

**ADDENDUM NO. 4**

**CONTRACT NO. 2023-4010**

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Grading, Drainage, Granular Base, Hot Mix Paving, Electrical and Structures - Fenelon Falls  
Maintenance Patrol Yard (MPY 249) Southeast Quadrant of Glenarm Road and Country Lane

0 km

Eastern Region

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The following will now form part of the Special Provisions of the contract and amends the applicable information contained in the original contract tendering documents.

**SPECIAL PROVISIONS (NEW)**

**NOTICE TO CONTRACTOR – Coordination of Propane Tank**

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Special Provision

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The Contractor shall coordinate with the following representative of the tenant (Webber), for the propane tank supply:

Abdallah El Tannoukhi  
Webber Infrastructure Management Canada Ltd.  
Phone: 613-407-1080  
Email: Abdallah.Tannoukhi@wwebber.com

As noted in the contract drawings, all costs related to the supply of the propane tank, including coordination with the tenant, are to be included in the lump sum item for the vehicle maintenance garage.

See Sheet 01 Note 6 for additional details.

**SPECIAL PROVISIONS (REVISIONS)**

**NMS DIVISION 1 SPECIFICATIONS**

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Special Provision (Page 29)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 1 National Master Specifications are included in this Contract.

**NMS 011400 – REGULATORY REQUIREMENTS**

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Special Provision

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**Part 1 General**

**1.1 SUMMARY**

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

**1.2 RELATED REQUIREMENTS**

– Not Applicable.

**1.3 REFERENCES TO REGULATORY REQUIREMENTS**

- .1 Perform Work in accordance with the Ontario Building Code, 2012 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
  - .1 Meet or exceed requirements of:
    - .1 Contract documents.
    - .2 Specified standards, codes and referenced documents.

**1.4 HAZARDOUS MATERIAL DISCOVERY**

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Contract Administrator.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Contract Administrator.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Contract Administrator.

**1.5 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions and municipal by-laws.

**1.2 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
  - .1 Regulatory requirements and fees in force on date of Bid submission, and
  - .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

## Part 2 Products

### 2.1 NOT USED

– Not Applicable.

### 2.2 EASEMENTS AND NOTICES

- .1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.
- .2 Constructor shall give notices required by regulatory requirements.

### 2.3 PERMITS

- .1 Development Permit: Owner has applied for, obtained, and paid for development permit (if required).
- .2 Building Permit:
  - .1 The MTO is a Provincial Authority and is not subject to the Municipal level building permit requirements. A building permit will not be obtained for this project.
- .3 Occupancy Permits:
  - .1 An occupancy permit is not required for this project.
- .4 Demolition Permits:
  - .1 Constructor shall apply for, obtain and pay for demolition permit on behalf of Owner, and other permits required for Work and its various parts.
  - .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
  - .3 Constructor shall display demolition permit and other permits in a conspicuous location at Place of Work.
- .5 Health unit approvals or Township/Municipality Approvals
  - .1 Constructor shall apply for, obtain and pay for septic system permits (construction and use) on behalf of Owner, and other permits required for Work and its various parts.
  - .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
  - .3 Constructor shall display permit and other permits in a conspicuous location at Place of Work

## Part 3 Execution

### 3.1 NOT USED

– Not Applicable.

## **NMS 011935 – LEAKAGE TESTING FOR TANKS**

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Special Provision

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## Part 1 General

### 1.1 APPROVALS

- .1 Obtain approval from the Contract Administrator for the test procedures and the water to be

used for leakage tests. Clean, potable water shall be used for leakage testing.

