Do not unload excess concrete from concrete trucks during clean-up operations and do not deposit in undesignated or unauthorized locations within the property boundaries whether concealed or not.

Division 03

Section 03 35 00
Concrete Finishing

Referenced Standards:

1.1 ASTM C309 Specification for Liquid Forming Compounds for Curing Concrete.

1.2 CSA-A23.1-04/A23.2-04 Concrete MaterialsandMethodsofConcreteConstruction/MethodsofTest and Standard Practices for Concrete.

1.3 TTMAC Terrazzo Tile and Marble Association of Canada.

1.4 LEED Canada NC Version 1.0December 2004, Reference Guide.

1.5 Levels of finished concrete shall be within 6 mm of established elevations in any

1.6 3000 mm section, and shall be non-accumulative from datum line.

1.7 Submit for incorporation in Manufacturer's Data Book, maintenance instructions in accordance with Section 01300.

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

1.9 Work incorporating the use of oils and deleterious liquids shall not be performed on finished areas unless they are fully protected by approved methods. Cooperate with other Subcontractors to ensure finished work is not damaged.

1.10 Slab finishing shall be done by an established Subcontractor with at least 5 years of proven, accredited and satisfactory experience in this trade, employing skilled personnel. Submit proof of this requirement to the Consultant.

1.11 Non Slip Inserts: Silicone carbide or aluminum aggregate filled zinc channels approximately 6 mm x 9 mm x length of tread less 100 mm. Provide for two colours for stair treads and detectable warning indicators.

1.12 Dividing Strips: Provide extruded white zinc shelf-type with 6 mm wide zinc body, with zinc shelf angle set at correct depth to receive resilient flooring at all locations where resilient flooring abuts another material, or plain concrete. All dividing strips shall be extruded solid zinc.

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

1.14 Obtain manufacturer's and TTMAC recommendations of slab surface requirements prior to finishing to ensure proper substrate preparation.

1.15 Ambient temperature shall not be less than 10°C. Do not start any finishing operation

Division 03

while there is excess moisture or bleeding water on the surface.

1.16 Finish concrete to level and dense surfaces and in accordance with the following Concrete Finish Schedule. See Room Finish Schedule for finishes applied to concrete.

1.17 Concrete Finish Schedule by location:

i. Pits - Screeded and Bull Floated.

ii. Base slab for stone or ceramic tile floors installed with mortar bed - Comply with TTMAC Guide 09300 requirements.

iii. Concrete to receive ceramic or porcelain tile - Comply with TTMAC Guide 09300 requirements.

iv. Floors to receive resilient flooring, carpet, and sealer - Powered Steel Trowel Finish, moist cure only.

v. Interior exposed slabs except where otherwise specified - Powered Steel Trowel Finish With Non-Slip Swirls.

vi. Concrete to receive waterproofing membrane; epoxy coating, seamless flooring or similar thin fluid applied finishes - Powered (Light) Steel Trowel.

vii. Stair treads - Steel Trowel Finish.

1.18 Hardener: Apply non-metallic hardener in two separate shakes. Apply two-thirds of the total amount in the first application. Steel trowel repeatedly to ensure maximum density. Finally spin trowel finish to produce a non-slip finish.

1.19 Non Slip Inserts: While concrete is still plastic, install non slip inserts in concrete treads and landings, behind the nosing line, and slightly above the finished concrete. Stop inserts 50 mm short of each side.

1.20 Divider Strips: Install shelf-type divider strips at edges of exposed finish concrete surfaces and other materials. Install them on true, straight lines, flush with concrete surfaces and on the centrelines of the door where they occur

1.21 Remedial Work: Grind floor levels which do not comply with specified tolerances to the tolerances required, or level with epoxy or latex compound. Obtain approval of method for correcting tolerances before proceeding.

1.22 Immediately prior to installation of applied floor finishes but not sooner than 28 days after concrete has been placed, examine concrete floor surfaces and repair cracks. Rout cracks which exceed 0.8 mm in width with mechanical router to 12 mm square cross section. Clean and fill cracks as specified for control joints.

Division 04

Section 04 20 00

Unit Masonry

Referenced Standards:

1.1 CAN3-A165 Series-04 CSA Standards on Concrete Masonry Units.

1.2 A370-04 Connectors for Masonry.

1.3 CAN3-A371-04 Masonry Construction for Buildings.

1.4 CAN3-S304.1-04 Masonry Design for Buildings (Limit States Design).

1.5 CSA A179-04 Mortar and Grout for Unit Masonry.

1.6 Conform to CAN3-S304 "Masonry Design for Buildings". Lay masonry to CAN3-A371.

1.7 Verify that water used contains no salts to cause efflorescence.

1.8 Concrete Block: For walls exposed to weather block shall be normal weight modular, to meet CAN3-A165 Series, Facet H/15/A/M and provide lightweight block Facet H/15/D/M for other walls. Provide bullnosed units for exposed corners, and lintel block above doors where required.

1.9 Architectural Block: Modular to meet CAN3-A165 Series Facet H/15/A/M. (Two Rib Split) (Three Rib Split) (Four Rib Split) (Six Rib Split) (Full Split Face) (One Scored) (Two Scored) (Ledge) (Grid).

1.10 Provide special sizes and shapes required including but not limited to, plain ends, halves, jambs, sash, lintel, bullnose, and other shapes. Special shapes shall be manufactured to shape, not cut. Use solid units at jambs of overhead doors and at top of interior walls. Use bullnosed units for all external corners.

1.11 Provide architectural blocks having void to solid ratios and aggregate as required to achieve required fire ratings for width of fire rated walls shown. Provide solid filled blocks at tops of all fire rated block partitions to support fire stop.

1.12 Notwithstanding the appearance requirements of the above mentioned CSA Standards, block shall be free from all surface indentations, surface cracks and other defects detrimental to the appearance of the finished surface. Block having visual defects shall be rejected for exposed areas but may be used for concealed or unfinished areas.

1.13 Mix mortars as specified in CSA A179 using the Proportion Specification.

1.14 Add bonding agent in accordance with manufacturer's instructions.

1.15 Mortar and Grout Type ‘N’ conforming to CSA A179.

1.16 All reinforcement designs shall meet criteria of CSA 370-94.

1.17 Verify with those performing work specified in other Sections that air vapour barrier, through-wall and dampproof flashings, waterstops, sheet metal air/vapour barrier flashings, accessories, access panels, frame anchors, guards, sills, and such items specified in other Sections are available for building in before work commences. Cooperate in the setting and aligning of built-in work and

provide for later installation of items which are included in the work of other Sections to avoid cutting, fitting, and patching.

1.18 Lay architectural block using stack bond unless indicated otherwise.

1.19 Anchor masonry construction to ensure its stability and to withstand loads imposed by intended use and by natural elements. Embed bolts and anchors solidly in mortar or grout to develop maximum resistance to design forces.

1.20 Anchors shall be spaced at the maximum vertical and horizontal spacing specified in CSA A370.

1.21 Where lateral support at the top of a wall is required anchors or clip angles shall be installed at a spacing not exceeding 10 times the nominal wall thickness in accordance with CSA A370.

1.22 Fill cells of block units at parapet walls with grout in accordance with CAN3-A371, "Appendix G1".

1.23 Where masonry is attached to structural studs secure in accordance with anchor manufacturer's instructions.

1.24 Provide 5.20 mm wire joint reinforcing every second course at columns which have masonry fireproofing to the satisfaction of the authority having jurisdiction.

1.25 Walls which provide required fire separations shall be constructed of masonry units which are approved by Jurisdictional Authorities for material thickness, and rating.

1.26 Unless otherwise approved by Jurisdictional Authorities, in no case shall unplastered fire separation walls of solid construction be reduced in any part to a thickness less than the listed actual dimensions for the separation ratings.

Division 05

Section 05 21 00

Steel Joist Framing

1.1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 All codes, standard specifications and by-laws referred to in this section shall be latest editions including all revisions, addenda and supplements.

1.3 Conform to the Ontario Building Code and the Occupational Health and Safety Act.

Conform to the following CSA Standards:

1.4 S16-09 Design of Steel Structures.

1.5 W59-03 (R2008) Welded Steel Construction (Metal Arc Welding).

1.6 W47.1-09 Certification of Companies for Fusion Welding of Steel.

1.7 W178.1-08 Certification of Welding Inspection Organizations.

1.8 W178.2-08 Certification of Welding Inspectors.

1.9 G40.20/G40.21-04 (R2009) General Requirements for Rolled or Welded Structural Quality Steel.

1.10 S136-07 North American Specification for the Design of Cold-Formed Steel Structural Members.

1.11 Conform to ASTM A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated.

1.12 Conform to ASTM A307-07b Standard Specification for Carbon Steel Bolts and Studs.

1.13 Conform to ASTM A123/A123M-09 Standard Specification for ZINC (Hot Dip Galvanized) coatings on Iron and Steel Products.

1.14 Conform to CAN/CGSB-1.210-2003 Quick-Drying Alkyd Primer for structural steel.

1.15 Conform to CISC/CPMA 1-73a Quick-Drying, One-Coat Paint for use on Structural Steel.

1.16 Conform to CISC/CPMA 2-75 Quick-Drying, Primer for use on Structural Steel.

1.17 Design details, new connections and open web steel joists by a Licensed Professional Engineer, to requirements of CSA-S16 or CSA-S136 to resist forces, moments and shears.

1.18 Beam connections shall be designed for a minimum of 50% of the shear capacity of the beam.

1.19 For non-standard connections, submit sketches and design calculations stamped and signed by the licensed Professional Engineer responsible for the design.

1.20 Design steel joists and bridging to carry loads indicated or implied by the drawings in accordance with CSA-S16 or CSA-S136.

1.21 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.

1.22 Conform to any Fire Rated Assembly Design specified to the project.

1.23 All shop drawings shall bear a Professional Seal and Signature.

Division 05

1.24 All steel joists shall be designed by a Professional Engineer experienced in this type of design and all drawings and calculations shall bear a Professional Seal and Signature.

1.25 Structural steel sections and plates and all connection angles and plates shall conform to CSA Standard G40.20/G40.21 as follows:

i W shapes – Grade 350W. S shapes – Grade 300W.

ii HSS Shapes – CSA G40.21 Grade 350W Class C.

iii Channels, Angles, Plates and Rod – Grade 300W.

1.26 Welding materials: to conform to CSA Standard W59.

1.27 High Strength Fasteners, Bolts, Nuts, and Washers to conform to ASTM A325.

1.28 Machine Bolts, Nuts and Washers to conform to ASTM 307.

1.29 Anchor Rods to conform to CSA G40.20/G40.21 Grade 300W.

1.30 Sag Rods to conform to CSA G40.20/G40.21.

1.31 Strap Anchors to conform to CSA G40.20/G40.21.

1.32 Shear Stud Connectors to conform to ASTM A108 (Fy=345 MPa).

1.33 Shop Primer and Field 'touch-up" Paint to conform to the specified standards.

1.34 For exterior exposed steel where surfaces are specified to be primed provide an inorganic Zinc Primer and Field "touch-up".

1.35 For field "touch-up" of galvanized surfaces use same product as specified primer.

1.36 For connections at all members specified to be galvanized, provide galvanized nuts, bolts, washers, clip angles and plates etc.

Section 05 41 00
Structural Metal Stud Framing

The section applies to exterior and interior wall, cold formed metal stud framing (light structural studs) including:

1.1 Wall studs.

1.2 Steel bridging.

1.3 Top and bottom track.

1.4 Head and sill members and jamb studs for wall openings.

1.5 Stud, bridging and track connections.

1.6 Top and bottom track connection to main structure including detailing to accommodate floor deflections.

1.7 Metal studs or hat channels to support interior gypsum board. Gypsum board is excluded from this section.

Division 05

1.8 Provision for support and attachment of items to be supported by work of this Section, including items specified under other Sections.

Referenced Standards:

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

1.10 CAN/CGSB 7.1-98 Lightweight Steel Wall Framing Components.

1.11 CAN/CGSB 19.24-M90 Multi-Component, Chemical-Curing Sealing Compound.

1.12 CSA W47.1-03 Certification of Companies for Fusion Welding of Steel Structures.

1.13 CSA W59-03 Welded Steel Construction (Metal Arc Welding).

1.14 CSSBI Canadian Sheet Steel Building Institute, Lightweight Steel Framing Manual.

1.15 CGSB 1-GP-181M Coating, Zinc Rich, Organic, Ready Mix.

1.16 Welding shall be undertaken only by a fabricator fully certified by the Canadian Welding Bureau and CSA W47.2, as may be applicable.

1.17 Follow recommendations of CSSBI "Lightweight Steel Framing Manual".

1.18 Have work of this Section designed by a Professional Engineer specializing in this type of work and who is licensed to design structures and registered in the Province of Ontario.

1.19 Resistances and resistance factors shall be determined in accordance with the Ontario Building Code and CAN3-S136.

1.20 Transport, store and handle material in a manner to avoid undue damage. Store units free of the ground and protected from mud or rain splashes. Cover units, secure covers firmly, and protect the units from dust, dirt or other staining materials.

Section 05 51 00
Steel Stairs and Handrails

Referenced Standards:

1.1 ASTM A53/A53M-06 Standard Specification for Pipe, Steel Black and Hot Dipped, Zinc Coated, Welded and Seamless.

1.2 ASTM A143-01 Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

1.3 ASTM A307-00 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

1.4 ASTM A325M-03 Standard Specification for High Strength Bolts for Structural Steel Joints (Metric).

1.5 ASTM A519-03 Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing.

1.6 ASTM A563M-04 Standard Specification for Carbon And Alloy Steel Nuts.

1.7 CSA W47.1-03 Certification of Companies for the Fusion Welding of Steel.

Division 05

1.8 CSA W47.2-M1987 (R1998) Certification of Companies for Fusion Welding of Aluminum.

1.9 CSA W55.3-1965 (R1998) Resistance Welding Qualification Code for Fabricators of Structural Members Used In Buildings.

1.10 CSA W59-03 Welded Steel Construction (Metal Arc Welding).

1.11 CAN/CSA-G40.20-04/G40.21-04 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

1.12 CAN/CSA-G164-M92 (R1998)Hot Dip Galvanizing of Irregularly Shaped Articles.

1.13 CISC/CPMA 2-75 Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association-A Quick Drying Primer for Use On Structural Steel.

1.14 Execute work of this Section using a firm thoroughly conversant with governing laws, bylaws, and regulations. Use workmen skilled in this work.

1.15 Welding of structural components shall be done only by fabricators certified by CSA W47.1 or W55.3 as applicable, for welding of steel, and CSA W47.2-M1987 for welding of aluminum, and who shall perform welding to conform to W59.

1.16 Weld all connections where possible, and bolt where not possible. Provide method to prevent loosening of nuts.

1.17 Ream holes drilled for fastenings.

1.18 Make welded joints tight, flush, and in true planes with base metals.

1.19 Make welds continuous at joints where entry of water into building or into voids of members or assemblies is possible.

1.20 Grind welds in exposed locations smooth in a manner that will not leave blemishes on exposed surfaces.

1.21 Join members generally by inert metal arc welding where practicable, using materials recommended by manufacturers of metals being welded.

1.22 Remove flux completely following welding, and grind and polish joints smooth and clean.

1.23 Where galvanized steel is to be welded, provide adequate ventilation. If adequate ventilation is not available, provide supplementary air circulation.

1.24 Touch up all uncoated weld areas.

1.25 Design work of this section in accordance with the Ontario Building Code.

1.26 The fabricator shall ensure the design details of the railings and stairs, and the connections to the building structure, satisfy all the requirements of the Ontario Building Code. The fabricator shall employ a Professional Engineer registered in the Province of Ontario if deemed necessary.

1.27 Submit shop drawings in accordance with Section 01300 for this work, including large-scale detail of members and materials, connection and jointing details, anchorage devices, dimensions, gauges, thicknesses, description of materials, metal finishing, as well as all other pertinent data and information, for the College's review before fabrication.

Division 05

1.28 Provide and maintain protection for work of this Section.

1.29 Protect exposed surfaces of metal work with protective coatings or wrappings.

1.30 Use materials recommended by finishers or manufacturers of metals, to ensure that method is sufficiently protective, easily removable, and harmless to the finish.

1.31 Raise the articles from the ground and separate with strip spacers to provide free access of air to most parts of the surface. Incline in a manner which will give continuous drainage.

1.32 Metals shall be free from defects which impair strength or durability, or which are visible.

1.33 Metals shall be new, of best quality, and free from rust, or waves, or buckles, clean, straight, and with sharply defined profiles.

1.34 Select materials for surface flatness, smoothness, and freedom from surface blemishes when exposed to view in finished unit. Exposed-to-view surfaces which exhibit pitting, seam marks, roller marks, "oil-canning", stains, discolorations, dents or other imperfections on finished units will not be acceptable.

1.35 Sheet: cold-rolled furniture steel, double annealed, mill stretched and leveled, and fully pickled. Otherwise, steel shall be hot-rolled or cold-rolled of alloy to suit needs of fabrication, use, and appearance.

1.36 Grating Treads and Landings: As manufactured by Borden Metal Products, Amico-ISG, Armco Irving or Dominion Bridge. Treads shall be sized as shown, with 32 mm x 5 mm bearing bars and incorporating 32 mm crosshatch abrasive nosing, or Diamond Grip channel type manufactured by ISG or equivalent by the other listed manufacturers'.

Primers and Coatings:

1.37 Interior Steel in Dry Areas: Quick drying oil alkyd conforming to CISC/CPMA 2.75.

1.38 Exterior Steel, Interior Steel in Unheated Areas, Steel Embedded in Concrete: Hot dip galvanized conforming to CSA G164, minimum Z275 coating.

1.39 Galvanized Coating Touch-Up: W.R. Meadows "Galvafroid" or Kerry Industries "Z.R.C." zinc rich coating or similar manufacturer containing minimum 90% zinc by weight.

1.40 Fastenings: Nuts and bolts shall conform to ASTM A307, A325, and A563 as applicable.

1.41 For interior work: cadmium-plated fastenings where other protection is not specified.

1.42 Anchors and Shims: For exposed anchorage, use stainless steel and otherwise to match metal anchored. For non-exposed work, anchors and shims may be galvanized steel.

1.43 Ferrous steel pipe: to ASTM A53, Type S- Seamless, Grades A and B.

1.44 Ferrous steel square tube: to ASTM A519, cold drawn, seamless and welded.

1.45 Non-Shrinking Grout: "In-Pakt" by King Construction Products, "V-3" by W.R. Meadows or "M-Bed" by Sika Canada Inc.

1.46 Fabricate this work with machinery and tools specifically designed for the intended manufacturing processes, and with skilled tradesmen.

Division 05

1.47 Fit and assemble work in the shop. When this is not possible, make a trial shop assembly.

1.48 Materials, component sizes, gauges of metals, anchorage and fastenings shall be of adequate strength to withstand the intended use within allowable design factors, as buckling, opening of joints and seams, distortion and permanent deformation.

1.49 Stairs, ladders and handrails shall support applicable live loads specified in the Ontario Building Code.

1.50 Ensure that work will remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.

1.51 Accurately cut, machine, and fit joints, corners, copes and mitres so that junctions between components fit together tightly, and in true planes.

1.52 Fasten work with concealed methods, unless otherwise indicated on the Drawings.

1.53 Provide for differential movements within assemblies and at junctions of assemblies with surrounding work.

1.54 Provide holes and connections for work installed under other Sections of this Specification.

1.55 Cleanly and smoothly finish exposed edges of materials, including holes.

1.56 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.

1.57 Prime Painting of Ferrous Steel: Clean all loose mill scale, rust, dirt, weld flux, and spatter from work after fabrication. Grind smooth sharp projections. Prepare for prime painting by blast cleaning to SSPC-SP6 standard. Apply a shop prime coat of paint. Work paint into corners and onto open areas smoothly. Deliver work to site with primer undamaged. Paint all surfaces except those to be welded in the field, or those encased in concrete. Give surfaces that are inaccessible to finish field painting two coats of primer.

1.58 Galvanized Steel: Use minimum Z275 coating.

1.59 Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot dip galvanizing.

1.60 Galvanize steel members, fabrications, and assemblies after fabrication by the hot dip process in accordance with CSA G164.

1.61 Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with CSA G164.

1.62 Safeguard products against steel embrittlement in conformance with ASTM A143.

Steel Railings, Handrails and Guardrails:

1.63 Provide steel handrails, railings, guardrails, wire mesh balustrade and clips, rod pickets, flanges and brackets to details shown. Min. wall thickness 12 ga.

1.64 Form rail-to-end post connections and all changes in rail direction by mitred joints or radius bends as applicable.

1.65 Remove burrs from all exposed cut edges.

Division 05

1.66 Form bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends.

1.67 Close exposed ends of pipe and tube by welding metal closure in place or by use of prefabricated fittings.

1.68 For posts set in concrete, furnish matching sleeves.

1.69 Work shall be one piece or in as long lengths as possible. Join pipe sections using concealed connectors.

1.70 Weld all field joints, grind and polish smooth to match base metal.

Stairs:

1.71 Framing shall not restrict required width or headroom.

1.72 Weld all connections where possible; where not possible, bolted connections will be permitted, but bolts shall be cut off flush with nuts and made as inconspicuous as possible.

1.73 Extend handrails horizontally at sides of stairs and ramps in accordance with the O.B.C.

1.74 Take site measurements to ensure that work is fabricated to fit surrounding construction around obstructions and projections in place, or yet to be put in place to suit service locations, and inaccuracies of construction.

1.75 Install work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding work.

1.76 Work includes anchor bolts, bolts, washers and nuts, lag screws, expansion shields, toggles, straps, sleeve brackets, clips, shims and other items necessary for secure installation, as required to support and/or resist loads and forces, and as required by Jurisdictional Authorities.

1.77 Hand to appropriate trades, items over for casting into concrete or building into structure together with setting templates.

1.78 Insulate between dissimilar metals, or between metals and masonry or concrete with bituminous paint to prevent electrolysis.

1.79 In concrete construction cast vertical pipes into sleeves set into concrete at least 150 mm. Fill with non-shrinking grout.

1.80 In steel construction weld to plates, stringers or other structural member.

1.81 Provide temporary supports and bracing required to position stair assemblies.

1.82 Caulk between components installed under this work. Caulking materials as specified in Section 07900. Caulking between miscellaneous metal work and adjacent work of others is included in the work of Section 07900.

1.83 After erection, touch up prime paint, and shop applied coatings and finishes (prefinishes) damaged or removed during installation.

1.84 Remove damaged, dented, defaced, defectively finished, or tool-marked components and replace with new. Clean off dirt on surfaces resulting from installation work.

Division 06

Section 06 10 00
Rough Carpentry

1.1 N.L.G.A. 1991 National Lumber Grades Authority, Standard Grading Rules for Canadian Lumber.

1.2 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

1.3 Plywood identification: by grade mark in accordance with applicable CSA Standards.

1.4 Each panel of plywood required to be fire retardant treated to bear ULC label indicating

1.5 Flame Spread Classification (FSC), and smoke developed.

Referenced Standards:

1.6 CSA-B111-1974 (R1998) Wire Nails, Spikes and Staples.

1.7 CSA-0121-M1978 (R1998) Douglas Fir Plywood.

1.8 CSA-0141-05 Softwood Lumber.

1.9 CSA-0151-04 Canadian Softwood Plywood.

1.10 CAN/CSA 080 Series-00 Wood Preservation.

1.11 CAN/ULC-S102-M88 (R2000) Standard Method of Test for Surface Burning.

1.12 Characteristics of Building Materials and Assemblies.

1.13 CAN/CSA G164-M92 Hot Dip Galvanizing of Irregularly Shaped Objects.

1.14 CAN/CSA-080.27-M89 Fire Retardant Treatment of Plywood by Pressure Processes.

1.15 CAN/CSA 086-01 Engineering Design in Wood.

1.16 NFPA 80-1999 Fire Doors and Windows.

1.17 When it is required that wood maintain dimensional stability and tolerances, to ensure accurate installation of later work, store and install it only in dry areas and when no further installation of moist materials is contemplated.

1.18 Provide dry storage areas for rough carpentry materials. Stack lumber [150 mm|6"] clear of floor.

1.19 Protect fire-retardant materials against high humidity and moisture.

1.20 Cover materials stored on site with tarpaulins or polyethylene sheets to prevent moisture, absorption and impairment of structural and aesthetic-properties.

1.21 Lumber shall be softwood S4S, SPF species moisture content (MC) not greater than 19% at time of installation in accordance with the following standards; CSA 0141, NLGA Standard grading rules for Canadian Lumber.

1.22 Machine stress - rated lumber is acceptable for all purposes.

1.23 Lumber: S-DRY, graded and stamped to National Lumber Grades Authority, Standard Grading Rules for Canadian Lumber.

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1.24 Studs: spruce, pine or fir (SPF), 121c. Labeled "STUD".

1.25 Blocking, furring, strapping, curbs, battens, nailers, bracing, bridging, and cants: spruce, pine or fir (SPF), standard or better grade.

1.26 Exterior wood: wood species and grades as specified above; pressure treated with CCA to CAN/CSA-080-Series-M89, minimum retention 4.0 kg/m³ by assay.

1.27 Bolts, Nuts, Washers, Screws and Pin Type Fasteners: Hot dip galvanized to CAN/CSA G164 for exterior work and for pressure preservative treated lumber. Elsewhere for sight exposed surfaces, prime paint.

1.28 Use surface fastenings of following types, except where specified type is indicated: To hollow masonry, gypsum board and panel surfaces use toggle bolts, to solid masonry and concrete use expansion shield with lag screw, or lead plug with wood screw.

1.29 Comply with CAN3-086 or CAN3-086.1 for all fabrication and assembly of structural components off site, or on site.

1.30 Design construction details for expansion and contraction of materials.

1.31 Lay out work carefully and to accommodate work of others. Cut and fit accurately. Erect in position indicated on drawings. Align, level, square, plumb and secure work permanently in place. Join work only over solid backing.

1.32 Bore holes true to line, and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for boltheads and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before being concealed by other work or at completion of work.

1.33 Work shall include such rough hardware as nails, bolts, nuts, washers, screws, clips, hangers, connectors, and strap iron required for installation of work, and all operating hardware required on work of this Section for temporary work.

Division 07

Section 07 10 00
Dampproofing and Waterproofing

Referenced Standards

1.1 CAN/CGSB-37.2-M88 Emulsified Asphalt, Mineral Colloid Type, Unfilled, For Dampproofing and Waterproofing and for Roof Coatings.

1.2 CAN/CGSB-37.16-M89 Filled, Cutback Asphalt for Dampproofing and Waterproofing.

1.3 CAN/CGSB 37-GP-3-M89 Application for Emulsified Asphalts for Dampproofing or Waterproofing.

1.4 CAN/CGSB-37-GP-9Ma Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.

1.5 CAN/CGSB-37.29-M89 Rubber-Asphalt Sealing Compound.

1.6 Do not proceed with work when wind chill effect would tend to set bitumen before proper curing takes place.

1.7 Maintain air temperature and structural base temperature at dampproofing installation area above 5 □C for 24 hours before, during and 24 hours after

1.8 Do not apply dampproofing in wet weather.

1.9 Provide forced air circulation during installation and curing periods for enclosed applications.

1.10 Surface to receive dampproofing shall be firm, and free from loose material, projections, grease, oil or other material detrimental to dampproofing. Clean substrate as may be required.

1.11 Apply dampproofing on exterior side of basement foundations against earth and elsewhere as required.

1.12 Apply in strict accordance with manufacturer's directions.

1.13 Dampproofing shall consist of minimum one prime coat and one full coat of asphalt dampproof coating.

1.14 Apply coatings leaving no pinholes, breaks, or other defects. Take care that each succeeding coat is not applied until the preceding coat has set. Allow final coat to set before permitting backfilling to begin.

1.15 Apply two additional coats to vertical corners and construction joints for a minimum width of 200 mm on each side, and all around and for 200 mm along pipes passing through walls.

Division 07

Section 07 31 00
Shingled Roofing Systems and Accessories

Referenced Standards

1.1 Flashing:
- i ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ii ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- iii ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.

1.2 Fasteners:
- i ASTM F 1667 - Specification for Driven Fasteners, Nails, Spikes and Staples, Type I, Style 20.
- ii CSA B 111 - Wire Nails, Spikes, and Staples.

1.3 ASTM D 226 / D 226M - 09 Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Waterproofing.

1.4 ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection.

1.5 ASTM D 3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.

1.6 ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).

1.7 ASTM D 7158/D 7158M-11 - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method).

1.8 ASTM D 3462 - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.

1.9 ASTM D 4869 / D 4869M - 05(2011) - Standard Specification for Asphalt Saturated Organic Felt Underlayment Used in Steep Slope Roofing.

1.10 ASTM E 108 - 11 - Standard Test Methods for Fire Tests of Roof Coverings (ULC S107).

1.11 ASTM D7530 / D7530M – 10 Standard Specification for Self-Adhesive Glass Fiber Fabric Reinforced Polymer Modified Asphalt Steep Slope Roll Roofing Surfaced with Mineral Granules.

1.12 Asphalt Roofing Manufacturers Association (ARMA).

1.13 Canadian Asphalt Shingle Manufacturers' Association (CASMA):
- i CSA A 123.2 Asphalt Coated Roofing Sheets.
- ii CSA A 123.3-05 (R2010) Asphalt Saturated Organic Roofing Felt.
- iii CAN/CSA A 123.5-05 (R2010) Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granule.
- iv CAN2 51.32 Sheathing, Membrane, Breather Type Paper.
- v CAN3 A 123.51 -M85 (R2011) Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
- vi CAN3 A 123.52 Asphalt Shingle Application on Roof Slopes 1:6 to Less than 1:3.

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1.14 Canadian Roofing Contractors Association (CRCA):
- i FM Class Number 4473 Specification Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls.
- ii National Roofing Contractors Association (NRCA).
- iii UL 790 - (Exterior Exposure), Standard Test Methods for Fire Tests of Roof Coverings.
- iv UL 997 - Wind Resistance of Prepared Roof Covering Materials.
- v UL 2218 - Impact Resistance of Prepared Roof Covering Materials Asphalt Roofing.

1.15 Submittals:
- i Submit under provisions of Section 01300 – Submittals.
- ii Product Data: Manufacturer's data sheets, including product characteristics, performance criteria, on each product to be used, including:
- iii Preparation instructions and recommendations.
- iv Storage and handling requirements and recommendations.
- v Installation methods.
- vi Shop Drawings: Indicate specially configured metal flashing, jointing methods and locations, fastening methods and locations, and installation details as required by Project conditions.
- vii Certificate of Compliance: Provide Certificate of Compliance from the manufacturer or an independent laboratory indicating that the asphalt fiberglass shingles made in normal production meet or exceed the requirements of the following:
  - o ASTM E 108/UL 790 indicating Class A Fire Resistance.
  - o ASTM D 3161/D 7158 indicating class of Wind Resistance.
  - o ASTM D 3462/CSA A 123.5-05 indicating product properties.
- viii Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- ix Submit duplicate samples of full-sized shingles to match finish and profile for each type of roofing shingle to be used on the Project.
- x Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.
- xi Submit duplicate samples of full-sized shingles to match finish and profile for each type of roofing shingle to be used on the Project.

1.16 Provide a complete roofing system achieving an ASTM E 108 Class A fire classification.

1.17 Ensure that materials and fastening methods meet requirements of jurisdictional authorities. The Installer shall be licensed or otherwise authorized to install roofing in the jurisdiction the work is to be performed in.

1.18 Install all roofing products in accordance with all Federal, Provincial and local building codes.

1.19 All work shall be performed in a manner consistent with current OH&SA guidelines.

1.20 Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

1.21 Provide all primary roofing products including shingles, underlayment, ice and dam protection and leak barrier by a single manufacturer.

1.22 Installer Qualifications: Where required for extended limited warranty coverage, the installer shall be approved or otherwise authorized by the Manufacturer to install all roofing products to be

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installed on this project. Work is to be executed only by those skilled to perform it expeditiously and who has been responsible for satisfactory installations similar to that specified during a period of at least the immediate past three years.

1.23 Conduct transport of materials to the job site storage compound in such a manner to prevent in-transit damage. These measures shall include, but not limited to crating, polyethylene wrapping system, etc.

1.24 All materials shall arrive on site with their original containers or wrappings carrying the manufacturer's seals and labels intact.

1.25 Store materials at least 100 mm (4 inches) off the ground or roof deck and be contained in the manufacturer's unopened and labeled packaging until they are ready for installation. Packing is to have the manufacture's name, product brand name, and standards pertaining thereof.

1.26 Store bundles on a flat surface. Maximum stacking height shall not exceed manufacturer's recommendations. Store all rolls on end.

1.27 Remove all existing roofing down to the roof deck.

1.28 Verify that the deck is dry, sound, clean, and smooth. It shall be free of any depressions, waves, and/or projections. Cover with sheet metal, all holes over 25 mm (1 inch) in diameter, cracks over 12 mm (1/2 inch) in width, loose knots, and excessively resinous areas.

1.29 The roof deck shall be smooth, firm, dry, and securely nailed. Plywood shall be exterior grade, conforming to building code requirements. Half-inch (13 mm) plywood is recommended for best deck performance.

1.30 Verify that the deck is structurally sound and free of deteriorated decking. All deteriorated decking shall be removed and replaced with new materials.

1.31 Clean deck surfaces thoroughly prior to installation of Ice & Water protector membranes used for eaves protection and before installation of underlayment.

1.32 At areas that receive Ice & Water protector membrane, fill knotholes and cracks with latex filler.

1.33 Apply each part of the roofing system only when surfaces are clean and dry.

1.34 Do not begin installation until the roof deck has been properly prepared.

1.35 The installation of asphalt shingles on dimensional lumber (including shiplap/board decks) is not recommended as it may potentially cause buckling problems. Buckling will not be covered by the Limited Material Warranty.

1.36 Follow manufacturer's application instructions in conjunction with manufacturer's reference standards and in accordance with local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.

1.37 Install asphalt shingles on roof slopes in accordance with CAN3 A 123.51-M85 and per manufacturer instructions. Follow whichever method is the more stringent.

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1.38 Install ice dam protection underlayment directly on plywood at all eaves and roof edges as well as at all penetrations, abutments, and to vertical walls. Apply 1-ply of underlayment over the entire deck surface, except where Ice & Water protector membrane has been installed.

1.39 Install eaves edge metal flashing tight with fascia boards; lap joints 51 mm (2 inches) and seal with plastic cement; nail at the top of the flange.

1.40 Base flashing shall be in place before shingles are applied. Cap flashings of sheet metal and base flashing of metal or mineral surfaced roofing shall be used at chimneys, skylights, vents, walls and other vertical surfaces and sealed with asphalt plastic cement. Flashing shall conform to the requirements of applicable building codes and good roofing practice.

1.41 Overhang eaves with underlayment by a nominal 6 mm (1/4 inch) minimum and extending up the roof at least 600 mm (24 inches) beyond the interior wall line.

1.42 In colder climates where required by codes, and on all roofs with slopes between 2:12 and 4:12 (low slopes), install eaves protection using an Ice & Water protector membrane product, up the slope from eaves edge a full 914 mm (36 inches) or to at least 610 mm (24 inches) beyond the interior "warm wall". Lap ends 152 mm (6 inches) and bond.

1.43 Use 2 layers of asphalt saturated felt (or equivalent), the first sheet overlapping the eave protection by 480 mm (19 inches), followed by full 914 mm (36 inches) widths overlapping each preceding course by 480 mm (19 inches). For areas where the roof slope is 150 mm per 300 mm down to 100 mm per 300 mm (6 inches per foot down to 4 inches per foot), cover the remainder of the deck with one ply asphalt saturated felt (or equivalent) laid parallel to the eaves, with 51 mm (2 inches) horizontal laps and 104 mm (4 inches) end laps. Apply metal drip edges on top of any underlay along rake edges and directly to the deck along eaves.

1.44 Install eaves protection at least 914 mm (36 inches) wide and centered on valleys. Lap ends 152 mm (6 inches) and seal.

1.45 Where valleys are to be "open valleys", install metal flashing over Ice & Water protector membrane before roof deck underlayment is installed; DO NOT nail through the flashing. Secure the flashing by nailing at 450 mm (18 inches) on center just beyond edge of flashing so that nail heads hold down the edge of the flashing.

1.46 Install one layer of roof deck underlayment over the entire area not protected by Ice & Water protector membrane. Install sheets horizontally so water sheds.

1.47 On roofs sloped at more 4:12, lap horizontal edges at least 51 mm (2 inches) and at least 51 mm (2 inches) over eaves protection membrane.

1.48 On roofs sloped between 2:12 and 4:12, lap horizontal edges at least 480 mm (19 inches) and at least 480 mm (19 inches) over eaves protection membrane.

1.49 Lap ends at least 102 mm (4 inches). Stagger end laps of each layer at least 914 mm (36 inches).

1.50 Lap underlayment over valley protection at least 152 mm (6 inches).

1.51 Vent pipes: Install a 600 mm (24 inches) square piece of Ice & Water protector membrane lapping over roof deck underlayment; seal tightly to pipe.

Division 07

1.52 Vertical walls: Install Ice & Water protector membrane for eaves protection extending at least 152 mm (6 inches) up the wall and 305 mm (12 inches) on to the roof surface. Lap the Ice & Water protector membrane over the roof deck underlayment. Sheet metal flashing along the slopes of roof shall be stepped with a minimum of 76 mm (3 inches) head lap in both lower flashing and counter flashing. Where roof slopes downward from wall, flashing shall extend over shingles. Where a roof slopes upward from the wall, flashing shall extend up the slope under the shingles to a point equal in height of 400 mm (15-3/4 inches) to the flashing on masonry. Counter flashing shall be embedded approximately 25 mm (1 inch) into the wall with turn back water stop.

1.53 Skylights and roof hatches: Install Ice & Water protector membrane from under the built-in counter flashing and 305 mm (12 inches) on to the roof surface, lapping over roof deck underlayment.

1.54 Chimneys: Intersection of shingle roofs and masonry walls or chimneys shall be protected using 24 gauge (or better) galvanized sheet metal to extend not less than 152 mm (6 inches) up the wall and 305 mm (12 inches) on to the roof surface. Lap the Ice & Water protector membrane over the roof deck underlayment.

1.55 Rake Edges: Install metal edge flashing over the Ice & Water protector membrane and roof deck underlayment; set tight to rake boards; lap joints at least 52 mm (2 inches) and seal with plastic cement; secure with nails.

1.56 Minimize breakage of shingles in cold weather (below 4 degrees C or 40 degrees F) by avoiding dropping bundles on edge or by "breaking bundles" over the roof ridge or other bundles. Separating shingles carefully, taking extra precautions in colder temperatures.

1.57 Handle shingles carefully in hot weather to avoid scuffing the surfacing or damaging the shingle edges.

1.58 Install the asphalt shingles on roof slopes in accordance with CAN3 A 123.51-M85.

1.59 Use galvanized (zinc coated) roofing nails, 11 or 12 gauge, with at least 10 mm (3/8 inches) diameter heads, long enough to penetrate through plywood or 20 mm (3/4 inches) into boards.

1.60 Use 4, 5, or 6 nails per shingle placed in the nail line per manufacturer's instructions and local codes. Placement of nails varies based on the type of shingle specified, roof slope, and other environmental considerations. Consult the manufacturer's application instructions for the specified shingle for details.

1.61 Drive nails straight so that nail head is flush with, but not cutting into shingle surface. Do not overdrive or under drive the nails.

1.62 Shingle offset varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.

1.63 For high wind areas, or on slopes of 21:12 (60 degree) or more, use more nails per shingle (consult specific shingle instructions and building code for exact quantity). Ensure that no nail is within 50 mm (2 inches) of a joint/cutout of the underlying shingle.

1.64 Seal down each shingle at time of application with three 25 mm (1 inch) diameter (approx. size and thickness of a quarter) spots of asphalt plastic cement placed under the shingle 51 mm (2 inches) above the bottom edge and equally spaced along the shingle. Apply plastic cement in moderation

Division 07

since excessive amounts may cause blistering. CAUTION: Shingles shall seal to the underlying course when the factory applied asphalt sealant is sufficiently warmed by the heat of direct sunlight.

1.65 When application conditions might limit the effectiveness of the sealing strip, such as in cool weather or in areas subject to high winds or blowing dust, shingle adherence shall be ensured through manual sealing as described above.

1.66 Install valleys using the "open metal valley" method, snap diverging chalk lines on the metal flashing, starting at 76 mm (3 inches) each side of top of valley, spreading at 3 mm per 300 mm (1/8 inch per foot) to the eaves.

1.67 Run shingles to chalk line.

1.68 Trim last shingle in each course to match the chalk line; SEQ level5 do not trim shingles to less than 300 mm (12 inches) wide.

1.69 Cut a 50 mm (2 inches) triangle off the top corner to direct water into the valley and embed the valley end of each shingle into a 75 mm (3 inches) band of asphalt plastic cement.

1.70 Apply a 50 mm (2 inches) wide strip of plastic cement under ends of shingles, sealing them to the metal flashing.

1.71 All penetrations are to be flashed according to Asphalt Roofing Manufacturers Association (ARMA), Canadian Asphalt Shingle Manufacturers' Association (CASMA), Canadian Roofing Contractors Association (CRCA), and/or National Roofing Contractors Association (NRCA) guidelines to meet local building codes.

1.72 Ridge / Soffit Ventilation, cut continuous vent slots through the sheathing, stopping 152 mm (6 inches) from each end of the ridge.

1.73 On roofs without a ridge board, make a slot 51 mm (2 inches) wide, centered on the ridge.

1.74 On roofs with a ridge board, make two slots 45 mm (1-3/4 inches) wide, one on each side.

1.75 Install ridge vent material along the full length of the ridge, including uncut areas.

1.76 Butt ends of ridge vent material and join using roofing cement.

1.77 Install eaves vents in sufficient quantity to equal or exceed the ridge vent area.

1.78 Cover walls and other surfaces in the vicinity of hoisting apparatus (when used) with heavy canvas or other suitable protective material. Any damage caused shall be repaired to match the original materials and appearance at no cost to the Owner.

1.79 Conduct operations to leave deck exposed for the minimum period of time. Protect the work area as required to prevent water infiltration or environmental damage to building interior.

1.80 Material shall be neatly stored, elevated, and protected from damage due to wetness or freezing.

1.81 Maintain all site equipment in good working order.

1.82 Maintain one copy of manufacturers' application instructions at the Project site.

1.83 Proceed with work only when existing and forecasted weather conditions will permit work to be performed as recommended by manufacturer.

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1.84 When application conditions might limit the effectiveness of the sealing strip, such as in cool weather or in areas subject to high winds or blowing dust, shingle adherence shall be ensured through manual sealing.

1.85 Systems described in this Section are intended to be installed in situations where the roof slope is at least 4 inches per foot, and where the roofs are not intended to receive regular foot traffic for equipment maintenance.

1.86 Provide a complete roofing system, making the materials manufacturer responsible for the roofing and flashing system.

1.87 Require the materials manufacturer to make periodic inspections of the work in progress to ensure that the completed work will qualify for the required warranties.

1.88 Coordinate roofing with flashing, parapet and related wall details.

1.89 Submit samples of proposed shingles.

1.90 Roofing shall be completed in its entirety. Phasing will not be permitted.

1.91 Finished roofs shall be protected with plywood sheets for any and all construction traffic, and all equipment moving be accomplished with rollers.

1.92 Include all components of the roof assembly, from the deck up.

1.93 Include sealing of all perimeters, joints, and penetrations.

1.94 Asbestos-containing materials are strictly prohibited.

1.95 Roofing system to be installed in accordance with manufacturer's recommendations.

1.96 The roofing trade shall coordinate with other trades, to receive, accept, and install, all sheet metal flashings.

1.97 Pitch pans, and guy wires fastened directly to the deck are not permitted.

1.98 Protect the work of this Section from damage. Protect other work from damage resulting from this work. Damaged work which cannot be satisfactorily repaired shall be replaced at no additional cost to the Owner.

1.99 Finished work shall be securely anchored, free of distortion and surface imperfections, uniform in colour and pattern.

1.100 All primary and secondary materials shall be supplied by a single manufacturer, or approved by the primary materials manufacturer, to ensure single-point responsibility for the installation and warranty.

Approved College Standards and Product(s):

i Shingles: Cambridge LT fiberglass composite as manufactured by IKO Manufacturing – Toll free: 888-IKO-ROOF (888-456-7663); Web: www.iko.com.
ii Type: Architectural
iii Exposure: 5-7/8 inches (152 mm).

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iv Size: 1038 mm x 349 mm (40 7/8" x 13 3/4").
v Quantity per package: 20 shingles/bundle.
vi Coverage per package: 3.1 m2 (33.3 sq. ft.).
vii FM Class No. 4473, UL 2218 (Impact): Class 4.
viii IKO Iron Clad Protection Period: 15 years.
ix Limited 10-Year Algae Resistant Warranty.
x Limited wind warranty coverage up to: 110 mph (177 kph).
xi High Wind warranty upgrade to 130 mph (209 kph) available.
xii ICC ER - 3532 Listed.
xiii Color: As selected by the College from manufacturer's color range available in the location of the Project.

1.101 Requests for substitutions will be considered in accordance with provisions of Section 01001 - Miscellaneous General Requirements.

Division 07

Section 07 40 00
Roofing and Siding Panels

Referenced Standards

1.1 ASTM A606/A606M-09a Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold- Rolled, with Improved Atmospheric Corrosion Resistance.

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

1.3 CAN/CGSB-19.13-M90 Single-Component, Chemical Curing Sealing Compound.

1.4 Metal siding and soffit shall be installed by the manufacturer's construction forces or by an accredited installer approved by the siding/soffit manufacturer.

1.5 Submit shop drawings for the fabrication and installation of metal siding and soffit in accordance with Section 01300. Show materials, gauges, dimensions, seams, layouts and installation details.

1.6 Submit sample sections of siding and soffit. Finished work shall match samples in colour, finish and texture.

1.7 Cladding panels and connections are to be designed by a Professional Engineer retained by the Contractor.

1.8 Protect the work of this Section from damage. Protect other work from damage resulting from this work. Damaged work which cannot be satisfactorily repaired shall be replaced at no additional cost to the Owner.

1.9 Store materials on site in a manner to prevent damage thereto, or deterioration of finish.

1.10 Galvanized surfaces which show evidence of "white rust" will not be accepted.

1.11 Conduct transport of materials to the job site storage compound in such a manner to prevent in-transit damage. These measures shall include, but not limited to crating, polyethylene wrapping system, etc.

1.12 Install Z-bars and sub-girts to the manufacturer's recommended spacing and to suit wind loads and siding design.

1.13 Siding face sheets shall be one piece full height of siding. Install as per manufacturers specifications. It must be noted that there shall be no apparent difference between face sheets of the same colour.

1.14 Bed all flashings, closures and corner pieces in sealant to provide a weathertight installation.

1.15 Install soffit and fascia panels in accordance with system manufacturer's details and instructions and so as to meet specified design and performance requirements.

1.16 Finished work shall be securely anchored, free of distortion and surface imperfections, uniform in colour and gloss.

1.17 Provide bug screen behind soffit panels to prevent the insect intrusion through system.

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1.18 Prime surfaces and apply sealant around siding, soffit, fascia and openings in panels and below metal flashings to panels in accordance with manufacturer's printed directions for a weatherproof assembly. Tool caulked joints. Remove excess sealant.

1.19 Touch-up marred surfaces with an air drying formulation of the coil paint to match original finish, or replace if necessary.

Section 07 53 16
Ethylene-Propylene-Diene-Monomer (EPDM) Roofing - Ballasted

1.1 Comply with requirements of Division 1.

1.2 Related work: Metal flashings, Section 07620

1.3 Roof System (from top to bottom):

- i Ballast
- ii Single-ply elastomeric (EPDM)membrane
- iii Fibreboard
- iv Sloping insulation where indicated
- v Thermal insulation
- vi Vapour retarder
- vii Fibreboard
- viii Roof deck

1.4 This roofing system must be installed by an applicator authorized by membrane manufacturer, who is a member in good standing with the Ontario Industrial Roofing Contractors Association or the Canadian Roofing Contractors Association, and has a minimum of 5 years of proven satisfactory experience in the type of work specified.

1.5 Upon completion of the installation, an inspection shall be conducted by a qualified technical representative of the membrane manufacturer to ascertain that the roofing system has been installed according to the most current published specifications and details.

1.6 There shall be no deviations made from manufacturer's installation requirements or the approved shop drawings without the prior written approval of the manufacturer.

1.7 Keep manufacturer's current installation instructions on site during execution of work.

1.8 Comply with requirements of Section 01400.

1.9 Deliver materials in original, undamaged, unopened containers.

1.10 Containers are to be labelled with manufacturer's name, brand name, installation instructions and identification of various items.

1.11 Store materials, except membrane, between 10C and 26C. If exposed to lower temperature, restore materials to 15C minimum temperature before using.

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1.12 Store materials, except membrane, in a dry area and protected from water and direct sunlight. Replace damaged materials at no extra cost.

1.13 Do not store roof insulation in direct contact with earth, road surface or roof deck. Place suitable supports under insulation upon delivery to protect from absorbing dampness from surrounding terrain or deck. Protect polystyrene insulation from prolonged exposure to sunlight.

1.14 Do not store more than 1 day's supply of materials on roof at any time. Provide weathertight cover over materials stored on roof in inclement weather.

1.15 Prior to use of any product consult the manufacturer's safety data bulletin for applicable cautions and warnings.

1.16 Some products specified herein are flammable. Take appropriate steps to protect workers and property from hazards, injury and damage.

1.17 Substrates which are to receive roofing materials shall be sound and dry.

1.18 Ensure that design load limitations of structural decks are not exceeded during execution of work.

1.19 Protect work of other Sections from damage; make good any damage caused as directed by the College.

1.20 Do not install materials in rain, cold, moisture, frost, snow or other climatic conditions which could jeopardize proper application of materials. Refer to manufacturer's recommendations and limitations on this subject.

1.21 At no cost to Owner promptly remedy any defects in work, including work of this and other Sections, due to faults in materials and workmanship provided under this Section appearing within a period of 10 years from date of Substantial Performance.

1.22 Use only materials compatible with each other, as recommended and approved by roofing membrane manufacturer.

1.23 Roofing membrane: 1.5 mm (60 mils) thick reinforced EPDM membrane.

1.24 Fasteners, cements, adhesives, sealants, mastics and seals: as recommended by membrane manufacturer.

1.25 Membrane flashings: self-curing membrane flashings.

1.26 Fibreboard: 25 mm thick high density board to CSA A247-1978, Type 1.

1.27 Insulation: rigid, polyisocyanurate board, faced, to CAN/CGSB-51.26-M86: E'NRG'Y 2 by Johns Manville, Atlas Acfoam II or equivalent product by other manufacturer approved by membrane manufacturer.

1.28 Sloping insulation: tapered high density fibreboard by Posislope, Accu-Plane or other manufacturer approved by membrane manufacturer. Unless otherwise indicated, minimum slope 1:50, maximum 1:6.

1.29 Vapour retarder:

i Asphalt felts: Asphalt saturated roofing felt to CSA A123.3-M1979.

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ii Asphalt: CSA A123.4-M1979

1.30 Ballast: rounded, water worn gravel 40 mm nominal diameter with the following gradation: 50% retained on 19 mm screen, 95% retained on 12.5 mm screen, 98% retained on 6.5 mm screen.

1.31 Pavers (if required): 600 x 600 x 50 mm thick standard grey precast concrete paving slabs to CSA A231.1-1972, to be used with 500 x 500 x 25 mm thick extruded polystyrene roof insulation spacers.

1.32 Membrane securement: rubber fastening strip: taped securement recommended by membrane manufacturer.

1.33 Steel curbs, closures: minimum 2 mm thick formed sheet steel to profile and thickness indicated, hot dip galvanized to CAN/CSA G164-M92.

1.34 Prefabricated expansion joint cover: LP expansion joint, with EPDM bellows.

1.35 Examine substrates over which work of this Section is applied and ensure that conditions are satisfactory.

1.36 Start of work shall imply acceptance of conditions.

1.37 Substrates shall be structurally sound, reasonably and uniformly smooth, dry and suitable for roof system installation.

1.38 Install steel curbs and closures where required. Anchor to concrete with expansion type concrete anchors.

1.39 Over roof deck lay fibreboard with long dimension perpendicular to flutes. Stagger end joints; provide full support at end joints. Butt sheathing boards free of gaps and broken edges.