## **Part 2 Products**

– Not Applicable

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Tanks shall include all water or liquid retaining or conveying structures of FRP, cast-in-place or precast concrete construction.
- .2 Perform leakage tests on all liquid retaining structures and tanks.
- .3 If the tank being tested has more than one cell, or if it has a common wall with another tank, test each cell or tank separately so that individual cells are leakage tested.
- .4 Carry out leakage tests before backfill is placed so that visible leakage, if any, will be apparent.
- .5 Carry out leakage testing before installing concrete coating system on the interior of the tank.
- .6 Do not commence testing until all structural concrete work and related structural steelwork has been completed and all concrete is at least 28 days old.
- .7 The Contract Administrator may permit multi-stage tests if required to allow backfill operations to proceed.
- .8 Do not perform leakage tests in any way which is likely to endanger the structural integrity of any tank.
- .9 All electrical conduits and fittings shall be sealed to prevent wetting during leakage testing.

### **3.2 TESTING**

- .1 Carry out leakage tests by filling the tanks with water to top water or overflow level and measuring drop in water level over at least a 5-day period.
- .2 Perform all leakage testing under the supervision of the Contract Administrator and subject to their prior approval.
- .3 Furnish all labour, water and equipment, including temporary pumps, measuring instruments, etc. necessary for testing.
- .4 For concrete tanks the tanks shall be filled with water up to 7 days before the start of the 5-day test period. Water level shall be maintained at constant level by adding water as required during this 7-day period. At the end of this period, the absorptive capacity of the concrete will be deemed to be satisfied and the 5-day test for leakage shall start. This absorption period is not required for FRP tanks.
- .5 If any tank does not meet the acceptance criteria and the daily drop in water level at the end of the 5-day period is decreasing, the Contract Administrator may direct the test to continue a further 5 days. If the specified criteria are satisfactorily met during the second 5-day period, the tank may be considered acceptable.
- .6 If the tank shows visible leakage or leakage in excess of the permissible rate:
  - .1 Empty the tanks and remedy defects as directed by the Contract Administrator.
  - .2 Re-test the tanks after the remedial work has been completed.
  - .3 Repeat this procedure until leakage testing meets acceptance criteria.

- .7 If leakage occurs during the 12-month maintenance period following substantial completion of construction, remedy such faults as directed by the Contract Administrator at no additional cost to the Owner.

### **3.3 CRITERIA FOR ACCEPTANCE**

- .1 Criteria for acceptance of concrete tanks containing potable water shall be:
- .1 No visible leakage of water at external walls or floors of tanks.
- .2 Average leakage rate over a 5-day period not to exceed "Q" as calculated by the equation:
- $$Q = 0.9A\sqrt{H}$$
- Where: Q = maximum permissible rate of leakage over a 5-day period in litres per day  
A = wetted surface area of tank in square metres  
H = vertical depth of water in tank in metres
- .3 In calculating the wetted surface area of tank:
- .1 Do not include internal partition or baffle walls normally wetted on both faces unless specifically directed by the Consultant in writing.
- .2 Measure bottom areas for tanks having sloped bottoms in horizontal plane.
- .3 Similarly, refer vertical water depths to mid-depth of sloping bottoms.
- .4 Make no allowance for local drainage sumps or pockets.
- .1 Criteria for acceptance of the sewage holding tanks and FRP tanks shall be:
- .1 No visible leakage of water at external walls or floors of tanks.
- .2 No measured leakage throughout the 5 day test period.

### **3.4 BASIS OF PAYMENT**

- .1 Payment for leakage testing to be included in the lump sum item in the form of tender for the Vehicle Maintenance Garage.
- .2 Cost of repairs to rectify noncompliant leakage and re-testing to be at Contractor's expense.

## **NMS 013300 – SUBMITTAL PROCESS**

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### **Special Provision**

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#### **Part 1 General**

##### **1.1 RELATED REQUIREMENTS**

– Not Applicable

##### **1.2 REFERENCE STANDARDS**

– Not Applicable

##### **1.3 ADMINISTRATIVE**

- .1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Contractor (including general contractor and applicable sub contractors) shall review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's, Owner or Contract Administrator review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant, Owner or Contract Administrator review.
- .10 Keep one reviewed copy of each submission on site.