1.40 Secure underlayment to roof deck with screws.

1.41 Over underlayment / roof deck apply vapour retarder consisting of 2 plies of felts in full bed of hot asphalt.

1.42 At terminations extend vapour retarder up and connect to wall air barrier.

1.43 Loose lay insulation boards on top of completed vapour retarder in 2 layers, with joints staggered, to total thickness 70 mm, unless otherwise shown, completely covering areas except roof drains and roof penetrations. Accurately cut insulation to fit at terminations and penetrations.

1.44 Where indicated, apply insulation to vertical surfaces at walls, parapets and curbs.

1.45 Where indicated, provide tapered insulation.

1.46 Do not lay more insulation than can be covered as a finished roofing system on the same day. Stagger side joints in adjacent rows 50%.

1.47 Install fibreboard with joints staggered from joints in insulation layer.

1.48 Execute work in strict accordance with membrane manufacturer's current installation instructions.

1.49 Unroll membrane and position over insulation without stretching, allow membrane to relax approximately 1/2 hour before splicing or securing in place.

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1.50 Position membrane in shingle fashion wherever possible. Stagger end laps in such a way that a 4-corner lap condition does not occur.

1.51 Follow manufacturer's recommended splicing procedure. Remove dirt and dust and clean both of the dry mating surfaces using clean rags or sponges. Change cloths and cleaning solution often to ensure a thorough cleaning.

1.52 Apply bead of lap sealant completely covering splice edge; feather smooth.

1.53 Secure membrane at perimeter of roof area, at curbs, walls and parapets. Provide mechanical securement or tape system as recommended by membrane manufacturer. Fully adhere membrane for 1500 mm width at perimeter.

1.54 Schedule work so that membrane can be temporarily sealed on a down slope surface at the end of each work period.

1.55 Install membrane flashings at curbs, walls, parapets. Use flashing material of longest practicable lengths. Bond membrane to substrate with adhesive and secure along top edge with mechanical securement bar.

1.56 Flash around penetrations through roof system. Coordinate with Section 07620 and make watertight connection to sleeve flashings.

1.57 Make watertight connection to roof drains. Extend membrane into drain and seal together. Install clamping ring exerting only sufficient pressure to affect a seal between clamping ring and membrane. Temporarily block drain pipes during application of granular ballast. Take care to remove blocking when work is not in progress to prevent flooding.

1.58 Provide minimum 100 kg/m² ballast over roof areas. Provide additional 100 kg/m² ballast, 2 m wide around roof perimeter. Exercise special care during ballasting operation not to damage roofing membrane or insulation layer below.

1.59 Provide sufficient ballast at all locations to completely cover membrane; membrane shall not be visible.

1.60 Provide precast pavers in lieu of aggregate ballast if required. Place pavers on top of insulation spacers.

Approved College Standards and Product(s):

xiv Sure-Seal by Carlisle
xv Rubbergard by Firestone
xvi Lexcan EPDM

1.61 Requests for substitutions will be considered in accordance with provisions of Section 01001 - Miscellaneous General Requirements.

Division 07

Section 07 53 17
Ethylene-Propylene-Diene-Monomer (EPDM) Roofing – Fully Adhered

Referenced Standards

1.1 ASTM C1177M-04el Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

1.2 ASTM D1079-05 Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials.

1.3 ASTM D3273-00 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

1.4 ASTM E84-05 Standard Test Methodfor Surface Burning Characteristics of Building Materials.

1.5 ASTM E136-04 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

1.6 CRCA Canadian Roofing Contractors' Association, Roofing Specification Manual.

1.7 ULC Underwriters' Laboratories of Canada Building Materials and Systems Directory, Fire Resistance Directory, Current Edition including Supplements to date.

1.8 CAN/ULC-S102-03 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.9 CAN4-S114-M80 Standard Method of Test for Determination of Non- Combustibility in Building Materials.

1.10 CAN/ULC-S126-M86 Standard Method of Test for Fire Spread under Roof- Deck Assemblies.

1.11 Conform to ASTM D1079 for glossary of terms and definitions of roofing terminology.

1.12 Comply with requirements of Division 1.

1.13 Related work: Metal flashings, Section 07620

1.14 Roof System (from top to bottom):

ix Single-ply elastomeric (EPDM)membrane

x Fibreboard

xi Sloping insulation where indicated

xii Thermal insulation

xiii Vapour retarder

xiv Fibreboard

xv Roof deck

1.15 Submit Product data on membrane, sheathing and flashing materials.

1.16 Submit shop drawings in accordance with Section 01300 showing method of installation and layout of each layer, fastening and flashings at edges, flashing of protrusions and penetrations, details of sheathing and vapour retarder and securement details of sheathing.

Division 07

1.17 This roofing system must be installed by an applicator authorized by membrane manufacturer, who is a member in good standing with the Ontario Industrial Roofing Contractors Association or the Canadian Roofing Contractors Association, and has a minimum of 5 years of proven satisfactory experience in the type of work specified.

1.18 Upon completion of the installation, an inspection shall be conducted by a qualified technical representative of the membrane manufacturer to ascertain that the roofing system has been installed according to the most current published specifications and details.

1.19 There shall be no deviations made from manufacturer's installation requirements or the approved shop drawings without the prior written approval of the manufacturer.

1.20 Keep manufacturer's current installation instructions on site during execution of work.

1.21 Comply with requirements of Section 01400.

1.22 Deliver materials in original, undamaged, unopened containers.

1.23 Containers are to be labelled with manufacturer's name, brand name, installation instructions and identification of various items.

1.24 Store materials, except membrane, between 10C and 26C. If exposed to lower temperature, restore materials to 15C minimum temperature before using.

1.25 Store materials, except membrane, in a dry area and protected from water and direct sunlight. Replace damaged materials at no extra cost.

1.26 Do not store roof insulation in direct contact with earth, road surface or roof deck. Place suitable supports under insulation upon delivery to protect from absorbing dampness from surrounding terrain or deck. Protect polystyrene insulation from prolonged exposure to sunlight.

1.27 Do not store more than 1 day's supply of materials on roof at any time. Provide weathertight cover over materials stored on roof in inclement weather.

1.28 Prior to use of any product consult the manufacturer's safety data bulletin for applicable cautions and warnings.

1.29 Some products specified herein are flammable. Take appropriate steps to protect workers and property from hazards, injury and damage.

1.30 Substrates which are to receive roofing materials shall be sound and dry.

1.31 Ensure that design load limitations of structural decks are not exceeded during execution of work.

1.32 Protect work of other Sections from damage; make good any damage caused as directed by the College.

1.33 Do not install materials in rain, cold, moisture, frost, snow or other climatic conditions which could jeopardize proper application of materials. Refer to manufacturer's recommendations and limitations on this subject.

1.34 At no cost to Owner promptly remedy any defects in work, including work of this and other Sections, due to faults in materials and workmanship provided under this Section appearing within a period of 10 years from date of Substantial Performance (total system warranty).

Division 07

1.35 Use only materials compatible with each other, as recommended and approved by roofing membrane manufacturer.

1.36 Roofing membrane: 1.5 mm (60 mils) thick reinforced EPDM membrane.

1.37 Fasteners, cements, adhesives, sealants, mastics and seals: as recommended by membrane manufacturer.

1.38 Membrane flashings: self-curing membrane flashings.

1.39 Fibreboard: 25 mm thick high density board to CSA A247-1978, Type 1.

1.40 Insulation: rigid, polyisocyanurate board, faced, to CAN/CGSB-51.26-M86: E'NRG'Y 2 by Johns Manville, Atlas Acfoam II or equivalent product by other manufacturer approved by membrane manufacturer.

1.41 Sloping insulation: tapered high density fibreboard by Posislope, Accu-Plane or other manufacturer approved by membrane manufacturer. Unless otherwise indicated, minimum slope 1:50, maximum 1:6.

1.42 Vapour retarder:

iii Asphalt felts: Asphalt saturated roofing felt to CSA A123.3-M1979.

iv Asphalt: CSA A123.4-M1979

1.43 Pavers (if required): 600 x 600 x 50 mm thick standard grey precast concrete paving slabs to CSA A231.1-1972, to be used with 500 x 500 x 25 mm thick extruded polystyrene roof insulation spacers.

1.44 Membrane securement: adhesives, rubber fastening strips and taped securement products all as recommended by membrane manufacturer.

1.45 Steel curbs, closures: minimum 2 mm thick formed sheet steel to profile and thickness indicated, hot dip galvanized to CAN/CSA G164-M92.

1.46 Prefabricated expansion joint cover: LP expansion joint, with EPDM bellows.

1.47 Examine substrates over which work of this Section is applied and ensure that conditions are satisfactory.

1.48 Start of work shall imply acceptance of conditions.

1.49 Substrates shall be structurally sound, reasonably and uniformly smooth, dry and suitable for roof system installation.

1.50 Install steel curbs and closures where required. Anchor to concrete with expansion type concrete anchors.

1.51 Over roof deck lay fibreboard with long dimension perpendicular to flutes. Stagger end joints; provide full support at end joints. Butt sheathing boards free of gaps and broken edges.

1.52 Secure underlayment to roof deck with screws.

1.53 Over underlayment / roof deck apply vapour retarder consisting of 2 plies of felts in full bed of hot asphalt.

Division 07

1.54 At terminations extend vapour retarder up and connect to wall air barrier.

1.55 Loose lay insulation boards on top of completed vapour retarder in 2 layers, with joints staggered, to total thickness 70 mm, unless otherwise shown, completely covering areas except roof drains and roof penetrations. Accurately cut insulation to fit at terminations and penetrations.

1.56 Where indicated, apply insulation to vertical surfaces at walls, parapets and curbs.

1.57 Where indicated, provide tapered insulation.

1.58 Do not lay more insulation than can be covered as a finished roofing system on the same day. Stagger side joints in adjacent rows 50%.

1.59 Install fibreboard with joints staggered from joints in insulation layer. Mechanically fasten with fasteners approved by and in accordance with membrane manufacturers instructions.

1.60 Execute all work in strict accordance with membrane manufacturer's current installation instructions.

1.61 Unroll membrane and position over fiberboard/ insulation without stretching, allow membrane to relax approximately 1/2 hour before splicing or securing in place.

1.62 Position membrane in shingle fashion wherever possible. Stagger end laps in such a way that a 4-corner lap condition does not occur.

1.63 Follow manufacturer's recommended splicing procedure. Remove dirt and dust and clean both of the dry mating surfaces using clean rags or sponges. Change cloths and cleaning solution often to ensure a thorough cleaning.

1.64 Apply bead of lap sealant completely covering splice edge; feather smooth.

1.65 Secure membrane at perimeter of all curbs, walls and parapets. Provide mechanical securement or tape system as recommended by membrane manufacturer. Fully adhere membrane on all verticals and the entire horizontal roof deck.

1.66 Schedule work so that membrane can be temporarily sealed on a down slope surface at the end of each work period.

1.67 Install membrane flashings at curbs, walls, parapets. Use flashing material of longest practicable lengths. Bond membrane to substrate with adhesive and secure along top edge with mechanical securement bar.

1.68 Flash around penetrations through roof system. Coordinate with Section 07620 and make watertight connection to sleeve flashings.

1.69 Make watertight connection to roof drains. Extend membrane into drain and seal together. Install clamping ring exerting only sufficient pressure to affect a seal between clamping ring and membrane. Temporarily block drain pipes during application of granular ballast. Take care to remove blocking when work is not in progress to prevent flooding.

1.70 Provide precast pavers if required. Place pavers on top of insulation spacers.

Approved College Standards and Product(s):

Division 07

xvii Sure-Seal by Carlisle
xviii Rubbergard by Firestone
xix Lexcan EPDM

1.71 Requests for substitutions will be considered in accordance with provisions of Section 01001 - Miscellaneous General Requirements.

Section 07 54 00
Thermoplastic Membrane (TPO) Roofing

Referenced Standards

1.1 ASTM C1177/C1177M-01 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

1.2 CAN/ULC-S704 Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

1.3 CAN/ULC-S706 Standard for Fibreboard Uses

1.4 This roofing system must be installed by a Roofing Applicator approved by the membrane manufacturer.

1.5 Upon completion of the installation the manufacture shall conduct an inspection to ascertain that the membrane roofing system has been installed according to the manufacturer's published specifications and details applicable at the time of bid.

1.6 Submit a warranty in accordance with Section 01300 in the form and to the intent of the standard CRCA roofing guarantee, covering the replacement of defective work for a period of 9 years from the expiration of the standard one-year warranty included in the Contract.

1.7 Defective work will include but not be limited to leaking, failure to stay in place, undue expansion, deformation, delamination and splitting seams, buckles, blisters, and ridges. Subsurface moisture failure to remain in place will be judged as defective work.

1.8 Total warranty period shall be ten (10) years.

1.9

1.10 Deliver materials to the job site in the original, unopened containers labelled with the manufacturer's name, brand name and installation instructions.

1.11 Store TPO membrane in the original undisturbed plastic wrap.

1.12 Store insulation and underlayment and insulation and sealants so it is kept dry and is protected from the elements.

1.13 When feasible, begin the application at the highest point of the highest roof level and work to the lowest point to prevent moisture infiltration and to minimize construction traffic on completed sections. This will include completion of all flashings, terminations and daily seals.

Division 07

1.14 Report defects in the roof deck. The Applicator shall not proceed with installation unless defects are corrected.

1.15 Install in accordance with manufacturer's requirements commencing at the designated low points and drains.

1.16 Replace all broken, damaged or misfit boards as work progresses. Lay only sufficient boards as can be covered by membrane roofing in the same work period.

1.17 Install insulation over air/vapour barrier by means of fasteners, as per manufacturer's specifications.

1.18 Mechanically fasten membrane sheets with the appropriate Fastener/Fastening Plate, within the membrane splice. Provide fastener spacing as recommended by manufacturer to suit roof slope.

1.19 Prepare membrane that has been exposed to the elements for approximately 7 days with Membrane Cleaner.

1.20 Secure the membrane at the perimeter of each roof level, roof section, expansion joint, curb, skylight, interior wall, penthouse, etc., at any angle change which exceeds 50mm in one horizontal foot and at all other penetrations in accordance with manufacturer's instructions.

1.21 Flash all walls and curbs with reinforced TPO membrane. Non-Reinforced membrane shall be limited to inside and outside corners, field fabricated pipe seals, scuppers and Sealant Pockets where the use of premoulded accessories are not practical. Terminate the flashing in accordance with an appropriate manufacturer's Termination Detail.

Section 07 62 00
Sheet Metal Flashing and Trim

Referenced Standards

1.1 The Aluminum Association Inc. (AA)
- i Aluminum Sheet Metal Work in Building Construction.
- ii AA DAF45, Designation System for Aluminum Finishes.

1.2 American Society for Testing and Materials (ASTM International)
- i ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ii ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- iii ASTM D523, Standard Test Method for Specular Gloss.
- iv ASTM D822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

1.3 Canadian General Standards Board (CGBS)
- i CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.

1.4 Canadian Roofing Contractors Association (CRCA)
- i Roofing Specifications Manual.

Division 07

1.5 Canadian Standards Association (CSA International)
- i CSA A123.3, Asphalt Saturated Organic Roofing Felt.
- ii CSA B111, Wire Nails, Spikes and Staples.

1.6 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

1.7 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ150 coating, regular spangle surface, 0.60 mm base metal thickness. Pre-painted to CGSB –GP-71.

1.8 Prefinished sheet with factory applied polyvinylidene fluoride.

1.9 Class F1S

1.10 Colour as selected by the College from manufacturer's standard range.

1.11 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.

1.12 Coating thickness: not less than 22 micrometres.

1.13 Resistance to accelerated weathering for caulk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:

- i Outdoor exposure period 2500 hours.
- ii Humidity resistance exposure period 5000 hours.

1.14 Isolation coating: alkali resistant bituminous paint.

1.15 Plastic cement: to CAN/CGSB 37.5.

1.16 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

1.17 Sealants: Section 07900 – Joint Sealants.

1.18 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

1.19 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

1.20 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

1.21 Touch-up paint: as recommended by prefinished material manufacturer.

1.22 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details as indicated.

1.23 Fabricate aluminum flashings and other sheet aluminum work in accordance with Aluminum Association Aluminum Sheet Metal Work in Building Construction.

Division 07

1.24 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

1.25 Backpaint sheet metal with bituminous paint on surface in contact with concrete, masonry, cementitious materials or dissimilar metal.

1.26 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.

1.27 Maximum Joint Spacing:
- i Parapet Face Flashings: 1200 mm.
- ii Cap Flashing 300 mm and Greater in Width: 1200 mm.
- iii All Other Flashings: 2400 mm.

1.28 Construct flashing joints to allow for flashing movement, using flat "S" lock seams.

1.29 Maintain minimum of 22 mm lap at all joints. Provide 25 mm anchor projection of "S" locks.

1.30 At inside and outside corners, mitre the joint, and use upstanding seams, 25 mm minimum height and 22 mm minimum lap.

1.31 Maintain minimum 1:5 slope on horizontal surfaces of flashings, parapets and control joints.

1.32 Fabricate cap flashing to have a drip leg minimum 110 mm high.

1.33 Fabricate cap and counter flashings to lap 100 mm over base flashings.

1.34 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

1.35 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

1.36 Form flashings, copings and fascias to profiles indicated of 0.60 mm thick prefinished steel.

1.37 Install sheet metal work in accordance with CRCA FL series details and as detailed.

1.38 Use concealed fastenings except where approved before installation.

1.39 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

1.40 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.

1.41 Lock end joints and caulk with sealant.

1.42 Form sheet steel roof drain sleeves, air-stops etc. from 0.70 mm galvanized steel.

1.43 Form gum boxes from 0.70 mm galvanized steel, with 75 mm minimum upstand and 100 mm one piece flanges. Solder joints. Make pans wider than member passing through roof membrane by 50 mm minimum all sides.

1.44 Fabricate roof scuppers from 0.70 mm, prepainted galvanized sheet steel with one piece deck flange, minimum 150 mm. Contour scuppers to cant strips.

1.45 Fabricate splash pans from 0.70 mm galvanized steel.

Division 07

1.46 Fabricate air/firestop below control joint box from 0.70 mm galvanized steel.

1.47 Install vent stacks to same elevation as top of curb.

1.48 Size flashings to extend minimum 150 mm down curb base flashing and screw to base flashing.

Section 07 86 00
Firestopping and Smoke Seals

1.49 Firestopping and smoke seals within mechanical (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside bus ducts) are specified in Divisions 15 and 16 respectively. All other firestopping and smoke seals are the responsibility of this Section.

Referenced Standards

1.50 CAN/ULC-S101-04 Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.51 CAN4-S115-05 Standard Method of Fire Tests for Firestop Systems

1.52 ASTM E119-05a Standard Test Methods for Fire Tests of Building Construction and Materials.

1.53 ASTM E814-02 Standard Test Method for Fire Tests of Through- Penetration Firestop Stops.

1.54 Submit shop drawings and product data in accordance with Section 01340.

1.55 Show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

1.56 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

1.57 It is the intent of this section of the specifications to establish a single, competent source to be responsible for providing firestopping and smoke sealing work for the entire project as clarified under 1.1 above.

1.58 Subcontractor shall be a specialist with accredited experience of not less than 5 years, and as recommended by firestopping/smoke seal manufacturers.

1.59 Firestopping and Smoke Seal Systems: In accordance with CAN4-S115, CAN/ULC- S101, ASTM E119, and ASTM E-814. Unless noted otherwise ‘F’ and ‘T’ ratings 2 hours.

Division 07

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

1.61 Tests shall be performed by an accredited testing agency acceptable to local Jurisdictional Authority.

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

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

1.64 Fire resistance rating of installed firestopping assembly not to be less than the fire resistance rating of surrounding floor and wall assembly as indicated.

1.65 For firestopping and smoke seals at openings intended for ease of re-entry such as cables, use elastomeric seal; do not use cementitious or rigid seal at such locations.

1.66 For firestopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control use elastomeric seal; do not use a cementitious or rigid seal at such locations.

1.67 Primers: To manufacture's recommendation for specific material, substrate, and end use.

1.68 Water (If Applicable): Potable, clean and free from injurious amounts of deleterious substances.

1.69 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.

1.70 Sealants for Vertical Joints: Non-sagging.

1.71 Rock Wool: Roxul "Safe".

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

1.73 Prepare surfaces in contact with firestopping materials and smoke seals to manufacturer's instructions.

1.74 Maintain insulation around pipes and ducts penetrating fire separation.

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

1.76 Install firestopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

Division 07

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

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

1.79 Tool or trowel exposed surfaces to a neat finish.

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

1.81 Work of firestopping and smoke seals shall include but not limited to the following:

i. Top of fire resistance rated masonry and gypsum board work.

ii. Intersection of fire resistance rated masonry and gypsum board work.

iii. Control joints in fire resistant rated masonry and gypsum board work.

iv. Penetrations through fire resistant rated walls.

v. Openings and sleeves installed for future use through fire resistant rated separations.

Division 07

Section 07 90 00
Joint Protection

Referenced Standards

1.1 CAN4-S115 ASTM C1193-05a Standard Guide for Use of Joint Sealants.

1.2 ASTM D1056-00 Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

1.3 CAN/CGSB-19.13-M87 Sealing Compound, One Component, Elastomeric, Chemical Curing.

1.4 CAN/CGSB-2-19.24-M90 Sealing Compound, Multi-Component, Chemical Curing.

1.5 CAN/CGSB 19-GP-22-M89 Sealing Compound, Mildew Resistant, for Tubs and Tile.

1.6 Sealant and Waterproofers InstituteSealant and Caulking Guide Specification.

1.7 Have work performed by a recognized established caulking and sealing contractor having at least ten years experience and with skilled workers thoroughly trained and competent in the use of caulking and sealing equipment and the specified materials.

1.8 In order that recommendations may be made, arrange with sealant manufacturers for one of their technical representatives to visit the site, prior to application of this work, to discuss with the Contractor, in the presence of the Consultant, the procedures to be adopted and to review site conditions, and surfaces and joints to be sealed.

1.9 Discuss the following items:

i. Weather conditions under which work will be done.

ii. Anticipated frequency and extent of joint movement.

iii. Joint design.

iv. Suitability of durometer hardness and other properties of material specified.

1.10 Samples: Prepare sample joints at site of each type of caulking and sealant for each joint condition. Approved joints shall represent minimum acceptable for work.

1.11 Submit manufacturer's name for each compound which will be used on project before commencing work.

1.12 Submit product data of sealants and caulking proposed in accordance with Section 01300.

1.13 Warranty shall provide for repair or replacement of damaged work resulting from leakage, gassing, wrinkling, ridging, sagging, shrinkage, running, loss of adhesion, cohesive failure, or staining of adjoining surfaces.

1.14 Total warranty period shall be 5 years.

Division 07

1.15 Apply materials only to completely dry surfaces, and at air and material temperatures above minimum established by manufacturer's specifications.

1.16 The applicator is responsible for ensuring the sealants are applied under acceptable conditions. Substrate temperatures of less than 4°C require special considerations, to ensure a clean, dry substrate and proper sealant wet-out.

1.17 The substrate to which sealant is to be applied should be dry. This is particularly crucial where the substrate is porous and subject to water absorption. Although the joint interface may appear to be dry, the substrate below the immediate joint surface may still be moist. This moisture can migrate rapidly to the joint surface thereby contaminating any preparation.

1.18 Use a quick flashing solvent such as MEK or Tremco 200 Cleaner to clean the substrates. NOTE: Ensure the substrate and/or any coating on the substrate is compatible with MEK or Tremco Cleaner 200.

1.19 After solvent cleaning, wipe the joint interfaces dry with a second clean rag.

1.20 Immediately following cleaning, install the sealant and tool it.

1.21 Labels indicating conformance to specified reference specifications will be acceptable as verification that contents meet specified requirements. Colour will be selected by College from manufacturer's standard range. Colours shall match surface on which it occurs unless noted otherwise.

1.22 Caulking, sealants, cleaning agents, fillers and primers shall be compatible with each other.

1.23 Interior Non-Traffic Bearing: One-part, non-sag, neutral cure, low-modulus high-performance silicone sealant, Class 100/50, VOC less than 250g/L.

1.24 Exterior Non-Traffic Bearing, Weather Side of Construction: One-part, non- sag, neutral-cure, medium-modulus, UV-resistant, high-performance silicone sealant.

1.25 Type S (single-component), grade NS (non-sag), Class 50 (±50 percent movement capability per ASTM C-719, VOC content – less than 250g/L.

1.26 Exterior Traffic Bearing: One-part, non-sag, neutral-cure, low-modulus, UV resistant, high performance silicone sealant, Class 100/50 movement capability VOC less than 250g/L.

1.27 Sanitary Caulking: Mildew resistant silicone, one-part +/-25% percent movement, high-modulus, acid curing. Non-bleeding and capable of supporting their own weight.

1.28 Primer: Specifically designed for use with compounds on surfaces encountered, and as specified by the compound manufacturer, to assure adhesion of compound and to prevent staining of substrate material.

1.29 Sealant Backing: Extruded, polyethylene round foam rod, 25% wider than joint width, and manufactured especially for caulking purpose. Ensure that sealant backing is not cut nor

punctured during installation. Use closed cell rod for horizontal traffic bearing joints, and open cell rod for vertical joints.

1.30 Bond Breaker: Tape of type supplied or recommended by sealant or caulking manufacturer.

1.31 Remove moisture, loose mortar, dust, oil, grease, oxidation, mill scale, coatings, and all other materials affecting bond of compounds by brushing, scrubbing, scraping, or grinding, from surfaces to which caulking compounds must adhere.

1.32 Ensure that releasing agents, coatings, or other treatments have either not been applied to joint surfaces, or that they are entirely removed.

1.33 Ensure joints are suitable to accept sealant and caulking.

1.34 Before any work is commenced, test the materials for indications of staining or poor adhesion.

1.35 Do not apply material to masonry until mortar has cured.

1.36 Do not exceed shelf life, and pot life of the materials and installation times, as stated by the manufacturers.

1.37 Become familiar with the work life of the material to be used. Do not mix two part materials until required for use.

1.38 Mix sealants thoroughly with a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the materials. Continue mixing until the material is a uniform colour and free from streaks of unmixed material.

1.39 Mask areas adjacent to the joints as required. Prevent contamination of adjacent surfaces. Remove masking promptly after the joint has been completed.

1.40 Work of this Section shall include all sealing and caulking, except where specified under the work of other Sections, to make the building weather and air tight, as indicated typically on drawings, and as otherwise specified.

1.41 Apply materials in accordance with the recommendation of the material manufacturer, in particular, backer rod, priming and depth-to-width ratio.

1.42 Pack joints tightly with sealant backing, set at sealant depth.

1.43 Apply primer with a brush which will permit all joint surfaces to be primed. Perform priming immediately before installation of caulking or sealant.

1.44 Caulking and sealants shall be of gun or knife grade consistency to suit the joint condition. Use gun nozzles of the proper sized to suit the joints and the caulking and sealing material.

1.45 Apply with manually operated or air pressure operated guns.

1.46 Use sufficient pressure to fill all voids and joints. Caulking sealants shall bond to both sides of joint but not backing material.

Division 07

1.47 Ensure that the correct compound depth is maintained. Superficial painting with a skin bead will not be accepted.

1.48 Finished applications shall be a full bead free from air pockets and embedded impurities and having smooth surfaces, free from ridges, wrinkles, sags, air pockets and imbedded impurities.

1.49 After joints have been completely filled, tool them neatly to a slight concave surface.

1.50 Caulk joints in site painted materials after adjacent surfaces have been painted.

1.51 The work shall include, but not limited to the following:

1.52 Exterior and interior hollow metal steel door frames; interior screens (both sides of frames).

1.53 Exposed control joints in masonry walls; masonry wall corners; masonry- to-column junctures; joints in front of steel lintels bearing on exterior masonry jambs.

1.54 Raked joints in junction of walls running at different angles, and at junction of walls to columns.

1.55 Joints between washroom vanities, and other counters, urinals, and adjacent surfaces (use sanitary caulking).

1.56 Wall to floor junctions and joints in floor, where typically indicated on drawings.

1.57 Joints between masonry and concrete surfaces.

1.58 Joints between gypsum board and masonry, or other materials.

1.59 Penetrations through roofs, floors and walls other than firestopping.

1.60 Joints in bottom of precast core slabs.

1.61 At other locations shown on drawings.

1.62 Do not use chemicals, scrapers, or other tools which would damage surfaces of caulked or sealed materials when excess compounds or droppings are removed. Work damaged by cleaning shall be made good under work of this Section.

1.63 Cut out damaged caulking and sealing, re-prepare and prime joints and install new material as specified to the Consultant’s satisfaction.

1.64 Provide wood planks or other approved, non-staining means of protection for the completed caulking and sealants installations where required to protect the work from mechanical, thermal, chemical and other damage by other construction operations and traffic.

1.65 Maintain protection securely in place until project completion.

Division 08

Section 08 10 00
Doors and Frames

1.1 Work Included In this Section: Installation of various types of doors, installation of various types of frames.

1.2 Inspect doors for damage, upon delivery to the site. Minimally marred doors which cannot be readily corrected by sanding shall be promptly returned to the manufacturer.

1.3 Store doors in a dry and clean location. Store in a temperature and humidity controlled area. Stack 150 mm off the floor.

1.4 Be responsible for any damage to doors and frames and related components from time of delivery until accepted by Owner after installation.

1.5 Prepare doors for installation with the required bevels, clearances and mortises for hardware. Install all applicable hardware, including hinges.

1.6 Provide clearance for intended finish flooring.

1.7 Hang doors to swing easily and freely on their hinges, to remain stationary in any position, and to close tightly and evenly on frames without binding.

Section 08 11 00
Hollow Metal Doors and Frames

Referenced Standards

1.1 CAN/ULC-S702-97 Mineral Fibre Insulation

1.2 CAN/CSA-G40.20-04/G40.21-04 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

1.3 CSA W59-03 Welded Steel Construction (Metal Arc Welding).

1.4 CAN4-S104M-M80 (1985) Standard Method of Fire Tests of Door Assemblies.

1.5 CAN4-S105M-M85 Standard Specification for Fire Door Frames.

1.6 CSDFMA Specifications for Commercial Steel Doors and Frames, 1990.

1.7 CSDFMA Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

1.8 NFPA 80-1999 Standard for Fire Doors and Fire Windows.

1.9 NFPA 252Standard Methods of Fire Rests of Door Assemblies, 2003 Edition.

1.10 Steel Fire Rated Doors and Frames: Labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4 S104M and CAN4 S105M for ratings specified or indicated.

1.11 Install labeled steel fire rated doors and frames to ULC requirements and NFPA 80.

Division 08

1.12 Fabricate doors and frames in accordance with the Canadian Steel Door and Frame Manufacturer's Association Standard.

1.13 Brace frame units to prevent distortion in shipment, and protect finished surfaces by sturdy protective wrappings.

1.14 Store doors in protective wrappings in a secure dry location, to ensure that they are not damaged until hung. Install them only when work has progressed to a stage when no damage will occur to them in place.

1.15 Commercial grade steel to ASTM A568 , Class 1, wiped coat galvanized to ASTM A653, coating designation ASTM A653, ZF75.

1.16 Frames in Gypsum Board Partitions: Steel anchor clips and floor anchors of suitable design securely welded inside each jamb.

1.17 Interior units-Steel sheet wipe coated with zinc-iron alloy to a total mass coating both sides of 75 g/m² to conform to ASTM A653, ZF75 coating designation.

1.18 Exterior units-Steel sheet coated with zinc to a total mass coating both sides of 275 g/m² to conform to ASTM A653, Z275 coating designation. Mill phosphatizes to provide for good paint adhesion.

1.19 Fabricate, reinforce and anchor component parts and assemblies to support loads that usage will impose without deflection detrimental to function, appearance or safety. For interior doors either the use of metal stiffeners with the spaces between stiffeners filled with insulation, or honeycomb structural core will be acceptable. For exterior doors the core is to be completely filled with insulation.

1.20 Prepare frames and doors for finish hardware, and electrically controlled devices with mortises, reinforcement, and holes. Drill and tap to template information. Reinforce for surface-mounted hardware and for door closer brackets. Provide for concealed door closers where specified. Install mortar guards at cut-outs and reinforcing plates in frame. For cylindrical locks install reinforcing units to lock manufacturer's specification. For mortise locks provide a suitable internal bracket to hold the lock case rigidly in the centre of the door.

1.21 Weld frame and door assemblies unless honeycombing or plastic insulation is used for core. Weld continuously at joints through which air or water could penetrate from the exterior of the building to the interior. Fill joints flush to make them inconspicuous.

1.22 Isolate from each other dissimilar metals and metal from concrete or masonry, to prevent electrolysis.

1.23 Attach two channel spreaders at bottom of door frames to maintain square alignment. Provide removable attachment for spreaders on frames that to not extend below finished floor, and remove them after frames are built in.

1.24 Incorporate structural stiffeners for frame members where required to withstand loadings. Securely anchor them at bottom and top. Where they extend above ceiling, anchor them to concrete or structural framing to suit site conditions and in such a way that load from the concrete is not transferred to the frames.

1.25 All exterior doors shall have thermally broken frames. Fill these frames with fibreglass insulation.

Division 08

1.26 Fabricate doors with faces true and smooth, and with no dimples or welds visible.

1.27 Locate hardware to Canadian Steel Door & Frame Manufacturer's Association Standard, unless shown otherwise on Drawings or Door Schedule.

1.28 Close top and bottom edges of exterior doors to make a weather tight seal.

1.29 Anchors shall have minimum gauges: "T" strap type, 1.6 mm "L" type, 1.2 mm; wire type, 3.9 mm diameter; stirrup type, 1.6 mm; stud type, 1.2 mm; jamb spreaders; 1.2 mm.

1.30 Construct fire-rated doors and frames of ratings indicated, in accordance with ULC Section 120 IDO, and as otherwise required by Jurisdictional Authorities. Fire rated screens containing doors shall be labeled (whole assembly).

1.31 Ensure that hardware used meets requirements of ULC 120 ID16, and installed to NFPA 80 requirements.

1.32 Doors and frames indicated as labelled shall have attached ULC labels. Attach labels on the inside of the hinge jamb midway between the top hinge and the head of the door frame.

1.33 **Approved College Standards and Products:**

HM Doors:

i Manufactured by Fleming, paintable galvanneal steel, outside and inside.
ii Dimpled hinge reinforcing for easy conversion from standard weight hinges to heavy weight hinges.
iii Closer reinforcing.
iv All interior components made with galvanneal steel.

HM Frames:

i Manufactured by Fleming, paintable galvanneal steel.
ii Hinge jambs are UL embossed.
iii Hinge reinforcing.
iv Tension anchor and dimpled bases for quick and simple installation.
v Inverted channel installed in all heads to prevent twisting and sagging.
vi Thermally broken steel frame for use where extreme temperature differences occur.

Section 08 11 16
Aluminum Doors and Frames

Referenced Standards

1.1 Aluminum Association Designation System for Aluminum Finishes - 1980

1.2 CAN/CSA-G40.20-04/G40.21-04 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

1.3 CSA G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 CGSB 1-GP-40M-89 Primer, Structural Steel, Oil Alkyd Type.

1.5 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.

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1.6 CAN/CGSB-12.8-97 Insulating Glass Units.

1.7 CAN/CGSB-12.20-M89 Structural Design of Glass for Buildings.

1.8 NAAMM AMP-501-88 Finishes for Aluminum, The National Association of Architectural Metal Manufacturers, Finishes for Aluminum.

1.9 NAAMM AMP-505-88 Applied Coatings, The National Association of Architectural Metal Manufacturers, Finishes for Aluminum.

1.10 AAMA 605.2 American ArchitecturalManufacturer's Association.

1.11 Design glass to conform to CAN/CGSB-12.20-M89.

1.12 Submit shop drawings in accordance with Section 01340.

1.13 Submit catalogue details for each type of door and frame illustrating profiles, dimensions and methods of assembly.

1.14 Provide operation and maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual specified in Section 01300.

1.15 Total warranty period shall be 5 years.

1.16 All components (except glass products) shall come from a single source.

1.17 Glass: For exterior doors and screens use hermetically sealed insulating glass conforming to CAN/CGSB-12.8 and IGMAC Certification Program. Units to have a continuous aluminum spacer with bent corners, polyisobutylene primary seal and polysulphide or silicone secondary seal with 13 mm argon filled air space between inner and outer lites, using warm edge spacers of metal and sealant. Exterior glass lite 6 mm grey tinted float glass conforming to CAN/CGSB-12.4, and inner lite in 6 mm clear float glass conforming to CAN/CGSB-12.3. Provide Low-E coating on #3 surface. Total thickness of unit not less than 25 mm. Shading coefficient .39 or better. For interior doors and screens use 6 mm thick clear float glass. All glass for doors and sidelights shall be tempered. Conform also to CAN/CGSB-12.20.

1.18 Doors and framing to be by same manufacturer.

1.19 Mortise, reinforce, drill and tap doors, frames and reinforcements using templates.

1.20 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.

1.21 Glaze aluminum doors and frames using sealing compounds conforming to CGSB 19-GP-24 or dry flexible sealants.

1.22 Before building is turned over to the College, remove temporary protection, clean and polish exterior and exposed interior surfaces of all work of this Section. Use proper cleaning materials and methods to prevent damage to surfaces, finishes, sealer or work of other trades.

1.23 **Approved College Standard Products:**

i Kawneer 500 Heavy Wall, with 5" stiles to accommodate Sargent hardware. Link: http://www.kawneer.com/kawneer/north_america/en/product.asp?cat_id=1339&prod_id=4332.

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Section 08 36 13
Sectional Doors

1.1 Referenced Standards: Electrical and Electronic Manufacturers Association of Canada.

1.2 Electrical equipment and installation thereof shall comply with all local and provincial laws, and with all other mandatory requirements. Be responsible to ensure an installation which is in compliance with all such laws and regulations, and all changes or alterations required by the authorized inspector of the authority having jurisdiction made without charge to the Owner.

1.3 Submit shop drawings in accordance with Section 01340, for review before fabrication.

1.4 Provide a written warranty in accordance with Section 01300, stating that door will remain free of defects in workmanship and materials for an extended period of two (2) years beyond the expiration of the warranty period.

1.5 Total warranty period shall be three (3) years.

1.6 Submit maintenance instructions in accordance with Section 01300, for incorporation in Project Data Book.

1.7 Submit samples of aluminum finish and glazing. Do not commence fabrication until approval of finish is received.

1.8 Heavy duty tracks, industrial grade, 51 mm, galvanized.

1.9 Continuous track angle mounting, galvanized.

1.10 All necessary hangers to suit building conditions, galvanized.

1.11 Emergency chain operator for electrically operated units.

1.12 Chain operator for manual doors.

1.13 Weatherstripping at jambs, heads and meeting rails.

1.14 Electrical Operators: Motor driven, CSA approved and ULC listed operated complete with circuit breaker disconnect switch, and flush-mounted Open-Close-Stop pushbuttons. Electric operator shall be heavy duty type equipped with a reversible motor with adjustable safety clutch, limit switches, motor brake for positive stopping of door, disconnect device with floor level release for manual operation, auxiliary built-in geared chain hoist for use in the event of a power failure which can be connected or connected or disconnected from ground level. Provide operators complete with mounting plates.

1.15 Assume all responsibility for the door operator, size of motor, and all other mechanical devices, furnished and installed under this heading; this responsibility to continue throughout the entire period of the warranty.

1.16 Provide all framing required to support door, tracks and operator from structure.

1.17 Fabricate the work true dimensions and square. Accurately fit joints and intersecting members with adequate fastenings.

1.18 Erect doors in accordance with manufacturer's directions.

Division 08

1.19 Install under manufacturer's supervision to ensure free-running, properly counterbalanced and tight-closing operation.

1.20 On completion, adjust and lubricate the doors, check and adjust controls, ensure that all equipment and mechanisms are operating smoothly, and demonstrate the operation of the doors to the College.

Section 08 41 13
Aluminum Framed Entrances and Storefronts

1.1 Section Includes:

i Aluminum-framed doors and storefront/screens (AS) for interior.

ii Vision glass.

iii Door hardware.

iv Perimeter sealant.

1.2 Design work of this section to withstand loads in accordance with the applicable code and the performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.

1.3 Design a complete system incorporating the types and configurations of fittings indicated following the design layouts provided on the Drawings with the materials specified in this Section.

1.4 Structural Performance: System shall withstand the effects of gravity loads, dead loads, live loads and stresses within limits and under conditions indicated.

1.5 Deflection: Design structural performance of aluminum components of curtain wall in accordance with CSA S157/S157.1.

1.6 Deflection Normal to Wall Plane: Limit mullion deflection to L/175, with full recovery of glazing materials.

1.7 Deflection Parallel to Glazing Plane: L/360 of clear span or 3 mm, whichever is smaller.

1.8 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with the code.

1.9 Screen assembly and attachments to resist lateral force of 1 kN at any point without damage or permanent set, in accordance with ASTM A935, unless otherwise required by applicable code.

1.10 Coordinate with other work having a direct bearing on work of this Section.

1.11 Coordinate the work with assembly of adjacent glazed wall assemblies.

1.12 Coordinate with Door Hardware Supplier and Hardware Schedule for supply of door and frame cables for electronic hardware.

1.13 Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and door hardware. Indicate door frame structural and physical characteristics, calculations and dimensional limitations.

Division 08

1.14 Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, design and coordination of connections to main building structure, affected related Work, and expansion and contraction joint location and details.

1.15 Prepare Shop Drawings under direct supervision of a professional structural engineer experienced in design of this work and licensed in the Province where the Project is located. Include framing member structural and physical characteristics, calculations, dimensional limitations.

1.16 Each shop drawing to bear seal and signature of the professional structural engineer named above.

1.17 Samples: Submit two 300 x 300 mm fabrication samples of each vertical-to- horizontal intersection of aluminum-framed system exampling prefinished aluminum surface, specified glass units, glazing materials, glazing stops, door stops.

1.18 Include joinery, including concealed welds, anchorage, expansion provisions, flashing and drainage, and wall trim.

1.19 Include samples of hardware and accessories involving colour selection.

1.20 Include samples of each type of finish and colour. Qualifications Data: For Manufacturer and Installer. Include proof of adequate facilities and capacity to produce work.

1.21 Test Reports: Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data.

1.22 Installation Data: Special installation requirements.

1.23 Certification from Glass and Gasket Manufacturer: Include statement certifying that glass and glazing materials and requirements indicated on Shop Drawings have been reviewed and approved for use relative to their specific applications, dimensional design and profile parameters, compatibility with adjacent materials, and conformance with project documents. Include relevant drawing numbers, dates, and revision numbers.

1.24 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.25 Maintenance Data: For aluminum-framed entrances and storefronts; include instructions for re-glazing.

1.26 Perform Work in accordance with AAMA SFM-1.

1.27 Conform to requirements of applicable code for accessibility.

1.28 Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years' documented local experience.

1.29 Handle work of this Section in accordance with AAMA Curtain Wall Manual CW-10.

1.30 Protect prefinished aluminum surfaces with wrapping or strippable coating.

1.31 Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

1.32 Do not install sealants when ambient temperature is less than 5 degrees C during and 48 hours after installation.

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1.33 Maintain this minimum temperature during and after installation of sealants.

1.34 Provide five year warranty including coverage for each complete system for failure to meet specified requirements.

1.35 Provide ten year manufacturer warranty for metal finishes. Failures shall include excessive fading, non-uniformity of colour, cracking, peeling, delamination and corrosion.

1.36 Warranties shall include removing and replacing covering and adjacent components and finishes. Warranty period shall recommence on remedied work.

1.37 Glass Thickness: Minimum 6 mm tempered safety glass. Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to conform to requirements specified.

1.38 Provide products and systems from one single source manufacturer. Mixing of doors, frames, and hardware from different manufacturers is not acceptable.

1.39 Acceptable Manufacturers:

i Alumicor Limited.

ii Kawneer Company Canada Limited.

1.40 Aluminum Members: Alcan 6063-T5 alloy and temper.

1.41 Extruded Aluminum: to ASTM B221.

1.42 Sheet Aluminum: ASTM B209.

1.43 Screws, bolts and fasteners: 300 series stainless steel or 400 series stainless steel cadmium plated.

1.44 Sheet Steel: Zinc-iron Alloy (ZF) coated steel sheet to ASTM A653/A653M structural quality Grade A, with Z275 coating, for interior surfaces not exposed to weather, unpainted finish, minimum 0.914mm base steel thickness.

1.45 Steel Reinforcement: to CAN/CSA-G40.21, grade 300W, as required by system design limitations.

1.46 Vision Glass: refer to Section 08 80 00.

1.47 Glazing gaskets: extruded, black, closed cell or dense elastomer of durometer appropriate to the function.

1.48 Sealants: refer to Section 07 92 00.

1.49 Isolation Coating: alkali resistant, epoxy resin solution.

1.50 Thermal separators for door cladding shall be rigid PVC extrusions.

1.51 Door Bumpers: black neoprene.

1.52 Interior Frames: nominal 45mm x 114mm, extruded aluminum, for single glazing; center glazed. Acceptable products are:

i TRIFAB ☐ VG 450, by Kawneer Company Canada Ltd.

ii 800 Series, by Alumicor Limited.

iii Approved alternative as approved by the College.

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1.53 Interior Doors: extruded aluminum for single glazing, with the following options;

1.54 Bottom Rails: manufacturer's standard height.

1.55 Acceptable Products:

i '190 Swing Doors' by Kawneer Company Canada Limited,

ii 'Canadiana series 100A' by Alumicor Limited.

iii Approved alternative as approved by the College.

1.56 Interior Finish, Clear Anodic Finish: AAMA standard AA-M12C22A31, Class II, 0.010 mm or thicker.

1.57 Weather Stripping: Mohair or Elastomeric.

1.58 Hinges, 5 knuckle ball bearing type or continuous hinge,

1.59 All other architectural hardware supplied under Section 08 71 00, is not in this scope of work.

1.60 Fabricate doors and frames from extrusions of size and configurations shown on drawings.

1.61 Door rails and stiles shall be porthole extrusions. Corner construction shall be mechanical clip, and plug and fillet weld fastening.

1.62 Fabricate units square and true with maximum tolerance of plus or minus 1.5mm for units with a diagonal measurement of 1800mm or less and plus or minus 3mm for units with a diagonal measurement over 1800mm.

1.63 Face dimensions detailed are maximum permissible sizes.

1.64 Brace frames to maintain squareness and rigidity during shipment and installation.

1.65 Provide all internal reinforcing as required for the proper structural design and support of the framing system.

1.66 All joints shall be accurately machined, assembled and sealed to provide neat weathertight joints.

1.67 Where doors are designed with panel inserts, fabricate doors to have flush appearance with no stops or hardware protruding.

1.68 Erect and anchor all frames square and level using concealed fastenings where possible.

1.69 Anchors to be built into the structure shall be provided to the contractor for setting in accordance with the approved shop drawings.

1.70 Doors shall be installed, glazed and adjusted by experienced personnel in accordance with the manufacturer's instructions and reviewed shop drawings.

1.71 All items in this Section shall be set in their correct location and shall be set level, square, plumb and at proper elevations and in alignment with other work.

1.72 Manufacturer's nameplates or labels shall not be installed on the exterior of doors or screens.

1.73 Isolate aluminum from following components, by means of isolation coating:

i Dissimilar metals except stainless steel, zinc, or white bronze.

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ii Concrete, masonry, and masonry mortar.

iii Untreated wood.

1.74 Apply sealant in accordance with Section 07 92 00.

1.75 During installation, remove all corrosive or foreign materials or droppings resulting from work of this or other trades.

1.76 Clean all surfaces in accordance with manufacturer's instructions for final cleaning of finished surfaces.

Section 08 70 00
Hardware

1.8 Work Included In this Section: Installation of Architectural Finish Hardware for hollow metal, aluminum and wood doors and frames.

1.9 Inspect all hardware for damage, upon delivery to the site.

1.10 Be responsible for any damage to hardware and related components from time of delivery until accepted by Owner after installation.

1.11 Provide locked room for the storage of hardware at the job and a person responsible for the control and distribution of hardware.

1.12 Finish Hardware installers 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. This document can be obtained through the Door and Hardware Institute.

1.13 Other trades installing hardware must follow all manufacturers' instructions including door closer adjustment, handing of locksets as required, and degree of door swing.

1.14 When requested, the hardware supplier will instruct the installer as to how various newer or unusual items that is required to be installed for proper performance.

1.15 Set, fit and adjust hardware according to manufacturer's directions. Hardware shall operate freely. After initial installation, adjust door closers for closing and latching speed and panic devices for proper latching. Protect installed hardware from damage and paint spotting.

1.16 Weatherstripping to be provided to effectively seal entire perimeter of doors.

1.17 Check and adjust each operating hardware item to ensure proper operation and function of unit.

1.18 Lubricate moving parts as recommended by hardware manufacturer. Use graphite type lubricant if no other is recommended.

1.19 Repair or replace defective materials and units which cannot be adjusted and lubricated to operate freely and smoothly. Re-install items found improperly installed.

Approved College Standards and Products:

Hardware, Interior Doors:

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i Sargent, Security Intruder Latch bolt (F32) 8238x LE1Jx26D lever. (IT, mechanical, and electrical rooms, use storeroom function).
ii Hager Heavyweight series “BB” ball bearing hinges.
iii Closers, Ingersol Rand LCN 4041.

Cylinders/Keying:

i Sargent 41 x 2KL #111111bidding.
ii 124 x 626 Thumb turn for 38 Function locking purposes.
iii #90 x 1/8 x 26D (626) finish Blocking ring.

Hardware, Exit doors:

i Sargent 88 line panic devices x function.
ii Hager 12L x 630 12" Offset stainless steel pull handle.
iii Hager 30S x 4 x 16 x 630 s/s push plate.
iv Closers, Ingersol Rand LCN 4041.

Contact for Sargent restricted keyway components: Rivett Architectural Hardware, John Tamblyn, johnt@rivett.com.

Section 08 80 00
Miscellaneous Glass and Glazing

Referenced Standards

1.1 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.

1.2 CAN/CGSB-12.3-M91 Flat, Clear Float Glass.

1.3 CAN/CGSB-12.11-M90 Wired Safety Glass.

1.4 NFPA 80 National Fire Protection Association, Fire Doors and Windows.

1.5 ANSI Z97.1-1984 (R1994) Glazing Materials Used in Buildings Safety Performance Specifications and Methods of Test.

1.6 Flat Glass Manufacturers Association (FGMA) Glazing Manual

1.7 Warranty shall apply against defects in workmanship and materials and, against silver deterioration and loosening of fastenings.

1.8 Total warranty period shall be 5 years.

1.9 Glass shall be designed and manufactured to conform to CAN/CGSB-12.20-M89.

1.10 Factory label every sheet of glass and keep in place until final cleaning.

1.11 Mirrors: Best quality, 6 mm thick float glass, conforming to CAN/CGSB-12.5-M86, Type 1A, and backed in an approved manner. Enclose edges with type 304 stainless steel.

1.12 Wired Plate Glass: 6 mm thick "Georgian" polished wire plate, conforming to CAN/CGSB-12.11.

1.13 Tempered Glass: Conforming to CAN/CGSB-12.1, and CAN/CGSB-12.20.

1.14 Float Glass: Conforming to CAN/CGSB-12.3, and CAN/CGSB-12.20.

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1.15 Follow manufacturer's recommendations for preparation. Design, fabricate and install glass to conform to CAN/CGSB-12.1-M89.

1.16 Remove deposits which affect appearance of units on completion of installation.

1.17 Clean and restore stained metal surfaces in accordance with manufacturer's recommendations. Replace if cleaning is impossible.

1.18 Clean glazing with methods and materials recommended by glazing material manufacturer.

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Section 09 29 00
Gypsum and Cement Board

Referenced Standards

1.1 ASTM C36/C36M-01 Standard Specification for Gypsum Wallboard.

1.2 ASTM C442/C442M-04 Standard Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.

1.3 ASTM C645-04a Standard Specification for Non Structural Steel Framing Members.

1.4 ASTM C840-04 Standard Specification for Application and Finishing of Gypsum Board.

1.5 GA-214-90 Gypsum Association.

1.6 GA-216-96 Application and Finishing of Gypsum Board.

1.7 ANSI B94-04 Standard Specification for Magnesium-Alloy Die Castings.

1.8 Package finish materials.

1.9 Store materials in a protected dry area. Store gypsum board flat in piles with edges protected.

1.10 Ensure that finish metal members are not bent, dented, or otherwise deformed.

1.11 Deliver products only supplied under the work of this Section to those who are responsible for installation, to the place they direct, and to meet installation schedules.