#### **1.4 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada. Shop drawings that require a professional engineers seal are identified in their given specification section.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 14 days for Contract Administrator review of each submission.
- .5 Adjustments made on shop drawings by Contract Administrator or Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.

- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Contract Administrator review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Contract Administrator.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Contract Administrator.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Contract Administrator.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

## **1.5 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Contract Administrator site office or Consultant site office. Contract Administrator will provide direction on where to ship each sample.
- .3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

## **1.6 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in jpg format, fine resolution monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints:
  - .1 Viewpoints and their location as determined by Contract Administrator.
- .4 Frequency of photographic documentation: daily and prior to closing in or covering up any work or as directed by Contract Administrator.
  - .1 Upon completion of: excavation, foundation, framing and services before concealment, as directed by Contract Administrator.

## **1.7 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**Part 2 Products**

**2.1 NOT USED**

– Not Applicable.

**Part 3 Execution**

**3.1 NOT USED**

– Not Applicable.

**NMS 017400 – CLEANING**

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Special Provision

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**Part 1 General**

**1.1 DESCRIPTION**

- .1 This section specifies the requirement for cleaning during and after the works has been completed.

**1.2 GENERAL**

- .1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws, including requirements of WHMIS.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Prevent accumulation of waste which creates hazardous conditions.
- .4 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

**1.3 MATERIALS**

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

**1.4 CLEANING DURING CONSTRUCTION**

- .1 Maintain the work, including roof and building systems, at least on a daily basis free from accumulations of waste material and debris.
- .2 Provide on-site containers for collection of waste materials and debris.
- .3 Remove waste materials and debris from site.
- .4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .5 Vacuum clean all building interiors prior to paint application. Continue to vacuum clean finished areas until final completion.

**1.5 FINAL CLEANING**

- .1 In preparation for acceptance of the project on an Interim or Final Certificate of Completion,

perform final cleaning.

- .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior finished surfaces including glass and other polished surfaces.
- .3 Clean lighting reflectors, lenses, and other lighting surfaces.
- .4 Broom clean paved surfaces; rake clean other surfaces of grounds.
- .5 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .6 Remove snow and ice from access to buildings.

## **1.6 MEASUREMENT AND PAYMENT PROCEDURE**

- .1 No measurement will be made under this section. Include costs in items of work for which cleaning is required at the Lump Sum Price bid in Form of Tender.
- .2 The Lump Sum Price shall cover supply of all labor, materials, tools and equipment, as specified, and/or required.

### **Part 2 Products**

– Not Applicable.

### **Part 3 Execution**

– Not Applicable.

## **NMS 017800 – CLOSEOUT SUBMITTALS**

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Special Provision

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### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast-in-place Concrete
- .4 Section 04 20 00 – Masonry
- .5 Section 05 12 23 – Structural Steel for Buildings
- .6 Section 05 21 00 – Steel Joist Framing
- .7 Section 05 31 00 – Steel Decking
- .8 Section 05 50 00 – Metal Fabrications
- .9 Section 31 23 02 – Backfill and Compaction for Structures.

#### **1.2 REFERENCE STANDARDS**

- .1 Canadian Environmental Protection Act (CEPA)

- .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with Contract Administrator, to:
    - .1 Verify Project requirements.
    - .2 Review warranty requirements and manufacturer's installation instructions.
  - .2 Contract Administrator to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, a digital copy of operating and maintenance manuals in English. Final hard copies to be submitted to the Contract Administrator after review and approval of the digital copy is received.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

### **1.5 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 mm x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg and dxf format on CD or solid state memory device.

**1.6 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant, Contract Administrator and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .6 Training: refer to Section 01 79 00 – Demonstration and Training.

**1.7 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Contract Administrator one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Contract Administrator.
- .6 The Contractor is fully responsible for keeping a daily red-line as built markup of all contract documents (drawings, specifications, shop drawings, addenda, field test records etc.). Contractor shall clearly mark all as-built conditions in red-line marking on all contract documents daily. After substantial completion the Contractor shall transfer all red-line as-built markups to a digital format and submit as-built documents to the Contract Administrator for review and approval.