1.12 Package fire-rated materials with Underwriters Laboratories of Canada labels attached.

1.13 Install work only in areas closed and protected against weather, and maintained between 10°C and 21°C. In cold weather, ensure that heat is introduced in sufficient time, before work commences to bring surrounding materials up to these temperatures, and maintained until materials installed by this Section have cured.

1.14 Do not install work in any area unless satisfied that work in place has dried out, and that no further installation of damp materials is contemplated.

1.15 Gypsum Board: Conforming to ASTM C36, as manufactured by Canadian Gypsum Company, Georgia Pacific, or Westroc Industries Limited as follows:

i. Plain Gypsum Board: In thicknesses indicated, with tapered edges.

ii. Fire-Rated Gypsum Board: Type "X", in thicknesses indicated, with tapered edges, classified for fire hazard by Underwriters Laboratories of Canada, and labelled in conformance with the ULC Label Service for the application specified.

iii. Linerboard and Coreboard: Conforming to ASTM C442/C442M 25 mm thick with V tongue-and-groove edges.

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iv. Abuse Resistant Gypsum Board: ASTM C1396 manufactured to a produce greater resistance to surface indentation and through-penetration than standard gypsum panels. Thickness: 19mm, Long Edges: Tapered, Type X, Location: Vivarium walls as indicated on drawings.

v. Sag Resistant Gypsum Board: ASTM C1396 manufactured to have more sag resistance than standard gypsum panels. Thickness ½", Long Edges: Tapered, Location: Ceiling Surfaces.

1.16 Joint Reinforcing Tape:

i. For Interior Gypsum Board: 50 x 0.3 mm perforated paper with chamfered edges.

ii. For Moisture (Water) Resistant Gypsum Board: manufacturer's standard tape for waterproof application.

iii. For Cement Board: manufacturer's standard for a waterproof joint assembly.

1.17 Joint compound: Asbestos-free and free of VOC's; CGC "Durabond 45" or equivalent manufactured by Domtar Gypsum, CertainTeed Gypsum Canada Inc or Georgia Pacific Canada.

1.18 Skim Coating: CGC "Durabond 90" or equivalent manufactured by Domtar Gypsum, CertainTeed Gypsum Canada Inc or Georgia Pacific Canada.

1.19 Accessories: As manufactured by Canadian Gypsum Company, Domtar Construction Materials, Westroc Industries Limited or Bailey Metal Products Limited as follows:

i. Corner Beads: #25 steel, zinc-coated with flanges suitable for thickness of wallboards on which applied, and suitable for taping and plastering over.

ii. Casing Beads: #25 steel, zinc-coated, channel-shaped, suitable for taping and plastering over.

iii. Control Joints: Crimped, roll-formed zinc, as CGC #093, with flanges for tape reinforcement or two casing beads set with gap for movement, and backed with flexible air seal membrane.

iv. Shaftwall Accessories: Hot-dipped galvanized, C-H, E and J runners in gauge and dimensions to suit conditions.

v. Thermal Break Tape: No.220D pvc tape manufactured by Sellotape Canada Ltd. or other reputable manufacturer.

vi. Closed Cell Acoustic Gaskets: Closed cell neoprene foam, grade SCE41.

1.20 Screws: Self-drilling, self-tapping, case-hardened, Phillips head, gypsum board screws with corrosion-resistant finish. #6 x 25 mm for single thickness panel fastening, and #7 x 40 mm for double thickness panel fastening.

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1.21 Tie Wire: 1.5 mm galvanized soft annealed steel wire.

1.22 Twist Clips: Caddy acoustical tee combination washer - wing nut, as manufactured by Erico Products Ltd, or Revoe clip by Revoe Manufacturing Ltd.

1.23 Concrete Anchors: Phillips Red Head TW-614 or other make of tie wire sleeve anchors conforming to US Federal Specs. FF-S-325, Group II Type 3, Class 3, and QQ-2-235, Type II, Class 3. Do not use powder activated fasteners for ceiling support, and wall and floor track.

1.24 Steel Studs: To ASTM C645 depth to suit span except where wider depths are shown on Drawings. Knurled flanges 32 mm wide with edges doubled back at least 4.8 mm; #25 steel galvanized, with girts as required and with service access holes. Where structural studs are indicated select gauge of steel to suit the applications. Structural studs shall be manufactured by Bailey Metal or Nicholson Roll Forming.

1.25 Partition Runners: As specified for studs with flanges a minimum 125 mm high, and to suit depth of studs as required to serve as backing for carpet base where carpet occurs.

1.26 Bracing Channels: For partitions, 19 x 9.5 x 1.2 mm cold-rolled, galvanized steel.

1.27 Furring Channels: #25 galvanized, nominal size of 22 mm deep by 32 mm face, hat type with knurled face.

1.28 Resilient Channels: CGC RC-1 or equivalent by Bailey Metals.

1.29 Ceiling Hanger System:

i. Hangers: Galvanized annealed steel wire, #12 gauge to support a maximum weight of 68 kg. per hanger. #9 gauge to support a maximum weight of 140 kg. per hanger, and galvanized annealed steel rod 4.8 mm diameter to support a maximum weight of 250 kg. per hanger.

ii. Inserts and Hanger Connection: Steel, galvanized after forming, suitable for structure and ceiling conditions and loading.

1.30 Acoustical Caulking: "Acoustical Sealant" by Tremco (Canada) Limited.

1.31 Sound Attenuation Batt Insulation: Friction fit, "Thermafibre" 50 mm thick sound attenuation batts by Canadian Gypsum Company Limited, "Quietzone" by Owens- Corning, "Sound Attenuation" blankets by the Roxul Company, or "SAB" by Fibrex Insulations Inc.

1.32 Control Joint Strip: Roll formed zinc coated metal with a tape protected void, 6 mm wide throat size x 13 mm deep with flanges for embedding in joint compound.

1.33 Corner Guards: Type 304 stainless steel 1.2m high with 75mm wide legs for gypsum board corners.

1.34 Before application of gypsum board commences, ensure that services have been installed, tested and approved by relevant Jurisdictional Authorities and College; that conduits,

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pipes, cables and outlets are plugged, capped or covered; and that fastenings and supports installed by others are in place.

1.35 Ensure that environmental conditions and work preceding that of this Section are satisfactory.

1.36 Verify that work performed under other Sections as a part of a ULC specification for a fire-rated assembly has been done in accordance with that specification.

1.37 Install furring, studs, gypsum board, accessories, and all other related products in strict accordance with ASTM Standard C840. Where the standard does not incorporate specific products and methods, follow the manufacturer's directions.

1.38 Use 16 mm thick gypsum board for interior work unless detailed otherwise. Install work within 3 mm of dimensioned location, and flat to tolerance of 3 mm maximum in 3 m and 1.6 m maximum in any running 300 mm.

1.39 Coordinate the work of this Section with that of other Sections. Ensure that adequate preparation is made for the attachment of hangers, fasteners, stiffeners, and reinforcing. Provide for carrying and integration of flush-mounted and recessed components only after consultation and verification of methods with those performing the work of Divisions 15 and 16. Do not use through-the-roof hangers.

1.40 Do not install metal framing, trim, casings, or accessories which have been bent, dented, or otherwise deformed.

1.41 Securely attach trim, casings, framing and accessories. Attachment by means of tape is unacceptable.

1.42 Framing and furring shown on Drawings is indicative, but do not regard it as exact or complete. Construct work to provide adequate strength to withstand stresses imposed by use without distortion and to maintain dimensions indicated on drawings.

1.43 Erect supporting and finish materials to dimensions indicated on drawings, plumb, level, straight, and square to adjoining elements.

1.44 Provide for movement at intersections with structural members to avoid transference of loads to this work. Construct vertically sliding deflection space at top of partitions by means of double channels. Secure top channel to structure and bottom channel to stud work. Secure board only to bottom track making allowance for up to 19 mm deflection of structure. Cut board short at top and caulk this joint.

1.45 Make allowance for thermal movements in gypsum board systems.

1.46 Install casings and thermal breaks at junctions of gypsum board with exterior door, window, or screen joints.

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1.47 Do not support the work of this Section from, nor make attachment to ducts, pipes, conduit or the support framing of the work of other Sections. Place supplementary steel supports as required to maintain hanger spacing and to keep mechanical ducts free from hangers being secured to.

1.48 Do not apply gypsum board in close proximity to hot pipes or heating ducts.

1.49 Install materials with the minimum of joints. Tightly butt joints without force and neatly align them.

1.50 Frame openings on each side with suitable sections. Provide clearances required at mechanical and electrical services such as grilles, diffusers, access panels and lighting fixtures only after verification of requirements in each case.

1.51 Cooperate with those installing the work of other Sections. Where the work of others penetrates gypsum board construction, fit openings snugly, and to ensure cover by escutcheons or plates utilized.

1.52 Control joints shall be either manufactured devices designed for this purpose or field fabricated from suitable materials.

1.53 Install control joints at the following conditions:

i. A partition, wall, or ceiling traverse a construction joint (expansion, seismic, or building control element) in the base building structure.

ii. Where a wall or partition runs in an uninterrupted straight plane exceeding 9m.

iii. Interior Ceilings Without Perimeter Relief: Install control joints so that linear dimensions between control joints do not exceed 9m and the total area between control joints do not exceed 84m². Install control joints or intermediate framing where ceiling framing members change direction.

iv. A control joint is incorporated as a design accent or architectural feature.

1.54 Verify location of supports within gypsum board assemblies to support wall mounted lights, fitments, cabinets, plumbing fixtures and any other item attached to drywall. Cooperate and coordinate with all trades and provide information in ample time to ensure supports are provided in the correct locations, and are adequate to support the loads. Supply and install minimum 1.2 mm steel sheets to secure wall mounted equipment, fixtures, and cabinets.

1.55 Where radiussed corners are required and cement board thickness is different than gypsum board, shim board or apply skim coat at the convenience of the trade. Use permanent material for shims.

1.56 Locate anchorage points in reinforced concrete floor slab underside in accordance with gypsum board manufacturers suspension requirements. Drill holes with carbide-tipped drill

bits conforming to ANSI B94. Install anchors; minimum installation depth and method of expansion shall be as recommended by the anchor manufacturer.

1.57 Include in the work of this Section the supply of hangers and supervision of their proper location, or inserts for hanger attachment, when either or both are embedded in concrete.

1.58 Space hangers for runner channels to suit structure, to support ceiling load, at a maximum distance of 1200 mm o.c. and at no greater distance than 150 mm from ends of runner channels.

1.59 Install runner channels at 900 mm o.c. generally, and at no greater distance than 150 mm from terminations of supported cross-furring members. Bend rod hangers sharply under bottom flange of runners, and wire securely in place with saddle ties.

1.60 Splice runner channels by lapping at least 300 mm, with interlocking flanges and wires at each end with two loops. Splice only where unavoidable. Do not bunch or line up splices.

1.61 Install cross-furring at 600 mm generally, and at no greater distance than 150 mm from walls, openings, breaks in continuity of ceilings, and changes of direction. Space furring in all cases to suit incorporated services, and so as to avoid contact with perimeter walls. Span hat-type furring no greater than 1200 mm. Use metal studs for greater spans: 40 mm deep spanning to 1500 mm, 65 mm deep to 1800 mm and 90 mm deep to 2400 mm.

1.62 Secure cross-furring to supports with double wire ties or approved equivalent attachment. Splice by nesting and tying together with 200 mm overlap.

1.63 Erect entire hanger and suspension system to adequately support the ceiling assembly, including services incorporated with a maximum deflection of 1/360 of span of each component member, and free from horizontal movement.

1.64 Enclose ducts, pipes or beams that occur below the general finished ceiling level with metal furring and gypsum board, in rooms where gypsum board is specified.

1.65 Enclose ducts, pipes, or beams that occur below the general finished ceiling level with metal furring and gypsum board, in rooms where acoustic treatment for ceilings is specified.

1.66 Form recesses for light coves where indicated on drawings. Enclose all light coves with gypsum board.

1.67 Secure runner channels at floor and tops of partitions for their full lengths, at 600 mm o.c. with concrete fasteners or as suitable for the substrate material. Install runner channels also at heads and sills of openings. Secure runners at openings by cutting flanges, turning up webs, and screwing to studs.

1.68 Butt, not mitre, runners at wall intersections and corners. At ceilings, lap and screw channels together.

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1.69 Space studs at 600 mm o.c. generally, and at no greater distance than 50 mm from abutting walls, partitions and corners.

1.70 Secure studs to runners by screws, crimping, or welding as required by stud type to conform with manufacturer's design specification.

1.71 Utilize only proper stud sizes to meet all the requirements of this specification. Span studs of 40 mm depth no greater than 2700 mm between supports, 65 mm depth, 3600 mm and 90 mm depth, 4800 mm.

1.72 Provide double studs at all door jambs. At each jamb of doors exceeding either 900 mm width or 60 mm in thickness or both, supply and install a structural channel reinforcing extending from floor structure to structure above, and adequately anchored at each end.

1.73 Brace studs with stiffeners over doors in partitions of greater height than 3000 mm spaced as preceding, and above and below window type openings spaced not more than 150 mm from the top and bottom of openings. Stiffeners shall be 19 mm bracing channels, wire tied or welded to each stud, and extending horizontally across entire length of each braced partition and across two full stud spaces at each side of door and window openings.

1.74 Splice studs only when unavoidable by nesting with 200 mm minimum lap, and fastened with one screw in each flange.

1.75 Coordinate work with others installing horizontal runs of service lines so that work of all is done simultaneously. Where standard holes are too small for installed services, notch studs and splice notched flange with a splice piece 300 mm longer than notch, fastened with two screws.

1.76 Unless shown otherwise on drawings, all partitions, together with wallboard facing, shall extend above ceilings to underside of structure at deck above.

1.77 Ensure that electrical and telephone boxes are not installed back to back.

1.78 Screw frame anchor clips of frames supplied and installed under the work of another Section, to jamb studs and head and sill runners. Provide adequate fastening to prevent movement of frames within partitions.

1.79 Masonry and Concrete Walls: Install furring horizontally at 600 mm o.c. Space furring no greater than 50 mm from abutting walls, floors, ceilings, and openings.

1.80 Secure furring to walls with fasteners, spaced at 600 mm o.c. on alternating or opposite channel flanges. Shim as required with metal spacers or use adjustable wall furring brackets.

1.81 Return furring into reveals.

1.82 Close all exposed open ends of furred space with suitable metal closure.

1.83 Where wall furring is indicated clear of wall on drawings, construct framing as for metal stud partitions.

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1.84 Acoustically Treated Walls, Bulkheads and Ceilings:

1.85 Install board 13 mm short at top, bottom and edges and fill with caulking. Caulk on both sides of wall. Caulk after gypsum board is in place, not before.

1.86 Where a partition abuts a window mullion, provide an infill panel between partition and mullion and between partition and convector unit.

1.87 Stagger all joints in double layer gypsum board construction.

1.88 Provide sound baffle within convector unit where partition meets window mullion. Tightly fit baffle and caulk around piping.

1.89 Pack partition cavities with acoustical insulation. Friction fit insulation securely between studs.

1.90 Fill all butt joints of gypsum board with joint filler prior to taping or finishing.

1.91 Caulk or plaster fill all penetrations through gypsum board for electrical boxes, wiring, pipes, ducts and all similar items. Caulk airtight around electrical and communication boxes before plate is installed.

1.92 Do not let fastening screws extend through to opposite set of studs.

1.93 Build bulkheads above acoustically rated doors and partitions as detailed.

1.94 For ceilings and walls requiring isolation hangers and closed cell gaskets, install components in accordance with details. Ensure tops of partitions are separated from structure by closed cell neoprene foam gaskets.

1.95 Installation of Gypsum Board:

i. Extend boards into door, window, and other opening reveals.

ii. Back all joints with a framing member.

iii. Install boards in maximum lengths and widths to minimize joints, and never in lengths of under 1800 mm. Stagger end joints where they are unavoidable. Locate joints in ceilings and soffits where least prominently discernible.

iv. Form neat joints at mill ends and at field-cut edges of wallboard panels. Cut paper on face with a knife. Smooth by sanding and rubbing edges together.

v. Fasten boards to metal support members by sheet metal gypsum board screws at 300 mm o.c. no closer than 9.5 mm to and no farther than 13 mm from centre of joints. Do not force adjacent boards into place. Allow moderate contact. Provide extension slips where required. Drive screws to form a slight depression, but no so paper cover is broken.

vi. Unless noted otherwise standard gypsum board in washroom areas either to receive paint or ceramic tile.

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1.96 Fill joints, screwholes, and depressions on board surfaces exposed to view to provide smooth, seamless surfaces, and square, neat corners. Use jointing compounds and reinforcing tapes in conformance with manufacturer's specifications. Ensure that board is tight against framing members, fasteners are properly depressed, and adhesives have sufficiently cured.

1.97 Fill joints, edges and corners by Gypsum Association Level 4 three coat tape and joint filler method as defined in GA-214.

1.98 At external corners, install corner beads secured to framing at 150 mm o.c. on alternate flanges. Fill to nose of corner bead with joint filler and topping cement, as specified for bevelled joints.

1.99 At casing beads installed at all edges of board exposed to view, where board butts against other materials, with no trim to conceal junction at control joints, at perimeter of ceiling surfaces, at top of partitions where they stop against continuous ceiling surfaces, and where otherwise shown on drawings, secure casing beads to framing at 300 mm" o.c.

1.100 At screwheads, fill holes and depressions with a two-coat application of joint filler.

1.101 Install accessories such as access panels, and grilles when supplied by other sections. Obtain prior Consultant's approval of locations of accessories prior to installation.

1.102 Gypsum board infill at access panels shall have taped edges. Apply gypsum board with adhesive. Fill and sand smooth perimeter edges as specified for joint finishing.

1.103 Construct gypsum board assemblies where located at fire separations of metal framing covered on both sides by fire-rated gypsum wallboard.

1.104 Fit assemblies tightly to all enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges. Ensure that caulking work under Section 07900 relative to non-sound rated assemblies, i.e. perimeter joints in concealed locations is done, before continuing with the work of this Section.

1.105 For two layers of gypsum board, attach one layer of gypsum board to each side of studs with long edges on studs by screws at 400 mm o.c. as well as at intermediate studs and runners. Attach second layer of gypsum wallboard by screws at 400 mm o.c. at studs and 300 mm o.c. at runners. Stagger joints at first and second layers 300 mm tape joints only where exposed to view. Fill screw holes. For tested assemblies secure in accordance with test data.

1.106 Assemblies constructed other than those indicated may be approved by the Consultant on presentation of affidavits which validate fire resistance ratings by acceptance of the Jurisdictional Authorities.

1.107 For walls containing fire dampers provide gypsum board end covers over studs between duct and stud.

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1.108 Provide double back to back tracks and a layer of gypsum board at door frame headers at fire walls as detailed in figure A-9.24.3.2 of the Appendix to the OBC.

1.109 Install shaft wall in accordance with manufacturer's directions.

1.110 Remove droppings and excess joint compound from work of others and from work of this Section, before it sets.

1.111 Make good to cut-outs for services and other work, fill in defective joints, holes, and other depressions with joint compounds.

1.112 Make good defective work, and ensure that surfaces are smooth, evenly textured, and within specified tolerances to receive finish treatments.

1.113 Clean off beads, casings, and other metal trim, and leave all surfaces ready for specified finishes.

Section 09 50 00
Acoustical Ceilings

Referenced Standards

1.1 ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.2 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

1.3 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

1.4 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

1.5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

1.6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

1.7 ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

1.8 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.9 ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

1.10 ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint.

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1.11 ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.

1.12 ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

1.13 ASTM E 1264 Classification for Acoustical Ceiling Products.

1.14 International Building Code.

1.15 ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.

1.16 NFPA 70 National Electrical Code.

1.17 ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures.

1.18 International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components.

1.19 International Code Council-Evaluation Services Report - Seismic Engineer Report

1.20 ESR 1308 - Armstrong Suspension Systems.

1.21 International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1.22 0244 - Armstrong Single Span Suspension System.

1.23 California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010.

1.24 LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings.

1.25 This specification relates to a Continuous/ Wall to Wall System.

1.26 Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

1.27 Provide minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

1.28 Submit shop drawings indicating layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

1.29 Provide 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.

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1.30 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.

1.31 Provide acoustical panel units and grid components by a single manufacturer.

1.32 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1.33 Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

1.34 Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory.

1.35 As with other architectural features located at the ceiling, acoustical ceiling components 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.

1.36 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.

1.37 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.

1.38 Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

1.39 Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.40 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.

1.41 Building areas to receive ceilings shall be free of construction dust and debris.

1.42 Ceiling material being reclaimed must be kept dry and free from debris.

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1.43 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:

i. Acoustical Panels: Sagging and warping

ii. Grid System: Rusting and manufacturer's defects

1.44 Warranty Period:

i. Acoustical panels: One (1) year from date of substantial completion

ii. Cirrus: Ten (10) years from date of substantial completion

iii. Grid: Ten years from date of substantial completion

1.45 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.

1.46 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.

1.47 Furnish quality of full-size acoustical units equal to 5.0 percent of amount installed.

1.48 Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Metal suspension systems

1.49 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 exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

i. Structural Classification: ASTM C 635 normal duty

ii. Color: Blizzard White.

1.50 Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

1.51 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.

1.52 Edge Moldings and Trim: 7875 - 10ft Shadow Molding

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1.53 Accessories:

i. ALBERC2 - aluminum systems - 2" Aluminum Beam End Retaining Clip.

ii. BERC2 - steel - 2" Beam End Retaining Clip.

iii. BERC - Beam End Retaining Clip.

iv. SJMR15 - Seismic Joint Clip - Main Beam - 15/16" Suspensions.

v. SJMR09 - Seismic Joint Clip - Main Beam - 9/16" Suspensions.

vi. SJCG - PeakForm Suspension - Seismic Joint Clips CT.

vii. SJCSI - Square Bulb Suspension - Seismic Joint Clip CT.

viii. ES4 - for 15/16" Prelude Expansion Sleeves.

ix. ES49 - for 9/16" Suprafine.

x. ES76004 for 1/4" Silhouette Suspension.

xi. ES76008 - for 1/8" Silhouette Suspension.

xii. STAC - Single Tee Adapter Clip.

xiii. 7445 - 48" Stabilizer bar - not required when using the BERC2.

xiv. 7425 - 24" Stabilizer bar - not required when using the BERC2.

1.54 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.

1.55 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.

1.56 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.

1.57 Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

1.58 For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

1.59 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.

1.60 Replace any damaged or broken panels.

1.61 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

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finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

Section 09 97 23
Concrete and Masonry Coatings

1.1 Sealer to be approved for use on concrete slabs not scheduled to receive a further surface finish. Apply these products in the later stages of construction as a sealer only, **not as a curing-sealing compound.**

1.2 Cleaner, Thinners and Accessories: Type recommended by sealant manufacturer, to suit each specific condition encountered on this project.

1.3 Before commencing with the work examine floors to be sealed, and verify compatibility between curing sealing agent if one was used to seal floors and final concrete sealer applied under work of this Section. Sandblast, acid etch, lightly grind, whichever is required to prepare floors to ensure bonding if curing-sealing agent has been used to cure concrete.

1.4 Commence sealing as soon as concrete surfaces have cured for the minimum period recommended by the sealant manufacturer, and after tests indicate moisture and chemical conditions are satisfactory for application.

1.5 Prepare concrete surfaces in accordance with sealer manufacturer's recommendations. Do not use wheelabrator method. Clean concrete of any dirt, dust, oil, grease, stains, paint, laitance, or other contamination detrimental the bond of sealer and final appearance.

1.6 Apply sealer in dust-free conditions suitable for achieving good results. Apply sealer in 2 coats in strict accordance with manufacturer's printed directions. In the case of urethane sealer, cut first coat 25% with thinner.

Section 09 90 00
Painting and Coating

Referenced Standards

1.1 CAN/CGSB-85.100-M93 Painting.

1.2 SSPC-SP6 Steel Structures Painting Council, Commercial Blast Cleaning Standard.

1.3 ASTM D523-89 Standard Test Method for Specular Gloss.

1.4 Include a complete list of paint and finish materials to be used, showing the name of the manufacturer, the catalogue number, grade and quality of the materials proposed for use.

1.5 Supply the College with one clearly identified sealed 3.78 litre can of each colour and type of paint, stain, and varnish for this work for future maintenance. Take such materials to designated storage area in the building.

1.6 Store containers of paint, varnish, thinner, and other volatile materials in well-ventilated designated room under lock and key, where they will not be exposed to excessive heat or direct rays of the sun. Keep containers tightly closed when not in actual use. Remove used cloths from building every

night, and when not in use. Take precautions against spontaneous combustion by burning, drenching in water, or placing in air-tight covered metal containers. Provide CO2 fire extinguisher of 9 kg. capacity in this room while area is used for paint storage.

1.7 Protect the work of other trades from damage. Post signs at freshly- painted surfaces immediately following their completion. Any soiling of concrete pavement attributable to this section due to spillage, mixing of material, or any other cause whatsoever, to be entirely reinstated under this Section at no expense to the College.

1.8 Do not paint or finish in unclean or improperly ventilated areas. Maintain ambient and substrate temperatures and humidity conditions within acceptable limits as recommended by paint manufacturer.

1.9 Use sufficient drop cloths and protective coverings for the full protection of floors, furnishings, woodwork, windows, and work not being painted. Protect mechanical, electrical, and special equipment hardware, all other components of the building which do not require painting from paint spotting and other soiling during the painting process.

1.10 Protect paint materials from fire and freezing. Environmentally friendly, solvent free, highest grade, first line quality product of the manufacturer. Painting and finishing materials shall comply with or exceed CAN2-85-100 for Premium Grade Work and comply with the specified generic formula guide in accordance with the manufacturer's recommendations.

1.11 One brand of paint shall be used for each formula.

1.12 Verify all surfaces with electric moisture meter and do not proceed if reading is higher than 12-15.

1.13 Proceed with work only when surfaces and conditions are satisfactory for production of a first-class job.

1.14 Remove dust, grease, rust, and extraneous matter from all surfaces.

1.15 Where extreme alkalinity occurs, wash surface with 4% solution tetra potassium pyrophosphate where latex base paint is to be used, and with zinc sulphate solution where other paint bases are to be used.