## **1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Contract Administrator.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain field test records, manufacturer's certifications, inspection certifications, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

## **1.9 FINAL SURVEY**

- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents. Provide survey in AutoCAD format in accordance with owner requirements.

## **1.10 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 91 13 – General Commissioning Requirements.
- .15 Underground and aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
- .16 Additional requirements: as specified in individual specification sections.

#### **1.11 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

#### **1.12 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Contract Administrator.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.

- .1 Submit inventory listing to Contract Administrator.
- .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Contract Administrator.
    - .2 Include approved listings in Maintenance Manual.

#### **1.13 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Contract Administrator.

#### **1.14 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator approval.
- .3 Warranty management plan to include required actions and documents to assure that Contract Administrator receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint four month and nine month warranty inspection, measured from time of acceptance, by Contract Administrator.

- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, ground source heat pumps, motors, roofs, pumps, transformers, snow melting system, lightning protection systems, fire protection, sprinkler systems, alarm systems, access control, door hardware, cctv and any commissioned systems.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Contractor's plans for attendance at four and nine month post-construction warranty inspections.
  - .5 Procedure and status of tagging of equipment covered by extended warranties.
  - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

#### **1.15 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.
  - .4 Contract number.
  - .5 Warranty period.
  - .6 Inspector's signature.
  - .7 Construction Contractor.

**Part 2 Products**

– Not Applicable.

**Part 3 Execution**

– Not Applicable.

**NMS 017900 – DEMONSTRATION AND TRAINING**

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Special Provision

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**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Not Applicable.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
  - .1 Verify conditions for demonstration and instructions comply with requirements.
  - .2 Verify designated personnel are present.
  - .3 Ensure equipment has been inspected and put into operation.
  - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 – General Commissioning Requirements and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
  - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure an adequate amount of time for instruction of each item of equipment is provided.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Contract Administrator approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

#### **1.4 QUALITY ASSURANCE**

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
  - .1 Instruct Owner's personnel.
  - .2 Provide written report that demonstration and instructions have been completed.

#### **Part 2 Products**

– Not Applicable.

#### **Part 3 Execution**

– Not Applicable.

### **NMS 019113 – GENERAL COMMISSIONING REQUIREMENTS**

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Special Provision

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#### **Part 1 General**

##### **1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
  - Not Applicable.
- .3 Acronyms:
  - .1 AFD – Alternate Forms of Delivery, service provider.
  - .2 BMM – Building Management Manual.
  - .3 Cx – Commissioning.
  - .4 EMCS – Energy Monitoring and Control Systems.
  - .5 O&M – Operation and Maintenance.
  - .6 PI – Product Information.
  - .7 PV – Performance Verification.
  - .8 TAB – Testing, Adjusting and Balancing.

##### **1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O&M staff.

- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Cx to be included in the contractor lump sum bid.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .4 Contract Administrator will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Contract Administrator.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Contract Administrator, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review Contract Documents, confirm by writing to Contract Administrator.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.
  - .6 Submit complete start-up documentation to Contract Administrator.

- .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Complete TAB procedures on systems, submit TAB reports to Contract Administrator for review and approval.
  - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Contract Administrator in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Contract Administrator before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Submit no later than four weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to Contract Administrator for changes to submittals and obtain written approval at least eight weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Contract Administrator where not specified and obtain written approval at least eight weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Contract Administrator.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Contract Administrator to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Contract Administrator.

## **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with the General Conditions.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

## **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60 % construction completion stage Contract Administrator to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

- .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
- .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Contract Administrator, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60 % and subsequent Cx meetings and as required.

#### **1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

#### **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Contract Administrator to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Contract Administrator.
  - .3 Arrange for Contract Administrator to witness tests.
  - .4 Obtain written approval of test results and documentation from Contract Administrator before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Contract Administrator:
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:

- .1 Included in delivery and installation:
  - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System PV: include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Contract Administrator after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Contract Administrator. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Contract Administrator.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Contract Administrator.
  - .3 If evaluation report concludes that major damage has occurred, Contract Administrator shall reject equipment.
    - .1 Rejected equipment to be removed from site and replaced with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Contract Administrator for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Contract Administrator to repeat start-up at any time.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Contract Administrator for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

#### **1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

**1.18 START OF COMMISSIONING**

- .1 Notify Contract Administrator at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

**1.19 INSTRUMENTS/EQUIPMENT**

- .1 Submit to Contract Administrator for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.
  - .3 Equipment as required to complete work.

**1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

**1.21 WITNESSING COMMISSIONING**

- .1 Contract Administrator to witness activities and verify results.

**1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Contract Administrator within five days of test and with Cx report.

**1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

**1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Contract Administrator in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

**1.25 EXTENT OF VERIFICATION**

- .1 Laboratory areas:
  - .1 Provide manpower and instrumentation to verify up to 100 % of reported results.
- .2 Elsewhere:
  - .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Contract Administrator.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20 % of reported results.
- .6 Perform additional commissioning until results are acceptable to Contract Administrator.

**1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Contract Administrator for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Contract Administrator approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Contract Administrator deems Contractor's request for second verification was premature.

**1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

**1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Contract Administrator.
- .2 Report problems, faults or defects affecting Cx to Contract Administrator in writing. Stop Cx until problems are rectified. Proceed with written approval from Contract Administrator.

**1.29 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Contract Administrator.

**1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

**1.31 TRAINING**

- .1 Contractor shall include time to train Owner and Owners occupants on the correct operation of all building systems.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with Contract Administrator during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Contract Administrator.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 % of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Contract Administrator will not relieve Contractor from compliance with specified start-up and testing procedures.

**1.37 COMMISSIONING OF THE FIRE WATER STORAGE SYSTEM**

- .1 The Contractor is fully responsible for commissioning the fire water storage system
- .2 Commissioning activities include but are not limited to: verification and testing of the tank level monitoring system, leakage testing the storage tanks in accordance with the Div. 1 leakage testing specification, verification operation and testing of valves and tank isolation, hiring the City of Kawartha Lakes Fire Department to visit the site with their pumper truck and fully test connection and draw down of the fire water storage system.
- .3 The Contractor is fully responsible to pay for all costs related to the commissioning activities including any fees the City of Kawartha Lakes Fire Department may have to undertake the test connection and pumping.

**Part 2 Products**

– Not Applicable

### Part 3 Execution

– Not Applicable

### **NMS 019200 – FACILITY OPERATION**

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Special Provision

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### Part 1 General

#### 1.1 SUMMARY

- .1 Section Includes:
  - .1 This section is limited to portions of the Building Management Manual (BMM) provided to Contract Administrator by Contractor.
- .2 Related Requirements
  - Not Applicable
- .3 Acronyms:
  - .1 BMM – Building Management Manual.
  - .2 Cx – Commissioning.
  - .3 HVAC – Heating, Ventilation and Air Conditioning.
  - .4 PI – Product Information.
  - .5 PV – Performance Verification.
  - .6 TAB – Testing, Adjusting and Balancing.
  - .7 WHMIS – Workplace Hazardous Materials Information System.

#### 1.2 GENERAL REQUIREMENTS

- .1 Standard letter size paper 216 mm x 279 mm.
- .2 Methodology used to facilitate updating.
- .3 Drawings, diagrams and schematics to be professionally developed.
- .4 Electronic copy of data to be in a format accepted and approved by Contract Administrator.

#### 1.3 APPROVALS

- .1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Contract Administrator.

#### 1.4 GENERAL INFORMATION

- .1 Provide Contract Administrator the following for insertion into appropriate Part and Section of BMM:
  - .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project – as indicated in Section 1.2 of BMM.
  - .2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned – as indicated in Section 1.4 of BMM.
    - .1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
  - .3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
  - .4 System, equipment and components Maintenance Management System (MMS) identification – Section 2.1 of BMM.