1.16 Sand smooth all surfaces which are to be finished and clean surfaces free of dust before applying first coat.

1.17 Prepare all surfaces in accordance with paint Manufacturer’s requirements.

1.18 Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

1.19 Apply work using skilled trades working under direction of a capable foreman, and according to manufacturer's specifications; with suitable clean equipment in good condition; in dust-free and under adequate illumination and suitable conditions for production of best results; evenly, uniform in sheen, colour and texture, free from brush marks, sags, crawls, runs, or other defects detrimental to appearance or performance; and in a manner to prevent spattering or spilling over finished surfaces.

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1.20 Use same brand of paint for primer, intermediate, and finish coats.

1.21 It is generally intended that material be applied by brush or roller. Spray painting will be permitted in areas where advantageous. The College may at any time prohibit the use of spray painting for such reasons during application as carelessness, poor masking, or protective measures, paint fogs drifting into prepainted surfaces or other finishes, disturbance to other trades, or failure to obtain a dense, even, opaque finish.

1.22 Do not paint stainless steel, chrome, baked enamel, plastic laminate, glass, tile, porcelain enamel, ceramic surfaces, equipment name or specification plates, fire resistance labels, washroom fixtures, manhole and catch basin covers, floors, circuit breakers, switches, receptacles, or similar electrical components or sprinkler heads. Make good paint finish on items where painted surfaces have become marred or defaced.

1.23 Paint convectors, grilles, conduit, pipes, ducts, hangers, brackets, panels, access panels, exposed steel, concrete inserts, fire hose cabinets, bus ducts, and other articles on or near finished surface shall to match the colour of the surface on which the article appears.

1.24 Identification paint schedule as follows:

i Fire protection system: red, alkyd enamel.

ii Systems posing safety hazards: yellow, alkyd enamel.

iii Safe systems: green, alkyd enamel.

1.25 Use the following sheens:

i Painted doors, frames, trim - semi-gloss.

ii Gypsum board for walls - semi-gloss.

iii Gypsum board for ceilings - eggshell.

iv Masonry - semi-gloss.

1.26 **Products must conform to Master Painter's Institute guide specifications:**

i Primer for Exterior Wood
- MPI #6 Primer, Latex for Exterior Wood with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #6 X-Green™ Primer, Latex for Exterior Wood.

ii Flat
- MPI # 10 Latex, Exterior Flat (MPI Gloss Level 1-2) with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #10 X-Green™ Latex, Exterior Flat (MPI Gloss Level 1-2).

iii Eggshell/Satin
- MPI #214 Latex, Exterior (MPI Gloss Level 2) with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #214 X-Green™ Latex, Exterior (MPI Gloss Level 2).

iv Low Sheen

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- MPI #15 Latex, Exterior, Low Sheen (MPI Gloss Level 3-4) with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #15 X-Green™ Latex, Exterior, Low Sheen (MPI Gloss Level 3-4).

v Semi-Gloss

- MPI #11 Latex, Exterior Semi-Gloss (MPI Gloss Level 5) with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #11 X-Green™ Latex, Exterior Semi-Gloss (MPI Gloss Level 5).

vi Gloss

- MPI #119 Latex, Exterior, Gloss (MPI Gloss Level 6) with VOC < 51 g/l and meets Environment Canada's VOC requirements.
- MPI #119 X-Green™ Latex, Exterior, Gloss (MPI Gloss Level 6).

vii Info: http://www.mpi.net/.

Approved College Products:

Beauti-Tone Paints, available at Home Hardware:

1. Designer Series Satin
2. Designer Series Door & Trim
3. NATURA Series Eggshell
4. NATURA Series Pearl
5. Signature Series Eggshell
6. Signature Series Semi Gloss

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Section 11 53 29
Controlled Environment Cabinets for Laboratories

Referenced Standards

1.1 ARI: American Refrigeration Institute, 420-77 and 520-78.

1.2 ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers, Standard 15-1994 – Refrigeration Components, Safety and Use of Refrigerants.

1.3 ASTM: American Society for Testing and Materials, A204 – Aluminum Alloy, Sheet and Plate.

1.4 ASTM: American Society for Testing and Materials, A240 – Stainless Chromium-Nickel-Steel, Sheet and Strip.

1.5 ASTM: American Society for Testing and Materials, A-525 – Steel Sheet, Zinc-Coated, Physical Structural Quality.

1.6 UL: Underwriters Laboratories Inc., 723 – Room Panel Flame Spread Ratings.

1.7 NSF: National Sanitary Foundation Seal of Approval – Room Panels.

1.8 FM: Factory Mutual, E84 Burn Test, Class 1 Rating, Aluminum Panels.

1.9 CSA: Canadian Standards Association, C22.2.

1.10 NEC: National Electrical Code Article 310 and 410 – Electric Motors.

1.11 NFPA: National Fire Code, 79 – Electrical Standard for Industrial Machinery.

1.12 Furnish all labor, materials, equipment and services necessary to complete the controlled environmental room work.

1.13 Factory assemble and test major components prior to delivery, including air handler / evaporator, compressor / condensing unit, humidification / dehumidification equipment and control panels.

1.14 Deliver components to their final location and complete assembly of rooms in place by manufacturer approved technician(s).

1.15 Install refrigeration piping, electrical power wiring, control wiring and connections to devices which are an integral part of the environmental room.

1.16 Startup and field test to be performed by manufacturer approved trained technical personnel.

1.17 Environmental room shall be designed, manufactured and installed by one supplier for single source responsibility.

1.18 If a supplier or manufacturer provides an item which causes changes to other portions of the plans or specifications in order to incorporate their product, the cost to make the change shall be included in the supplier or manufacturer’s cost.

1.19 Environmental room shall be self-contained unit with all essential systems and equipment necessary for a complete and functional room.

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1.20 Environmental room footprint shall not be less than (6' x 8') (1830mm x 2440mm), or exceed (9' x 9') (2745mm x 2745mm).

1.21 Design systems with sufficient capacity to simultaneously and continuously meet all loads; including heat transmission from external sources, ventilation load and internal heat gain from equipment, lighting and people.

1.22 The environmental room design and installation shall conform to applicable codes, ordinances and regulations.

1.23 Submit, for approval, manufacturer's data for all environmental room components including panels, air handler / evaporator, compressor / condensing units, humidification / dehumidification equipment and control panels.

1.24 Submit shop drawings, minimum scale (1/4 inch = 1'-0") (1:50), which include dimensioned plans, elevations and sections. Provide utility data, details and other information required for proper evaluation of work and for coordination with other related work.

1.25 Submittals shall include, as a minimum, cooling, heating and humidification / dehumidification requirements and capacities. Provide refrigeration piping schematic showing all components and their respective size or capacity, airflow schematic and written sequence of operation.

1.26 Electrical plan shall show all power connections to lighting and equipment; the voltage, amperage and kW load for each circuit; and control and power wiring schematics.

1.27 Provide roughing in requirements for mechanical and electrical services.

1.28 Submit reports of all specified factory and field performance tests.

1.29 Before request for final payment, provide Operating and Maintenance Manuals that reflect installed conditions and provide detailed operating and maintenance procedures.

1.30 Environmental rooms and associated equipment shall be provided by a single laboratory environmental room manufacturer.

1.31 Manufacturer's Qualifications: 10 years or more experience in manufacture of laboratory environmental rooms and equipment of type specified, and 10 installations of equal or larger size and with similar requirements.

1.32 Schedule delivery of environmental room components and equipment when building spaces are sufficiently complete so that material can be installed immediately following delivery.

1.33 Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.

1.34 Examine project conditions at the site with regard to access, dimensions and the general areas of work. Installation work shall be performed in close coordination with other trades as applicable.

1.35 Provide for any mechanical or electrical service different than indicated in these Specifications, but necessary to accommodate the manufacturer's product requirements.

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1.36 Provide a written warranty stating the product is free from defects in material or workmanship under normal use and service. Warranty shall become effective following the acceptance date and cover the following items for the noted duration:

i Ten year insulated panel warranty
ii Five year compressor warranty
iii One year parts warranty
iv One year labor warranty

1.37 Wall and Ceiling Panels:

i Modular panel sections, (4 inches) (100 mm) thick, consisting of foamed in place urethane insulation with interior and exterior metal surfaces. Provide panels in standard size increments, fully interchangeable, and in a configuration that meets the specified dimensions. Structural metal, wood or fiberglass material shall not be used between interior and exterior surfaces.
ii Interior and Exterior Surfaces; Stucco embossed aluminum, minimum (0.04 inches) (1 mm) thick, with baked enamel finish. Color selected by Owner.
iii Insulation: Foamed-in-place urethane having a thermal conductivity ("K" Factor) not exceeding (0.118 BTU/hour/square foot/degree Fahrenheit/inch) shall not exceed 0.029 (R-34) for (4 inch) (100 mm) thick walls. Foam shall be 97 percent closed cell, impervious to moisture. Insulation shall bond the panel and have a minimum compressive strength of (28 pounds per square inch) (193 kPa).
iv Panel sections shall lock together from inside the room with cam type fasteners, providing accurate, tight joining. A minimum of 3 locking devices shall be used on each vertical joint. Distance between locking devices shall not exceed (48 inches) (1220 mm). Edge of panels shall be foamed in place, tongue and groove construction with every tongue including an interior and exterior foamed in place flexible vinyl gasket to ensure a tight fit. Batten strips or pressure clips as a means of covering seams or joining panel sections shall not be utilized.
v Each panel shall meet UL fire test rating with a flame spread rating of 25 or less and display the UL label for this rating. Panels shall be tested and approved by Factory Mutual, Standard Number 4880, for Class I building type, insulated wall and ceiling construction in combination.
vi Reinforce ceiling panels to support equipment loads without violating the insulation value of the panels.
vii A minimum of 4 pass through ports to be provided, each minimum (3") (76mm) diameter.

1.38 Floor Panels:

i Minimum of (4 inches) (100 mm) of foamed in place urethane insulation with interior and exterior metal surfaces of (14 gage) (1.99 mm) galvanized steel capable of withstanding a minimum of (600 pounds per square foot) (23.5 kPa). Provide ramps at all doors, extending inside.
ii Ramps shall support minimum of (1000 pounds) (454 kG) rolling load.

1.39 Doors:

i In fitting, semi flush, with a minimum clear opening of (52 inches wide by 78 inches) (1320 mm by 1980 mm) high. Doors shall have a thermal resistance within 10 percent of that for wall panels.

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ii Observation Window: Minimum of (18 inches by 12 inches) (45 mm by 300 mm), 3 pane with (1/4 inch) (6 mm) air space between panes. Windows shall be removable for replacement.

iii Gaskets: Extruded vinyl, resistant to oils and sunlight and easily replaceable. Provide antisweat heaters to control condensation as a standard item on all door jambs at rooms designed for operation below degrees Celsius.

iv Hardware: Polished aluminum, cam action type, self closing, self lubricating and edge or strap mounted with stainless steel. A minimum of 2 hinges per door, adjustable for proper gasket seal.

v Lock: Provide with keyed cylinder lock capable of release from the room interior whether or not the door is locked.

1.40 Closure Panels:

i Furnish and install the necessary vertical and horizontal closure panels, strips and shrouds to enclose opening between environmental rooms and adjacent corridor, building partitions and ceiling. Finish to match adjoining environmental room wall panels.

1.41 Interior:

i Lay in Ceiling: Provide a (24 inch by 48 inch) (610 mm by 1220 mm) acrylic, egg crate type lay in ceiling grid supported by (1 ½ inch by 1 ½ inch) (38 mm by 38mm) anodized aluminum members.

ii Ceiling plenum to contain evaporator coils, drain pans, fans, heating elements, control valves and other equipment necessary to condition the room air to maintain specified conditions.

iii Conditioned air shall pass into a positive pressure plenum extending across the room ceiling. Plenum to provide the correct percentage of total opening to ensure uniform air distribution throughout the room.

1.42 Flooring:

i Provide resilient flooring in each room, 4 degrees Celsius and above. Final selection of color and style by the Owner. Prefinish floor with a substrate that will accept the resilient flooring. Flooring is to be secured to the substrate with adhesive that will withstand the temperatures in the Environmental Room. Provide grooved base.

1.43 Conditioning Module:

i Room air shall be temperature conditioned by a conditioning module consisting of an evaporator with drain pan, air circulating fans and controls.

ii Minimum requirement for selectable temperature range shall be -31C to +45C.

iii Locate conditioning module in ceiling plenum above lay in ceiling. Conditioning module shall be low profile type to maximize the clear height inside the room.

iv Electrical power feed to conditioning module shall be through the environmental control panel.

1.44 Lighting shall be sufficient to provide (70 foot-candles) (753 lx) of uniform illumination when measured at (36 inches) (910 mm) above the floor.

1.45 Mount fixtures above the false ceiling panels.

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1.46 Fixtures shall be LED or Vapor proof fluorescent type with low temperature ballast suitable for the temperature listed in the Environmental Room Schedule. Underwriters Laboratories approved 120/60/1.

1.47 For rooms at 0 degrees Celsius and below, provide low temperature lamps.

1.48 Provide light switch with pilot light and locate outside of the room next to the door.

1.49 Grow lighting option: Adjustable lighting with a minimum of 24 full spectrum fluorescent and 24 incandescent fixtures providing 800 Watts/m2.

1.50 Provide freestanding open wire shelves, adjustable on (1 inch) (25 mm) centers, constructed of 9 gage wire ribs and side reinforcing members all around. Provide (1 inch) (25 mm) diameter vertical support posts with ringed grooves (1 inch) (25 mm) apart.

1.51 Shelves and posts of epoxy coated nickel-chrome steel or type 304 stainless steel.

1.52 Shelf Size: (74 inches) (1800 mm) high, (72 inches) (1830 mm) maximum width, and depth. Provide with 5 tiers of shelves.

1.53 Refrigeration System:

i Complete integrated system consisting of a conditioning module, compressor / condenser unit, interconnecting piping, interconnecting wiring and controls designed for continuous system operation. The refrigeration system shall be a fully modulating type which continuously proportions the mixture of liquid and hot gas phases of the refrigerant entering the evaporator, utilizing a modulating control valve. On/off solenoid valve type of control will not be acceptable. The system shall also include high/low pressure controls, receiver, expansion valve and all necessary components for a complete system to achieve the specified performance.

ii System Capacity shall be sufficient to simultaneously and continuously meet all loads, from 0 to 100 percent, including heat transmission from external sources, ventilation load and internal heat gain from equipment, lighting and people.

iii Refrigerant: R-404A.

1.54 Ventilation will be continuously provided from building supply air system. Rooms must maintain temperature control and uniformity with ventilation load continuously present.

1.55 Evaporator Coil: Copper tube, copper fin with aluminum housing. Minimum 8 fins per (inch) (24 mm), minimum 4 rows deep. Air velocity shall be less than (500 fpm) (2.5 m/s).

1.56 Coil Blower/Motor: Permanently lubricated, ball bearing design, rubber mounted and thermally protected.

1.57 Drain Pans: Provide an insulated, stainless steel, condensate drain pan large enough to collect all condensate during normal operating and defrost cycles.

1.58 Compressor/Condenser Unit: Air cooled, semi hermetic, serviceable unit sized to maintain temperature / humidity conditions.

1.59 All components of the unit shall be designed from 125 psig working pressure or 150 percent of maximum operating pressure, whichever is greater.

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1.60 Unit shall have a minimum of a high/low pressure safety control, receiver with fusible plug, liquid line drier with sight glass, crankcase pressure regulator, accumulator, vibration absorbers and thermal protection.

1.61 Unit shall be designed for continuous operation for maximum compressor life and to eliminate on-and-off cycling.

1.62 The compressor / condenser unit shall be linked to an evaporator of matching capacity.

1.63 Provide a fully accessible sheet metal sound enclosure internally lined with (2 inch, 6 pound) (48 mm, 2.7 kg) density glass fiberboard tightly fitted to the cold room. The enclosure shall be provided with acoustically lined air transfer ducts as required to dissipate any heat buildup within the enclosure.

1.64 For rooms with setpoint temperature between 0 degrees Celsius and 6 degrees Celsius, provide hot gas bypass defrost with timer and fan delay switch. Set defrost initiation time and duration so that room temperature increase is minimized while achieving complete removal of accumulated frost. Electric heat trace and insulate drain pipe.

1.65 Piping: ACR type, hard drawn, cleaned and capped Type L copper tubing soldered with silver solder. Hot gas piping shall be silver brazed. All piping shall be installed to allow for linear expansion of copper after startup.

1.66 Suction Piping: Size for velocity of (500-700 fpm) (2.5 – 3.5 m/s) on horizontal runs with a slight pitch toward condensing unit. When condensing unit is located below evaporator and there is no possibility of trapping oil; size vertical runs same as horizontal runs. When condensing unit is located above evaporator; size vertical runs for velocity of (1,000 – 1,500 fpm) (5-7.5 m/s) and install proper traps spaced not more than over (10 feet) (3 m) apart on all tubing risers.

1.67 Hot gas Piping: When hot gas piping is field installed remote from compressor, size at same velocities and with same trap requirements as specified above for suction lines.

1.68 Liquid Piping: Size all liquid piping for maximum (2 psig) (13.8 kPa) pressure drop.

1.69 Hangers: Provide with appropriate tubing clamps to support liquid, suction and discharge lines individually. Space hangers or clamps (8 feet) (2.4 m) on center maximum.

1.70 Condensate Drain Piping: Provide (7/8 inch) (20 mm) or greater, Type L copper tubing from evaporator drain pan to the building waste system. In rooms with sinks, drain piping shall be connected to the sink drain on the house side of the trap. In rooms without sinks, drain piping shall terminate (2 inches) (48 mm) above the floor sink or floor drain outside the room. Horizontal piping between drain pan and environmental room wall shall be located above the lay in the ceiling and pitched in the direction of flow. Rigidly support piping at walls, (3 feet) (1 m) on center with a (1 inch) (24 mm) clear space between the wall and the drain line. Provide cleanout tee near drain pan. Where piping passes through wall of room, provide chrome plated escutcheons on both faces of the wall and a trap seal at the outside surface of the wall. Insulate and electric heat trace drain piping.

1.71 Refrigerant Testing: Pressurize and leak test entire system at not less than (100 psig) (690 kPa). Clean and dehydrate by maintaining a vacuum of 500 microns, or lower, for a 5 hour period. Add

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required charge of refrigerant and oil if necessary and test entire system for performance. The type of refrigerant used shall be in accordance with State and Local Codes. Mark each system clearly as to refrigerant type used.

1.72 Service line penetrations shall be properly sealed with silicone caulking.

1.73 Suction and hot gas refrigeration lines shall be insulated with a closed cell foam plastic insulation. The material shall be tubular in form and sized according to the pipe size. Joints shall be thoroughly bonded by the adhesive recommended by the manufacturer of the insulation. Insulation shall meet local and state fire and smoke requirements. Penetrations of the insulation must be thoroughly sealed to form a complete vapor barrier. Wherever the insulation terminates the edges shall be sealed to the pipe with sealant.

1.74 Ventilation supply and exhaust will be provided on a continuous basis from the building ventilation system. Provide a pressure independent constant volume air valve on the supply and exhaust to each environmental room. Environmental rooms must maintain specified uniform temperature and humidity control with ventilation load continuously present.

1.75 Provide a (4 inch) (100 mm) diameter exhaust duct collar through the roof of the environmental room for connection to the building laboratory exhaust system. Exhaust ducts shall be insulated for a minimum of (6 feet) (1 m) beyond the duct collar.

1.76 Provide a (4 inch) (100 mm) diameter supply duct collar through the roof of the environmental room for connection to the building laboratory supply air system. Termination of the supply air duct in the ceiling plenum shall be at warm side of the evaporator.

1.77 Dehumidification system:

i Automatic, continuous duty, dry desiccant type. Rotary non-cycling for continuous, unattended operation. The dehumidifier shall be completely factory assembled, wired and tested. It shall be self-contained and include a rotary cylinder type desiccant drum assembly filled with granular chemical desiccant. The dehumidifier shall be complete with a process air fan and motor, reactivation air heating system, access panels, filters and controls for complete automatic operation.

ii The dehumidifier shall be constructed of (16 gage) (1.613 mm) zinc grip type steel and provided with access panels which shall be designed to allow complete internal inspection and servicing of the desiccant drum and drive assembly. The dehumidifier shall be primed and painted consistent with corrosion prevention standards. The casing shall be constructed air and vapor tight throughout.

iii The unit shall be divided internally into two separate sections, process and reactivation. Division of the separate sections shall be accomplished with long life silicone seals, ensuring minimum cross leakage.

iv The drum drive assembly shall have a positive drive arrangement for slip free rotation of the desiccant cylinder. An electronic control shall allow drum rotation adjustment. Filters shall be factory mounted in the process and reactivation air inlet openings. Filters shall be of the cleanable type.

v The desiccant drum shall be fully charged with a granular, chemically inert, non-corrosive, nonflammable, nontoxic desiccant. The desiccant shall be high absorption capacity silica gel.

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1.78 Controls:

i Locate all instruments and controls in a control panel on the outside of the room. Controls shall be mounted at AODA compliance. Provide panel with a clear acrylic cover and a lock with two keys.

ii Microprocessor based PID controller designed for environmental room applications with the following features:

iii Resistance Temperature Detector (RTD) 100 ohm platinum sensor for rabid response to temperature fluctuation, open tip for environmental rooms. Sensitivity shall be greater than or equal to plus or minus 0.1 degree Celsius.

iv The microprocessor PID controller shall continuously monitor room condition versus setpoint, providing an output which will modify the conditioning system capacity in response to any deviation.

v Controller range shall be established to cover the required range of the room as scheduled.

vi Accuracy: Plus or minus 0.25 percent of reading plus 1 digit over advertised span at 25 degrees Celsius.

vii Ambient Temperature Error: 0.01 percent of span per degree Celsius deviation from 25 degrees Celsius.

viii Resolution: 1 degree/unit.

ix Calibration Drift: Self compensating for ambient temperature. All calibration values shall be stored in memory. No field calibration shall be required.

x Noise Rejection: Normal mode, 85 dB minimum at 60 Hertz or greater. Common mode, 90 dB minimum.

xi A separate and independent safety control circuit and devices shall be installed in the control panel. This control shall be a sensitive electronic controller with setpoint dial calibrated in degrees Celsius. In the event of a high temperature alarm condition, the safety control will de-energize the heaters and lights in the room and activate an audible and visual alarm. A panel mounted momentary contact push button shall be provided to deactivate only the audible portion of the alarm. When temperature returns to the normal range the heaters, lights and alarm system shall automatically reset. Provide dry contact for connection to external alarm.

xii A separate and independent safety control circuit and devices shall be installed in the control panel. Its sole function shall be to deactivate the refrigeration system and activate audible and visual alarms in the event of a low temperature alarm condition. This control shall be a sensitive electronic controller with setpoint dial calibrated in degrees Celsius. A panel mounted momentary contact push button shall be provided to deactivate only the audible portion of the alarm. When temperature returns to the normal range the alarm system shall automatically reset. Provide dry contact for connection to external alarm.

xiii Temperature Recorder: House in main control panel case and provided with a (10 inch) (250 mm) circular chart capable of recording 7 days of operation with minus 50 degrees Celsius to plus 75 degrees Celsius recording range. Ambient temperature error shall be no more than 0.02 percent of span per degree Celsius deviation from 25 degrees Celsius. Chart making shall be by means of a disposable felt tip pen. Input to the recorder shall be from a 100 ohm RTD sensor. The sensor shall be immersed in a glycerin solution and the container secured to the interior wall of the room.

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1.79 Provide room with a reset type, electrically powered personnel emergency alarm system. Power shall be from the room electrical input. The system shall consist of an actuator within the room and audible and visual alarms affixed to the front exterior of the room. Provide an additional alarm for the building automation system utilizing two dry contacts.

1.80 The alarm system actuator shall be a heavy duty, oil tight switch, equipped with a red button marked, "EMERGENCY ALARM – PULL TO RESET." The actuator shall be mounted on the interior wall of the room adjacent to the door jamb and (12 inches) (300 mm) above the finish floor.

1.81 The audible alarm shall be of a type that provides a high decibel level of sound output at a frequency distinct from room parameter alarms. The visual alarm shall be mounted in an area providing no vision interference and shall be prominently labeled "PERSONNEL EMERGENCY."

1.82 Deliver to job site, uncrate and assemble all equipment herein. All debris and crafting materials shall be removed. Components shall not be exposed to weather.

1.83 Sections shall match without distortion. Door shall close and seal without binding.

1.84 Electrical:

i 575V, 3 Phase.
ii Furnishing, installation and connection of control panel, complete with disconnects for incoming service and branch circuits included.
iii Incoming service to control panel mounted disconnects from junction box located above the environmental room.
iv Interlocking control wiring between control panel and remote compressors or heaters, between fan/coil unit and remote compressors or heaters, where required.
v Provide a dry contact, for use by building automation system, that will close when any of the operating controls fail or when any of the safety devices prevent operation of conditioning equipment.
vi Provide sealing fitting to seal conduit at all penetrations of environmental room wall or roof panels.

1.85 Mechanical:

i Service line penetrations into rooms shall be properly sealed with silicone caulking.
ii Insulate the exhaust duct for a minimum of (6 feet) (1.8 m) beyond the collar.
iii Manufacturer's Representative shall instruct Owner's staff in the operation of room including controls, after completion of room startup.
iv The operating and maintenance manual shall indicate sequential operation, startup and shutdown, with all pertinent control data and schematics.

1.86 Startup & Testing:

i Provide all equipment and instrumentation for testing and perform the specified tests.
ii Verify temperature control of plus or minus 0.5 degrees Celsius at the room sensor.
iii Measure the temperature on a horizontal plane (40 inches) (1000 mm) above the floor within (12 inches) (300 mm) of walls throughout the entire room. Temperature uniformity shall be plus or minus 0.5 degrees Celsius. Measure and record uniformity using a multipoint strip chart recorder utilizing a minimum of twelve thermocouples during a continuous 24 hour test period.

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iv Verify that maximum temperature gradient from floor to ceiling does not exceed 1.0 degrees Celsius.

v All rooms, except freezers, shall recover preset operating temperature within 5 minutes after door has been fully opened to (75 degrees Fahrenheit) (24 degrees Celsius) ambient for a period of 1 full minute.

vi Each room shall maintain plus or minus 1.0 degree Celsius control when operating with the number of people, amount of ventilation and internal heat gain of lighting and equipment as shown on the Environmental Room Schedule.

vii Provide written reports, in duplicate, of all tests. Reports shall indicate procedures followed, instruments used and tabulation of results.

viii Owner's Representative shall be given the option of witnessing and confirming test results. Notify Owner's Representative, in writing, 10 days prior to tests.

ix Supplier shall provide all equipment for testing and perform all tests for IQ and OQ validation. Test shall confirm that the room meets the temperature stability specifications.

Division 22

Section 22 00 00
Plumbing General Requirements

1.1 Workmanship and method of installation shall conform to best standards and practice.

1.2 Where required by local or other By-Laws and Regulations, tradespeople shall be licensed in their trade.

1.3 Take information involving accurate measurement of building at building. Make, without additional charge, any necessary changes or additions to runs of piping or equipment locations to accommodate structural conditions.

1.4 Furnish "built-in" items in ample time and give necessary information and assistance in connection with building-in of same. Notify Section concerned in writing of size and location of recesses, openings and chases at least 48 hours before walls are erected, floors poured and similar work.

1.5 Before commencing work, check and verify all sizes, locations, materials, elevations, levels and dimensions to ensure proper and correct installation. Verify existing and municipal services.

1.6 Supply and install ball type isolation valves at all locations where connecting to a main supply line.

1.7 Supply and install isolation valves at all fixtures.

1.8 Securely plug or cap open ends of pipes or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all piping and equipment inside and outside before testing.

1.9 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts. Protect all bearings and motors from damage due to moisture and dust. Equipment not yet in operation shall be turned over at least at monthly intervals to prevent bearing deterioration.

1.10 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.11 Instruct Building Operators in repair, maintenance and operation of Mechanical Systems and associated equipment.

1.12 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.13 Confer with other Sections and arrange work so it will be carried on in best interests of all concerned bearing in mind building construction and finish required.

1.14 Proceed as quickly as practical so that construction may be complete in shortest possible time.

1.15 Temporary or trial usage of any mechanical device, machinery, apparatus, equipment or materials shall not be constructed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be used.

1.16 Shop drawings shall have manufacturer’s names, or supplier's name complete with phone numbers and names of contacts, catalogue model numbers, name of trade supplying same, identification number, all pertinent selection criteria such as air flow, noise, heat input/output, etc.

Division 22

1.17 In addition, electric wiring diagrams, control panel boards, motor test data, motor starters and controls for electrically operated equipment furnished by Mechanical trades must also be submitted.

1.18 Supply as required, 12 gauge hinged metal access doors with frames for installation by other Sections in walls or ceilings to permit access to built-in or inaccessible controls, dampers, valves, cleanouts and components.

1.19 Access doors in fire rated walls, duct shafts or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated.

1.20 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shafts or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated.

1.21 Instruct and supervise other Sections doing related work. Co-ordinate all work between this Division and their relationship to all other Sections. Supply measurement of equipment to other Sections to allow for necessary openings to be left in work of other Sections.

1.22 Install all work and equipment to manufacturer's printed directions.

1.23 Install work in advance of concrete pouring, ceiling installation, furring or similar work.

1.24 Locate all mechanical and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

1.25 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions wherever necessary for this purpose.

1.26 Core drill holes up to 200 mm diameter (150 mm pipe) in concrete walls and floors for piping where not previously sleeved. Neatly patch holes to approval and where located in exterior walls above grade, make watertight. Make holes in walls below grade with due provision for pipe movement (min. 50 mm clear all around), fill with 50 mm thick fiberglass blanket insulation and seal watertight with mastic.

1.27 Supply and install supports, stands and platforms necessary for proper installation of equipment and components, of steel or wood as may be required.

1.28 Where equipment is roof mounted, this Section will provide suitable approved curbs and bases properly flashed and sealed to roof unless otherwise noted.

1.29 Supply and install hangers to support pipes. Adjust hangers so that pipes will be true in respect of alignment and grade.

1.30 Do not use wire, chain, strap or extension bar hangers under any circumstances.

1.31 Install all work supported from hangers or supports in a manner to ensure that building construction is not weakened or over-stressed, that pipes are secure, vibration free, free to expand and contract and properly graded, and that vertical adjustment of horizontal pipes is possible after erection.

1.32 Support all hangers directly from building structure only. Do not support pipes or equipment from other pipes, ducts or equipment.

Division 22

1.33 Support plumbing piping in accordance with requirements of Plumbing Code.

1.34 Where pipes pass through walls, supply and install suitable 1.2 mm (18 gauge) galvanized steel sleeves. Size sleeves on insulated pipes to permit insulation to continue through sleeves.

1.35 Seal spaces between unburied pipes and ducts through "required" fire separations" with U.L.C. listed (Guide 40U19) fire stopping including pipe insulation. Fire stopping shall comply with O.B.C. and OFC.

1.36 Seal all holes and openings through floors water tight.

1.37 Sleeves on buried piping shall be 50 mm larger all round than pipe and be filled with 50 mm thick fiberglass blanket insulation and sealed with mastic.

1.38 Ensure stamped, etched or engraved lettering on plates is legible. Nameplates shall not be painted over and where apparatus is insulated, provide adequate openings in insulation for viewing purposes.

1.39 Examine site and local conditions. Before commencing work, examine the work of other Sections and report at once any defect or interference affecting the work, its completion or warranty.

1.40 Provide drainage systems as required for roof and interior floor.

1.41 Supply and install insulation for following piping systems:

- i Domestic water piping and lab water supply piping
- ii Miscellaneous piping as noted on Drawings or in specifications.
- iii Horizontal suspended sanitary soil and waste piping.
- iv Storm & sanitary drains as specified.
- v Miscellaneous insulation as specified.

Division 23

Section 23 00 00
Heating, Ventilation & Air Conditioning (HVAC) General Requirements

1.42 Workmanship and method of installation shall conform to best standards and practice.

1.43 Where required by local or other By-Laws and Regulations, tradespeople shall be licensed in their trade.

1.44 Take information involving accurate measurement of building at building. Make, without additional charge, any necessary changes or additions to runs of ducting or equipment locations to accommodate structural conditions.

1.45 Furnish "built-in" items in ample time and give necessary information and assistance in connection with building-in of same. Notify Section concerned in writing of size and location of recesses, openings and chases at least 48 hours before walls are erected, floors poured and similar work.

1.46 Before commencing work, check and verify all sizes, locations, materials, elevations, levels and dimensions to ensure proper and correct installation. Verify existing and municipal services.

1.47 Securely plug or cap open ends of ducts or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all ducting and equipment inside and outside before testing.

1.48 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts. Protect all bearings and motors from damage due to moisture and dust. Equipment not yet in operation shall be turned over at least at monthly intervals to prevent bearing deterioration.

1.49 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.50 Instruct Building Operators in repair, maintenance and operation of HVAC Systems and associated equipment.

1.51 If duct or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.52 Confer with other Sections and arrange work so it will be carried on in best interests of all concerned bearing in mind building construction and finish required.

1.53 Proceed as quickly as practical so that construction may be complete in shortest possible time.

1.54 Temporary or trial usage of any HVAC device, machinery, apparatus, equipment or materials shall not be constructed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be used.

1.55 Shop drawings shall have manufacturer’s names, or supplier's name complete with phone numbers and names of contacts, catalogue model numbers, name of trade supplying same, identification number, all pertinent selection criteria such as air flow, noise, heat input/output, etc.

1.56 In addition, electric wiring diagrams, control panel boards, motor test data, motor starters and controls for electrically operated equipment furnished by HVAC trades must also be submitted.

Division 23

1.57 Supply as required, 12 gauge hinged metal access doors with frames for installation by other Sections in walls or ceilings to permit access to built-in or inaccessible controls, dampers, valves, cleanouts and components.

1.58 Access doors in fire rated walls, duct shafts or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated.

1.59 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shafts or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated.

1.60 Instruct and supervise other Sections doing related work. Co-ordinate all work between this Division and their relationship to all other Sections. Supply measurement of equipment to other Sections to allow for necessary openings to be left in work of other Sections.

1.61 Install all work and equipment to manufacturer's printed directions.

1.62 Install work in advance of concrete pouring, ceiling installation, furring or similar work.

1.63 Locate all HVAC and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

1.64 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install ducting and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions wherever necessary for this purpose.

1.65 Supply and install supports, stands and platforms necessary for proper installation of equipment and components, of steel or wood as may be required.

1.66 Where equipment is roof mounted, this Section will provide suitable approved curbs and bases properly flashed and sealed to roof unless otherwise noted.

1.67 Supply and install hangers to support ducts. Adjust hangers so that ducts will be true in respect of alignment and grade.

1.68 Do not use wire, chain, strap or extension bar hangers under any circumstances.

1.69 Install all work supported from hangers or supports in a manner to ensure that building construction is not weakened or over-stressed, that ducts are secure, vibration free, free to expand and contract and properly graded, and that vertical adjustment of horizontal ducts is possible after erection.

1.70 Support all hangers directly from building structure only. Do not support ducts or equipment from other pipes, ducts or equipment.

1.71 Seal spaces between unburied ducts through "required" fire separations" with U.L.C. listed (Guide 40U19) fire stopping. Fire stopping shall comply with O.B.C. and OFC.

1.72 Seal all holes and openings through floors water tight.

1.73 Ensure stamped, etched or engraved lettering on plates is legible. Nameplates shall not be painted over and where apparatus is insulated, provide adequate openings in insulation for viewing purposes.

1.74 Examine site and local conditions. Before commencing work, examine the work of other Sections and report at once any defect or interference affecting the work, its completion or warranty.

Division 23

1.75 Supply and install insulation for following HVAC systems:

vi Supply air ducting.

vii Return air ducting.

viii Miscellaneous ducting as noted on Drawings or in specifications.

ix Miscellaneous insulation as specified.

Division 26

Section 26 00 00
Electrical General Requirements

1.1 Equipment provided under this Division shall conform to applicable standards and regulations of the following organizations:

- i Canadian Standards Association (CSA) Underwriter's Laboratories of Canada (ULC) Canadian Electrical Code (CEC)
- ii Electrical Inspection Department of Ontario Hydro
- iii Electrical Safety Code (ESC)
- iv Canadian Underwriters Association (CUA) National Building Code (NBC)
- v Ontario Building Code (OBC)

1.2 Workmanship and method of installation shall conform to best standards and practice. Where required by local or other By-Laws and Regulations, tradespeople shall be licensed in their trade.

1.3 Temporary or trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be so used.

1.4 Work shall conform with latest rules, regulations and definitions of Canadian Electrical Code and applicable Municipal and Provincial Codes and Regulations, and with requirements of other authorities having jurisdiction in the area where work is to be performed.

1.5 File Contract Drawings with proper authorities and obtain their approval of installation and permits for same before proceeding with work. Prepare and submit necessary detailed shop drawings as required by Authorities.

1.6 Furnish necessary certificates as evidence that work installed conforms with laws and regulations of authorities having jurisdiction.

1.7 Take information involving accurate measurement of building at building.

1.8 Examine site and local conditions. Before commencing work, examine the work of other Sections and report at once any defect or interference affecting the work, its completion or warranty.

1.9 Furnish "built-in" items in ample time and give necessary information and assistance in connection with building-in of same. Notify Section concerned in writing of size and location of recesses, openings and chases at least 48 hours before walls are erected, floors poured and similar work.

1.10 Prior to equipment fabrication, delivery or installation, submit complete lists of materials proposed, indicating manufacturer, catalogue numbers and complete performance data.

1.11 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all equipment inside and outside before testing.

1.12 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.

Division 26

1.13 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.14 Arrange for on-site instruction by various Manufacturers where necessary.

1.15 Immediately prior to completion of work:

1.16 Balance demand loads for service and distribution feeders within 5 percent upon completion of work and after the building is in full operation.

1.17 Provide copy of final inspection certificate from Electrical Inspection Authority.

1.18 Where new electrical items or systems are installed through existing construction assemblies, Electrical Subcontractor involved shall be responsible for properly sized and accurate cutting of existing construction assembly to allow installation of new work.

Section 26 05 00
Common Work Results for Electrical

1.1 Conform to Section 26 00 00 - Electrical - General Requirements.

1.2 Materials shall be new, of Canadian manufacture where available, first quality and uniform throughout.

1.3 Electrical materials shall be C.S.A. approved and be so labeled. Material not C.S.A. approved shall receive acceptance for installation by Ontario Hydro Special Inspections Branch before delivery, and modifications and charges required for such acceptance shall be included in work of this Section. Material shall not be installed or connected to the source of electrical power until approval is obtained.

1.4 Confirm capacity, ratings and characteristics of equipment items being provided to supply power to equipment provided under other Sections of the work. Resolve discrepancies before such items are purchased.

1.5 Acceptance of materials installed presumes that materials have not been damaged or exposed to conditions that would adversely affect performance and life expectancy.

1.6 Rigid galvanized steel conduit shall comply with CSA Specification C22.2 No. 45.

1.7 Electrical metallic tubing (EMT) shall comply with CSA Specification C22.2 No. 83.

1.8 Connectors and couplings to be forged steel. Connectors to have factory-installed insulated throats.

1.9 Rigid PVC conduit shall comply with CSA Specification C22.2 No. 136.

1.10 Watertight flexible conduit: “Sealtite” PVC jacketed flexible steel with Hubbell-Kellum strain relief grips; shall comply with CSA Standard C22.2 No. 56.

1.11 Surface wall-mounted raceways shall be Wiremold No. 4000 dual service steel type complete with twin covers and a built-in divider that provides full isolation of services. Provide all necessary fittings, closers, device modules, etc. to suit application.

1.12 Wire and cable shall comprise copper conductors, sized appropriately, rated 75 deg. C., 600 volt minimum flame retardant insulation and CSA approved for application.

Division 26

1.13 Wire and cable installed in conduit shall be PVC insulated Type TWH - Flame retardant and comply with CSA Specification C22.2 No. 75.

1.14 Use Electrovert "Z-Type" code markers for control & communication conductors.

1.15 Wiring devices unless otherwise specified, shall be ‘Decora Style’ as manufactured by Arrow-Hart, Hubbell, Leviton, Pass & Seymour.

1.16 Double Pole lighting switches shall be connected to 2 pole circuit breakers.

1.17 Standard Duplex receptacles indicated to have `split-feed' shall be two-circuit type wired and connected to a 2 pole common trip circuit breaker in associated panelboard. Orientation of common circuit shall be similar throughout project.

1.18 Receptacles with integral ground fault interrupter shall be Hubbell No. GF-5262 with thermoplastic faceplate.

1.19 Isolated ground receptacles shall be Pass & Seymour #IG26262GRY, grey finish.

1.20 Switch and receptacle and other device faceplates for flush mounted devices, generally shall be single or multi-gang as required, type 301, stainless steel, #4 brushed finish with removable protective covering. Hubbell 97000 Series.

1.21 Weatherproof enclosures for outdoor receptacles shall be P & S 4600 with 4600-26 Mounting Plate, duplex ground fault receptacle and two #4609 Keys. Include re- installation of lockable covers as part of installation.

1.22 Cover plates for other devices such as flush fan controls, telephone, etc., shall be stainless steel to match above.

1.23 Panelboards shall comprise "Branch" panelboards, with fixed bolted connection thermal-magnetic, quick-make, quick-break, 40oC, calibrated ULC rated ‘SWD’ switching duty, molded-case circuit breaker branches. "Plug-in" breakers are not acceptable. Multipole breakers shall be common trip type.

1.24 Panelboards shall include the following features:

- i Flush or surface trim as noted.
- ii Concealed hinges.
- iii Combination catch and lock semi flush tumbler type - all keyed alike.
- iv Adjustable self-positioning trims.
- v Plain trims not displaying any names or Symbols.
- vi "Vault" type handles shall not be used except in unfinished areas.
- vii Typed schedules of circuits indicating equipment and area controlled on the backs of panel doors, in a steel trim pocket, covered with transparent non-inflammable plastic.
- viii Insulated neutral block.
- ix Supplementary ground block.

Division 26

x Copper Bus.

xi Isolated ground bar, as noted.

xii Surge-suppression system, as noted.

xiii Sprinklerproof design

xiv Interrupting rating as per Coordination Study for both panels and breakers

1.25 Branch panelboards circuit breaker type, 120/208 volt, 3 phase, 4 wire mains, minimum interrupting rating of 10,000 amps. RMS asymmetrical at 120 volts.

1.26 Panelboards shall be Square D “NQ” Series.

1.27 Provide safety disconnect switches adjacent to motors and other equipment when required by regulations.

1.28 In absence of definite detail exact location of outlets shall be determined on site as work progresses. Local switches for lighting shall generally be installed on the lock side of doors. Verify switch locations on the site.

1.29 Device plates shall cover opening left for outlet box, and plates shall be attached to boxes in an approved manner. Outlets and fixtures are to be located symmetrically, (i.e. centred in wall panels, ceiling panels or tiles, columns, between and above doors and the like).

1.30 Mounting heights of devices, centre line of device to finished floor, except for exposed masonry construction, shall generally be as follows:

i Lighting Switches - 1200 mm

ii Telephone Outlets - 450 mm

iii Manual Fire Alarm Stations - 1200 mm

iv Fire Alarm Audible Devices – 2300mm AFF and 150mm below ceiling

v Automatic Fire Alarm Stations - ceiling

vi Panelboards- 1980 mm to top of trim for standard panels.

vii Receptacles – 200mm above counter or as noted on Architectural drawings

1.31 Where not sleeved, make holes through concrete walls and floors by core-drill only.

1.32 Seal holes and sleeves through floors to serve as water dam.

1.33 Provide necessary hangers and inserts for work of this Division.

1.34 Do not use wood, chain, wire lashings, strap or grappler bar hangers.

1.35 Support fixtures independently of ceiling suspension systems. Provide additional supports as required, which shall be fastened to building structure steel members, joists, beams, etc., but not metal pan or roof decking. Material for additional supports and their installation shall comply with requirements of U.L.C. Refer to "List of Equipment and Materials" Vol. 2, and "Supplement" for application to rated assemblies.

Division 26

1.36 Support outlet and junction boxes independently of the conduits running to them where required by electrical code.Use steel angle brackets or steel rods to support outlets and fixtures, to the building structure.

1.37 Hangers, support framing and all equipment fabricated from ferrous metals which are not protected with zinc or other suitable corrosion-resistant finish shall have at least one coat of a corrosion-resistant paint applied before shipment or immediately on arrival at the site.

1.38 Identify electrical equipment supplied under this Division with 3 mm thick black laminated plastic nameplate to indicate equipment controlled to provide instruction or warning. Fasten each plate with two chrome plated screws. Lettering shall be 6 mm high for small devices such as control stations and at least 13 mm high for all other equipment. Submit a list of proposed nameplates for approval before manufacture.

1.39 Provide panelboards with typewritten schedules identifying outlets and equipment controlled by each branch circuit including existing panels being changed. Protect schedules with non-flammable clear plastic.

1.40 Identify junction boxes, pull boxes, cover plates, conduits and the like, provided for future extension, indicating their function (e.g. power, fire alarm, communication).

1.41 Verify room names and numbers prior to listing on nameplates and schedules.

1.42 Provide branch circuit wiring, conduits and feeders as required for Lighting, Power and Auxiliary Systems. Separate conduit systems shall be provided for feeder, lighting and power systems and auxiliary communication systems.

1.43 Conduit embedded in concrete or buried below grade floors shall be CSA approved rigid PVC type.

1.44 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be provided with factory-installed insulated throats.

1.45 Use flexible metallic conduit for connections to chain suspended and recessed fixture drops, motors and similar equipment to prevent transmission of vibration. A code-gauge green grounding conductor shall be provided for all such connections.

1.46 Fasten every conduit and cable to structure by means of approved conduit clamps or clips. Wire lashing is not acceptable.

1.47 Conceal conduits and wiring except where noted. Run exposed conduits parallel to building lines and to other conduits. Provide every empty conduit with a pull rope (3 mm polypropylene rope) and identify to designate its function (Power, Telephone, Fire Alarm and the like).

1.48 Conductors used for all auxiliary systems (e.g. Fire Alarm) shall be tagged and/or colour-coded, and where applicable shall agree with manufacturer`s wiring diagrams.

1.49 Minimum wire size for power wiring shall be No. 12 AWG gauge unless specified otherwise. Minimum wire size for "Common" neutral conductors shall be No. 10

Division 26

1.50 Wire or cables in feeders, sub-feeders and branch circuits shall be colour-coded in accordance with Ontario Electrical Safety Code. Each end of feeder terminations (e.g. in Switchboard, Panelboards, switches, splitters and the like) Code Phase A - Red, Phase B - Black, Phase C - Blue, Neutral - White.

1.51 Install pull boxes where necessary to permit installation of conductors. Support pull boxes, outlet boxes, panels and other cabinets independently of conduit.

1.52 Electrical boxes and panels shall be CSA approved, code-gauge sheet metal, galvanized or with suitable protective treatment. Secure covers with screws or bolts.

1.53 Main pull and junction boxes (excluding obvious outlet boxes) shall be clearly identified by painting the outside of the cover in accordance with the following schedule:

i Lighting Yellow

ii Power Blue

iii Fire Alarm Red

iv Telephone Cream

v Control Brown

vi Intercom & Sound Green

1.54 Supply access doors for where electrical equipment requiring maintenance or adjustment or inspection is located above ceilings, within walls or behind furring; except ceilings of lay-in removable panel type.

1.55 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shaft or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated access doors.

1.56 Provide empty conduits from flush panelboards, and others as noted, terminating in accessible ceiling spaces, sized to accommodate spare and space breaker provisions. One 25 mm (1") conduit for each three spare breakers or spaces.

1.57 Faulty and defective equipment shall be replaced with new materials. Conductors which are found to be shorted or grounded, or to have less than proper insulation resistance, shall be replaced with new conductors.

1.58 Co-ordinate the exact location and verify characteristics of electrical provisions for the work of the Mechanical Division.

1.59 Ground all electrical systems in accordance with provisions of the Ontario Electrical Code.

1.60 Provide a grounding electrode in accordance with Section 10 of the Canadian Electrical Code.

1.61 Make watertight seal at sleeves and other openings through floors above grade.

1.62 Provide Fireproofing protection of openings through floors and fire rated walls.

1.63 Caulk spaces between conduit, cables, bus ducts, raceways, cable trays etc. to maintain rating(s).

Division 26

1.64 Roof flashing for conduit feeders to roof mounted equipment shall be sealed and flanged to roof with pre insulated aluminum flashing sized to suit. Install in accordance with manufacturer's instructions and details.

1.65 Provide exterior lighting system to match the light levels, fixture types, and layout of the main building. Determine if additional site lighting is required by Municipality and design, supply, and install site lighting to meet Municipality light standards and criteria.

1.66 **Approved College Standards and Products:**

i Duplex receptacles shall be installed at minimum every 8' of linear wall length (appx.), or as directed.
ii Electrical devices, "Decora" style.
iii Receptacle & switch covers, Hubbell type "97000" series.
iv Motion detectors "WT-1100" as manufactured by The Watt Stopper, for common, open area(s).
v Fluorescent lamp ballasts, Advance programmed start IOP2S32SC. Warranty 3 years.
vi Fluorescent lamp Design - T8-25W, base - md bip.; Initial lumens 2900; Life hr. - 24,000; Description 4100K (Cool White equivalent).
vii Replacement branch panels, Square D "NQ" [flush or surface] mount, 225 amp copper buss with feed through lugs, 60 circuits with a total of 30 x 15 amp single pole QOB-VH 22ka bolt in breakers.
viii Exterior lighting poles for parking areas by Powco/Valmont Engineering, info: http://www.valmontwce.com/.
ix Exterior lighting pole bases by Artforms Inc. model "NEWAVEA 510". Info: http://www.artformsconcretebases.com/.
x Flame Stopper by Wiremold or approved equal, where wire passes through any wall that is a Fire Separation.

Division 28

Section 28 30 00
Electronic Detection and Alarm

1.1 Conform to Section 26 00 00 - Electrical - General Requirements.

1.2 Conform with applicable Section 16050 requirements governing installation, electrical connections, raceways, conductors and the like.

1.3 The Main Building consists of an existing Edwards Fire Alarm System. Provide all Edwards devices as required and modify existing Fire Alarm System as required. Reverify fire alarm system throughout the entire scope of work area and any components of existing system required to meet CAN4-S537-M86 requirements.

1.4 All components shall be CSA and ULC listed and labeled, acceptable to the Ontario Fire Marshal and the local Fire Department and suitable for operation on service characteristics noted. System equipment and operation and installation shall comply with the National and Provincial Building Code; Canadian Underwriters Association Standards CUA-70 and CUA-72A, Canadian Electrical Code, and ULC Standard CAN4-S524-M91 and latest amendments.

1.5 Modify existing remote annunciator to suit.

1.6 Replace existing fire alarm graphic with new colour graphic reflecting additional building. Include for survey of existing fire alarm zones as required to produce an accurate fire alarm graphic.

1.7 ULC and CSA standards and Electrical Safety Code, shall establish installation requirements.

1.8 Retain the services of the equipment supplier to provide Special Commissioning "Verification, Inspection and Certification" and to supervise the connection, initial test and adjustment of the system throughout renovated area. The verification shall be done to suit code and Local Authorities requirements.

1.9 Verification procedure shall comply with ULC standard CAN4-S537-M86 and shall include providing proper functioning and connection of each device and function of the systems. Furnish upon completion of the work, a letter from the manufacturer as evidence that such tests and instruction have been performed to their satisfaction, and additionally to indicate that:

- i System complies with manufacturer's installation recommendations, ULC requirements, and specified operation.
- ii Installation is acceptable for Warranty.
- iii Completed system complies with regulations concerning supervision of functions, signals, stations, and automatic detectors.
- iv Test completed systems for Building Approval Authority. Advise Local Fire Department when "Verification" is to be performed.

1.10 Shop Drawings for the Fire Alarm System shall include copies of documents to substantiate ULC listing for all items, identified by catalogue.

Division 28

1.11 Retain services of the Supplier to perform tests and provide the following documents:

i A copy of the inspection Technician's report showing location of each device, and certifying the test results of each device.

ii A Certificate of Verification confirming that the inspection has been completed and showing the conditions upon which such inspection and certification have been rendered.

iii Proof of liability insurance for the inspection.