- .5 Information on operation and maintenance of architectural systems and equipment installed and commissioned – Section 2.0 of BMM.
- .6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned – Section 2.0 of BMM.
- .7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned – Section 2.0 of BMM.
- .8 Operating and maintenance manual – Section 3.2 of BMM.
- .9 Final commissioning plan as actually implemented.
- .10 Completed commissioning checklists.
- .11 Commissioning test procedures employed.
- .12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Contract Administrator.
- .13 Commissioning reports.

#### **1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL**

- .1 For detailed requirements refer to Section 01 78 00 – Closeout Submittals.
- .2 Contract Administrator to review and approve format and organization within 12 weeks of award of contract.
- .3 Include original manufactures brochures and written information on products and equipment installed on this project.
- .4 Record and organize for easy access and retrieval of information contained in BMM.
- .5 Include completed PI report forms, data and information from other sources as required.
- .6 Inventory directory relating to information on installed systems, equipment and components.
- .7 Approved project shop-drawings, product and maintenance data.
- .8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.
- .9 Inventory and location of spare parts, special tools and maintenance materials.
- .10 Warranty information.
- .11 Inspection certificates with expiration dates, which require on-going re-certification inspections.
- .12 Maintenance program supporting information including:
  - .1 Recommended maintenance procedures and schedule.
  - .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

#### **1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL**

- .1 Content of Manual:
  - .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
  - .2 Failure of elevators and escalators.
  - .3 HVAC emergencies and fuel supply failures.
  - .4 Intrusion and security breach.
  - .5 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
  - .6 Dedicated emergency generators for high security projects, medical facilities and computer systems.
  - .7 Emergency control procedures for fire, power and major equipment failure.

- .8 Emergency contacts and numbers.
- .9 Manual to be readily available and comprehensible to non- technical readers.

## **1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES**

- .1 Provide Contract Administrator supporting documentation relating to installed equipment and system, including:
  - .1 General:
    - .1 Finalized commissioning plan.
    - .2 WHMIS information manual.
    - .3 Approved "as-built" drawings and specifications.
    - .4 Procedures used during commissioning.
    - .5 Cross-Reference to specification sections.
  - .2 Architectural and structural:
    - .1 Inspection certificates, construction permits.
    - .2 Roof anchor log books.
    - .3 PV reports.
  - .3 Fire prevention, suppression and protection:
    - .1 Test reports.
    - .2 Smoke test reports.
    - .3 PV reports.
  - .4 Mechanical:
    - .1 Installation permits, inspection certificates.
    - .2 Piping pressure test certificates.
    - .3 Ducting leakage test reports.
    - .4 TAB and PV reports.
    - .5 Charts of valves and steam traps.
    - .6 Copies of posted instructions.
  - .5 Electrical:
    - .1 Installation permits, inspection certificates.
    - .2 TAB and PV reports.
    - .3 Electrical work log book.
    - .4 Charts and schedules.
    - .5 Locations of cables and components.
    - .6 Copies of posted instructions.
- .2 Assist Contract Administrator with preparation of BMM.

## **1.8 LANGUAGE**

- .1 English and French Language to be in separate binders.

## **1.9 USE OF CURRENT TECHNOLOGY**

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.
- .2 Obtain Contract Administrator approval before starting Work.

## **Part 2 Products**

– Not Applicable

## **Part 3 Execution**

– Not Applicable

**NMS DIVISION 4 SPECIFICATIONS**

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Special Provision (Page 68)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 4 National Master Specifications are included in this Contract.