1.12 **Approved College Standards and Products:**

i Edwards of Canada Ltd. EST-3 fire alarm systems and compatible components.

ii Operation of fire alarm equipment to be verified by Troy Sprinkler Ltd., contact Michelle Guernsey, Service Manager, T: 905 725 5553 ext. 23, F: 905 725 4294, C: 905 914 6194 michelle.guernsey@troysprinkler.com.

Division 31

Section 31 00 00
Earthwork

1.1 Work included in this Section, but not limited to, is; excavation, dewatering, removal and replacement of unsuitable fill and contaminated materials identified in the soil investigation report, backfill and compaction.

1.2 Work shall also include protection measures, consisting of materials, constructions, and methods required by the Occupational Health and Safety Act of the Province of Ontario, and as otherwise imposed by Jurisdictional Authorities to save persons and property from harm.

1.3 Ensure that adjacent property is not damaged in any way by excavating and grading work; by the removing, stockpiling and transporting of materials; by blown sand and dust or by spillage during the removing, stockpiling and transporting of materials; by the collapse or movement of excavated banks and stockpiles; or by storm water from altered drainage course. Provide all necessary precautions to control sediment by whatever means required.

1.4 Ensure that no damage is caused by earthwork to existing structures, trees, buried and above-ground services, bench marks, and survey monuments on the site, or adjacent property. Arrange or ensure that all damage which occurs is repaired completely and immediately.

1.5 Protect the bottom and sides of the excavated pits and trenches from exposure to sun and rain to prevent cave-ins and softening of the bed upon which concrete and drains rest.

1.6 Protect newly graded areas from the elements. Repair settlement and washouts that occur before acceptance of the work, and re-establish grades to the required elevations and slopes. Fill to required subgrade levels any area where settlement occurs.

1.7 Bail or pump all water out of excavation, from whatever cause, as it accumulates. Take all necessary measures to prevent flow of water and earth fines into the excavation.

1.8 Support walks, roads, and services, and prevent cave-ins of excavated banks. A Professional Engineer specializing in this work shall design all protection. Provide shop drawings for authorities as required.

1.9 Temporarily cover all existing catchbasins and manholes to prevent entry of earth or debris.

1.10 Electronically locate underground services such as electrical and telephone lines, gas and water and sewer lines. Mark line of services with yellow ribbons or stakes with tip fluorescent painted, and indicating both plan location and depth.

1.11 Provide and maintain adequate system to avoid any nuisance caused by dust and dirt rising throughout the area of operations. The use of calcium chloride is prohibited.

1.12 Ensure in examination of the site that all possible factors concerning earthwork are investigated.

1.13 Soil investigation of the existing site was carried out for the College for guidance in design and construction. A report and bore hole log on this investigation were prepared and copies are included in this document.

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1.14 Unless specified or detailed otherwise the work of this Contract includes the Earthwork recommendations identified or reasonably inferred from the soil report. No responsibility is assumed by the College for the scope or accuracy of the soil investigation report or the Contractor's interpretation of the soil report.

1.15 The Contractor shall include for Earthwork which is identified in the soils report or is reasonably inferred from the soils report.

1.16 Remove topsoil completely from areas targeted for construction. Store good topsoil, acceptable for reuse, in quantity to provide 200mm thick topsoil over areas to be sodded. Stockpile within the work site boundary, and provide measured quantity of stockpiled material immediately after stripping.

1.17 Strip topsoil at stockpile points. Dish top of stockpile to retain moisture in the topsoil.

1.18 Keep topsoil stockpile separate from other stockpiles.

1.19 Perform bulk excavation and detailed excavation for installation of foundations & footings. Do not re-fill over excavated areas with materials removed.

1.20 Excess and unsuitable excavated materials can be disposed of on site if material is required for use or fill. Rough grading of fill may be required to provide suitable drainage within the Owner's property.

1.21 Keep all surfaces against which concrete or fill is to be placed free from frost. Thaw out frozen surfaces against which concrete or fill is to be placed to unfrozen depth.

1.22 Remove excess and unsuitable excavated materials from the site. Comply with the MOE regulations and those of other regulating bodies, and those of the operator of the receiving disposal site, regarding disposal of contaminated soil.

1.23 Provide appropriate protection and containment at areas of environmental concern as directed by the College.

1.24 Dedicate vehicles to transport excavated material from the site for each day excavation work is in progress.

1.25 Ensure that vehicles do not operate from, and do not transport excavated material from other locations, while engaged in the transporting of excavated material from the Project site.

1.26 "Unusual material" is defined as drums, tanks, containers, as well as soil and fill or other items, waste materials, deposits, features or conditions of possible environmental concern.

1.27 Carriers used to transport and dispose of excavated materials shall be certified as required in compliance with the Ontario Environmental Protection Act with regards to the type of material and/or hazardous waste being transported. Note: Under the new Ontario Regulation 558/00 (Reg. 558) amending the existing Ontario Regulation 347 (Reg. 347) governing waste management and disposal, additional waste characterization analyses will be required by prospective receiving facilities prior to accepting any impacted materials.

1.28 Dewater the site as necessary for the installation of the work, by providing a series of temporary trenches/pits and pumping as necessary. Backfill temporary trenches/pits and restore area when dewatering is no longer required.

Division 31

1.29 Plug unused services such as drains, sewers, field tile, and service pipes uncovered by excavation.

1.30 When backfilling both sides of walls, place fill simultaneously on both inner and outer faces to balance pressure on wall.

1.31 Compact fill to densities specified for material requirements.

1.32 Prior to filling, proof roll existing earth subgrade in order to identify inconsistencies or soft areas.

1.33 Proceed with filling operations only after inconsistencies or soft areas have been reworked and compacted or excavated, backfilled and compacted as required to eliminate such conditions.

1.34 Avoid proof rolling close to columns, walls and other structures within the confines of the proof rolling operations.

1.35 Prior to placing fill ensure existing ground is compacted to 98% Standard Proctor density.

1.36 Compact fill to density specified for material requirements with a heavy vibrating roller.

1.37 Compact fill adjacent to walls, piers, or wherever else heavy roller equipment cannot approach, with mechanical tampers to equivalent density. Dig out soft spots and re-fill and compact as required.

1.38 Provide, operate and maintain compacting equipment necessary to achieve the compaction densities required.

1.39 Compact fill until the required density is achieved. Do not compact material containing frost. Fill hollows and depressions which develop under compaction with matching backfill material. If the base becomes rutted or displaced due to any cause, regrade the surface.

Section 31 05 16
Aggregate Materials

References

1.1 American Society for Testing and Materials (ASTM International).

1.2 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 Ontario Provincial Standard Specifications (OPSS) for Roads & Public Works Volume 2: http://www.raqsb.mto.gov.on.ca/techpubs/opsa.nsf/OPSHomepage

1.4 Source of materials to be incorporated into work or stockpiles requires approval.

1.5 Inform College of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

1.6 If, in opinion of the College, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

1.7 Should a change of material source be proposed, advise the College 4 weeks in advance of proposed change to allow sampling and testing.

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1.8 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if its field performance is found to be satisfactory.

1.9 Aggregate will be subject to continual sampling by the College during production.

1.10 Provide the College with access to source and processed material for sampling and testing.

1.11 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

1.12 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

1.13 Flat and elongated particles of coarse aggregate: to ASTM D4791:

- i Greatest dimension to exceed five times least dimension.

1.14 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

- i Natural sand.
- ii Manufactured sand.
- iii Screenings produced in crushing of quarried rock, boulders, gravel or slag.

1.15 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

- i Crushed rock or slag.
- ii Gravel and crushed gravel composed of naturally formed particles of stone.

1.16 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

1.17 Commence topsoil stripping of areas as indicated after area has been cleared and removed from site.

1.18 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.

1.19 Stockpile in locations as directed by the College. Stockpile height not to exceed 2.0 m.

1.20 Contractor to produce aggregates off site.

1.21 Contractor to develop aggregate source to prevent contamination of aggregates stockpiled.

1.22 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

1.23 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by the College.

1.24 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer /Architect.

1.25 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

1.26 Handle and transport aggregates to avoid segregation, contamination and degradation.

Division 31

1.27 Stockpile aggregates on site in locations as indicated unless directed otherwise by the College. Do not stockpile on completed pavement surfaces.

1.28 Stockpile aggregates in sufficient quantities to meet Project schedules.

1.29 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

1.30 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.

1.31 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

1.32 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the College within two (2) working days of rejection.

1.33 Stockpile materials in uniform layers of thickness as follows:

- i Max 1.0 m for coarse aggregate and base course materials.
- ii Max 2.0 m for fine aggregate and sub-base materials.
- iii Max 1.5 m for other materials.

1.34 Complete each layer over entire stockpile area before beginning next layer.

1.35 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified. Do not cone piles or spill material over edges of piles.

1.36 Do not use conveying stackers.

1.37 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

1.38 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

1.39 Leave any unused aggregates in neat compact stockpiles as directed by Owner’s Representative.

Division 32

Section 32 12 16
Asphalt Paving

References:

1.1 OPSS - Ontario Provincial Standard Specifications.

1.2 Paving work shall be done only by a contractor with an accredited experience of at least 10 years, and having skilled workers, experienced foremen and suitable machinery.

1.3 Commence laying of asphalt binder courses only when base surfaces are at least 1°C and the temperature is rising.

1.4 Commence laying of asphalt surface courses only when binder course surfaces are completely dry, at least 7°C, and the temperature is rising.

1.5 Suspend paving operations if temperature drops below specified minimums.

1.6 Prevent vehicle or foot traffic over freshly-paved areas of asphalt for at least 24 hours following completion. Barricade as required.

1.7 Pave only in areas where no project earthwork or trucking is taking place.

1.8 Materials:

- i Asphaltic Concrete Paving: conforming to OPSS 1050, and consisting of a base course and a surface course, in "HL" types as specified herein.
- ii Asphalt Cement: conforming to OPSS 1050.
- iii Asphalt Primer: OPSS 1103 Grade SS-1, liquid asphalt emulsion, slow drying for spray or brush application.
- iv Granular Base and Subbase Courses: Conforming to OPSS Form 1010.
- v Coating: Chip sea reflective coating provided in 50% of asphalt.

1.9 Ensure that grading and backfilling has been completed in accordance with Section 02200 of this Specification, and that subgrade conditions are satisfactory for placing of pavements, before commencing work.

1.10 Remove existing pavement or soil/granular and excavate subgrade as required to construct new pavement structure.

1.11 Proof roll exposed subgrade, subexcavate weak areas and backfill with clean, approved material capable of obtaining 100% Standard Maximum Dry density.

1.12 Remove surplus materials from the site at the end of each day's work.

1.13 Proof roll earth subgrade prior to the placement of granular material, compact the subgrade surface uniformly to provide a minimum compaction of 100% Standard Proctor density. Compact top 300 mm to 100% Standard Proctor density. Grade the subsoil to catch basins and weeping tile in such a manner that water will not pond beneath the pavement, nor flow back toward building.

Division 32

1.14 Spread aggregate in 75 to 100 mm layers and shape accurately, finish by blading, and roll to cross-section and profile required by drawings and specifications. Compact to 100% Standard Proctor maximum dry density. Sprinkle water on base course ahead of compacting machine to aid compaction or to reduce dust nuisance, or both.

1.15 Specified granular course thicknesses shall be the thickness after compaction to refusal.

1.16 Apply additional layers of aggregate to attain design depth.

1.17 Eliminate surface irregularities exceeding 13 mm under a 3000 mm long straight edge.

1.18 Shape base course at edges of asphalt pavement to form extended shoulder and to allow for thickened asphalt edge band.

1.19 Provide asphalt paved surfaces formed to lines and compacted thicknesses shown on the Drawings. Preparation of the mix, transportation, methods of application and compaction shall be in accordance with OPSS 310. 3.4.2.

1.20 Asphaltic concrete paving is in the following categories:

1.21 **Heavy Duty Paving** – Includes Roadways, Parking lot entranceways, Fire Routes, Bus lanes.

- i Asphalt 50 mm HL3, 50 mm HL8
- ii Granular Base 150 mm of Granular "A".
- iii Granular Subbase 300 mm of Granular "B".

1.22 **Medium Duty Paving** - Includes parking areas, shipping receiving lanes/aprons.

- i Asphalt 40 mm HL3, 40 mm HL8.
- ii Granular Base 150 mm of Granular "A".
- iii Granular Subbase 150 mm of Granular "B".

1.23 **Light Duty Paving** – Includes pedestrian walkways, paths, patios.

- i Asphalt 40 mm HL3, 40 mm HL8.
- ii Granular Base 150 mm of Granular "A”.

1.24 Finish pavement surfaces to elevations indicated on drawings.

1.25 Maintain accuracy of elevations to within specified tolerances.

1.26 Ensure that drainage is effected from all areas, without formation of puddles.

1.27 Inform College if slopes to drains are less than 1% before commencing work, in order that corrective methods may be considered.

1.28 Lay asphalt mixture only on dry bases from which foreign matter has been removed.

1.29 Deliver admixtures to site at minimum workable temperature. After spread, and before initial rolling, temperature of mixture shall be no less than 110°C.

1.30 Control spreader alignment by positive means, such as string lines set from grade stakes or alignment stakes, or both. Place these controls on each side of pavement, or utilize other approved methods so that spreader is not guided by edges of preceding courses.

Division 32

1.31 Locate containers carrying fuel oil to clean shovels, rakes, or brooms, on pavers where they will not drip or splash oil on freshly-laid asphalt.

1.32 Adjust course widths so that centre joints of successive courses do not coincide.

1.33 Compact asphalt in accordance with requirements of OPSS Form 310 to 97% Marshall Density.

1.34 Smooth out surface irregularities to within a tolerance of 6 mm under a 3000 mm straight edge.

1.35 Roll asphalt to a smooth, dense, uniform surface with a heavy steel tandem roller.

1.36 Manually tamp areas around manholes, walls and other inaccessible areas to produce surfaces matching rolled areas. Use a light roller for walks or other confined areas of light- duty pavement.

1.37 Roll asphalt across the direction it is spread.

1.38 Trim exposed edges to neat, straight lines.

1.39 Correct alignment and grade irregularities at edges of pavement by addition or removal of asphalt mixture before rolling.

1.40 Form a thickened edge band of asphalt to strengthen exposed pavement edges.

1.41 Make transverse and longitudinal joints, and joints between new and old work precisely and carefully. Make sawcuts where services are installed under existing pavement. Make joints by keying or butting, and bond them well.

1.42 Provide bond between new and old pavements, or between work of successive days by cutting through full depth of older course to expose a clean, vertical surface. Clean and remove loose or broken material and seal with asphalt emulsion. Paint all surfaces against which all joints are to be made with a thin, uniform, and continuous coat of joint painting material. Place hot admixture of new pavement against joint, and rake to required depth and grade.

1.43 Do not scatter excess material derived from joint making on freshly-laid asphalt. Remove from site.

1.44 Where the work of asphalt paving joins into municipal paving all work shall conform to local municipal standards. Unless detailed otherwise carry paving from the street to the new paving inside the property line. Obtain all pertinent details and specifications before the work begins and make arrangements for inspections by municipality field supervisors. Additionally, take 2 photographs each of the existing work and the completed work. Photos shall be in 8" x 10" size taken from 2 different angles.

1.45 The Contractor will be responsible to ensure that all access hole and catch basin overall heights match the final elevation and cross fall of the surface asphalt or concrete.

1.46 If requested by the College, the Contractor will assume all costs relative to sampling of existing or new materials to obtain the desired mix design, including QA monitoring and QC testing of the mix. Includes repair of sampling locations. The requirement for sampling will be at the sole discretion of the College.

1.47 Where the Hot Mix asphalt supplier fails to consistently produce asphalt that meets the specifications, the College shall have the right to refuse further material from the supplier until mix specifications are verified for compliance. Alternatively, the contractor may be required to obtain hot mix asphalt material from another supplier.

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Section 32 14 00
Unit Paving

References:

1.48 CAN3-A231.2-M85 Precast Concrete Pavers.

1.49 ASTM C902-84 Specification for Pedestrian and Light Traffic Paving Brick.

1.50 ASTM C136-04a Method for Sieve Analysis of Fine and Coarse Aggregates.

1.51 ASTM C117-04 Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

1.52 ASTM D698-78 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop.

1.53 Deliver full size samples of paving units to the College for approval prior to the delivery of product to site.

1.54 The contractor is to use a level and rod during the installation of the base and the unit pavers. This equipment is to remain on site for the duration of the installation process. "By eye" grading techniques are unacceptable.

1.55 Deliver pavers to the site in factory wrapped bundles.

1.56 Prevent damage to existing features. Make good any damage.

Unit Pavers:

1.57 Field: ‘Centurion’ as manufactured by Oaks Concrete Products (1-800-709-6257) or approved equivalent. Pattern to be Random Rectangular. Colour to be Executive Blend.

1.58 Double Soldier Course: 68x138x70mm ‘Centurion’ as manufactured by Oaks Concrete Products (1-800-709-6257) or approved equivalent. Colour to be Executive Blend.

1.59 Mowing Edge: 500mm Width Edge – ‘Siena Stone’, concrete wall ‘cap’ as manufactured by Unilock (1-800-UNILOCK).

1.60 Permeable Paving: ‘Hydr’eau Pave’ as manufactured by Oaks (1-800-709-6257), Colour to be Silversand.

1.61 Granular bases for unit paving: Granular ‘A’ and ‘B’ to depths specified on details conforming in all respects with OPSS 1001 and 1010. High Performance Bedding (HPB), as supplied Dufferin Aggregates.

Bedding and joint sand for Unit Pavers:

1.62 Shall be clean, non-plastic, free from deleterious foreign matter. The sand shall be natural or manufactured from crushed rock. Limestone screenings or stone dust that does not conform to the grading requirements shall not be used. Sand to meet the paver manufacturer’s requirements.

1.63 The bedding sand shall conform to the grading requirements of ASTM C 33.

1.64 The joint sand shall conform to the grading requirements of ASTM C 144.

Division 32

1.65 Bedding for permeable pavers: Refer to manufacturer specifications.

1.66 Metal Edge: Brickstop or approved equivalent.

1.67 The pre-grade elevation for pavement areas shall be set slightly higher than the adjacent concrete pavement structure thickness to accommodate settling.

1.68 Blade off and compact the pavement areas to achieve the required subgrade elevation. Excess material shall be disposed off-site.

1.69 If pre-grade area gets contaminated due to inclement weather or construction traffic, Contractor shall cut, fill, shape and compact as needed to achieve the required subgrade. Excess material shall be disposed off-site.

1.70 All costs associated with establishing the pavement area subgrades shall be included in the Contract Price.

1.71 Spread and compact granular in uniform layers not exceeding 100mm compacted thickness.

1.72 Compact to a density of not less than 98% Standard Density in accordance with ASTM D698.

1.73 Construct a smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.

1.74 Apply water as necessary during compaction to obtain specified density. If granular ‘A’ or ‘B’ is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

1.75 Ensure top of granular base does not exceed plus or minus 10mm of finished grade less combined thickness of sand bedding course plus pavers.

1.76 Place bedding sand to 30mm max. compacted thickness.

1.77 Ensure sand laying course is dry (4-8% moisture content) prior to placement of unit pavers.

1.78 Install unit paving true to grade, in location, layout and pattern as indicated.

1.79 Install pavers with 3mm joints maximum.

1.80 Where required, saw cut units accurately without damaging edges.

1.81 Fill spaces between non permeable pavers by sweeping in sand.

1.82 Surface of finished pavement: free from depressions exceeding 3mm as measured with 3m straight edge.

1.83 Sweep surface course clean.

1.84 Remove and reinstall any section of pavement that does not drain properly or does not meet the tolerances for surface regularity.

1.85 Install ‘Hydr’eau Pave’ permeable pavers as per manufacturer’s specifications.

Division 32

Section 32 91 19
Landscape & Topsoil Grading

1.1 All required topsoil for general landscape areas to be supplied by Contractor or from on-site stockpiles.

1.2 Topsoil: mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

1.3 Soil texture to consist of 45% sand, 35% silt and 20% clay and contain 4 to 15% organic matter by weight.

1.4 Fertility: major soil nutrients present in following ratios:

- i Nitrogen (N): 20 to 40 micrograms of available nitrogen per gram of topsoil.
- ii Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.
- iii Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.
- iv Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support establishment of intended vegetation.
- v Ph Value: 6.0-7.5

1.5 Free from debris and stones over 50mm diameter, course vegetative material, 10mm diameter and 100mm, occupying more than 2% of soil volume.

1.6 Consistence: friable when moist.

1.7 No topsoil is to be brought onto site that does not meet the above requirements.

1.8 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

1.9 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove all toxic materials. Dispose of removed material off site.

1.10 Cultivate area which is to receive topsoil to depth of 100mm. Cross cultivate areas where heavy equipment has compacted soil.

1.11 Ensure that rough grade levels conform to elevations required to allow for installation and contouring of topsoil.

1.12 For seeded areas, apply 100mm of topsoil and keep topsoil 15mm below finished grade.

1.13 Spread soil with adequate moisture over unfrozen subgrade, where identified. Ensure minimum depth requirements are installed after compaction.

1.14 Grade to eliminate rough spots and low areas and ensure positive drainage.

1.15 Roll to consolidate topsoil leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose texture for areas to be seeded or sodded.

1.16 Dispose of materials not required, off site.

Division 32

Section 32 92 19
Seeding

1.1 Seed after frost has left ground and before June 1, or between August 25 and September 15.

1.2 Schedule work in seasons specified above, and after weed killing has been performed.

1.3 Seed: Canada 'Certified' seed, in accordance with Government of Canada 'Seeds Act' and 'Seeds Regulations', in packages individually labeled in accordance with 'Seeds Regulations' and indicating name of supplier, seed mix content, germination rate, and date bagged.

1.4 Seed mixes shall be suitable for the geographic region.

1.5 Seeded areas are to be saturated with water once daily after being placed, for a minimum period of 2 weeks, as required.

1.6 Fertilizer: To Canada 'Fertilizers Act' and 'Fertilizers Regulations', complete synthetic, 5-20-20 slow release with minimum 50% of nitrogen content in ureaformaldehyde form. Max 1% of Phosphorous to be from an organic source.

1.7 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.

1.8 Remove dead vegetation prior to seeding.

1.9 Fertilize at time of seeding.

1.10 Sow seed uniformly.

1.11 Protect seeded areas against damage with snow fence hoarding.

1.12 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

Section 32 93 00
Planting

1.1 Plant material to meet the standards as outlined in the Canadian Standards for Nursery Stock, most current edition.

1.2 For all contractor purchased materials plant sizes will be as measured on site. Nursery waybills will not be acceptable for determination of plant sizes.

1.3 Schedule shipment of plant material with planting operations.

1.4 Protect plant material from frost, excessive heat, wind and sun during transportation.

1.5 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in appropriate storage location.

1.6 Warranty replacements of all plant material will be undertaken by the contractor as requested at any time during the warranty period.

Division 32

1.7 Any plant that is dead or in poor condition at that time will be replaced under warranty. The contractor's final replacements will cover all plants including those which may have been replaced earlier under warranty.

1.8 Plant material shall be free of disease, insects, defects or injuries and structurally sound with strong fibrous root system, root pruned regularly, but not later than one growing season prior to arrival on site.

1.9 Trees shall be of straight trunks, well and characteristically branched for species.

1.10 Remove subsoil, rocks, roots and debris from excavated material that will be used as planting soil. Dispose of excess material.

1.11 Water plant material thoroughly. After soil settlement has occurred, fill with soil to finish grade.

1.12 Maintain all plants and planting areas immediately after installation and continue until the expiry of the warranty period.

1.13 Maintenance shall include all necessary measures to establish and maintain plants in a healthy, vigorous growing condition and planting areas neat and tidy, and protected from ongoing construction operations and activities.

1.14 All plants shall be free of diseases and insect infestations in a healthy growing condition and planting areas free of weeds and freshly cultivated, at time of final inspection.

1.15 Use organic compounds for control of weeds, disease or pests in strict accordance with manufacturers label and be fully responsible for all damages resulting from the use of chemicals. All compound applications are to be carried out by licensed applicators following provincial regulations.

1.16 Protect all planting areas against damage, including erosion and trespassing, by providing and maintaining proper safeguards. Remove safeguards at the end of the maintenance period. Use chemicals for control of weeds, disease or pests in strict accordance with manufacturers label and be fully responsible for all damages resulting from the use of chemicals. All chemical applications are to be carried out by licensed applicators following provincial regulations.

1.17 Plant material installed following leaf drop in the fall will be accepted after the start of the next growing season provided that acceptance conditions are fulfilled.

1.18 All plants shall be guaranteed for a period of one year from the date of final acceptance.

1.19 All plants shall be inspected at the end of the guarantee period. Plants which at that time are not in a healthy vigorous growing condition shall be replaced without charge.

1.20 Replacements shall be planted as soon as possible, but during the proper planting season, in accordance with accepted horticultural practice.

1.21 All replacement trees shall be banded for identification.

1.22 Replacements required because of vandalism, theft, or other causes beyond the contractor's control, are not part of this contract.

Division 33

Section 33 46 00
Subdrainage

1.1 Included in this section- subsurface drainage weepers around building perimeter.

1.2 Referenced Standards - CAN/CSA-A23.1-04/A23.2-04 Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, and CGSB 41-GP-29Ma Tubing, Plastic, Corrugated, Drainage.

1.3 Submit shop drawings in accordance with Section 01300. Show typical detail of base condition and location thereof (ie. relative to subgrade) as part of Shop Drawings.

1.4 Subsurface Drainage Weepers- 100 mm diameter perforated flexible drain pipe conforming to CGSB 41-GP-29Ma, Type 1 for unperforated and Type 2 for perforated and wrapped with filter fabric, as manufactured by Big-O Inc., Oxford Plastics (1983) Inc., or Prinsco Inc. or other approved manufacturer.

1.5 Provide all adapters, fittings, couplings as required.

1.6 Filter Fabric: Synthetic geotextile fabric by Terrafix Geosynthetics Inc, Mirafi Inc. or approved equivalent.

1.7 Bedding and Cover Material: Clear, pea gravel, free from shale, clay, friable materials and organic matter.

1.8 Provide cleanouts at changes in direction consisting of outlets, wyes, extension pipes and flush plugs.

1.9 Clean up and remove all unused and discarded materials arising from the work of this section.