**NMS 042000 – MASONRY**

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Special Provision

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 03 30 00 – Cast-in-Place Concrete.
- .2 Section 04 22 23 – Architectural Concrete Unit Masonry.
- .3 Section 05 50 00 – Metal Fabrications.
- .4 Section 07 21 13 – Board Insulation.
- .5 Section 07 92 00 – Joint Sealants.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
- .2 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .3 CSA-A165 Series-04, CSA Standards on Concrete Masonry Units. covers: A165.1, A165.2, A165.3.
- .4 CSA-A179-04 Mortar and Grout for Unit Masonry.
- .5 CSA-A370-14, Connectors for Masonry.
- .6 CSA-A371-04, Masonry Construction for Buildings.
- .7 CSA-G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement.
- .8 CAN/CSA G30.18-M92, Billet Steel Bars for Concrete Reinforcement.
- .9 CSA-S304.1-04, Design of Masonry Structures.
- .10 CSA-W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

**1.3 SUBMITTALS**

- .1 Product Data.
  - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Submit two copies of WHMIS MSDS – Material Safety Data Sheets in accordance

with Section 01 33 00 – Submittal Procedures.

- .2 Samples.
  - .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Submit samples:
    - .1 Two of each type of masonry unit specified.
    - .2 Two of each type of masonry accessory specified.
    - .3 One of each type of masonry reinforcement, tie and connector proposed for use.
  - .3 Submit two size samples of coloured mortar.
- .3 Shop Drawings.
  - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Shop drawings consist of bar bending details, lists and placing drawings.
  - .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4 Manufacturer's Instructions.
  - .1 Submit manufacturer's installation instructions.

#### **1.4 QUALITY ASSURANCE**

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Mock-ups.
  - .1 Construct mock-ups for Contract Administrator approval for each masonry wall type.
  - .2 Construct mock-up panel of interior masonry wall construction and the exterior masonry veneer construction, 1,200 x 1,800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.
  - .3 Mock-up will be used:
    - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
  - .4 Construct mock-up where directed by Contract Administrator.
  - .5 Allow 7 days hours for inspection of mock-up by Contract Administrator before proceeding with work.
  - .6 When accepted by Contract Administrator, mock-up will demonstrate minimum standard for judging materials, quality and workmanship incorporated into the masonry work.
  - .7 Sample panels to remain on site until removal is directed by the Contract Administrator.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, handle and protect materials in accordance with the General Conditions.
- .2 Deliver materials to job site in dry condition.
- .3 Cement and other packaged materials shall be delivered in original undamaged packages.
- .4 Storage and Protection.
  - .1 Keep materials dry until use except where wetting of bricks is specified.
  - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with contract requirements.

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material and pallets in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Unused metal materials are to be diverted from landfill to a metal recycling facility as approved by Contract Administrator.
- .5 Unused or damaged masonry materials must be diverted from landfill to a local quarry facility as approved by Contract Administrator.

## **1.7 SITE CONDITIONS**

- .1 Site Environmental Requirements.
  - .1 Cold weather requirements.
    - .1 No masonry shall be laid when the temperature is below 5°C, unless means approved by the Contract Administrator are provided to heat and maintain the temperature of masonry materials and protect the completed work from freezing.
    - .2 Protection shall consist of heating and maintaining the temperature of the masonry materials to at least 5°C, but not more than 71°C and maintaining an air temperature above 5°C on both sides of the masonry for a period of at least 48 hours if Type "M" or "S" mortar is used, and 72 hours if Type "N" is used. These periods may be reduced to 24 and 48 hours, respectively, if high-early-strength cement is used.
    - .3 The Contractor shall take such further measures as the Contract Administrator may deem advisable, but the responsibility for the adequacy of the finished work shall remain with the Masons.
    - .4 Supplement Clause 6.7.2 of CSA-A371 with following requirements.
      - .1 Maintain temperature of mortar between 5° C and 50° C until batch is used or becomes stable.
      - .2 Maintain ambient temperature between 5° C and 50° C and protect site from wind-chill.
  - .2 Hot weather requirements.
    - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
    - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

## **Part 2 Products**

### **2.1 MASONRY UNITS**

- .1 Standard concrete block units: to CSA-A165 Series (CSA-A165.1).
  - .1 Classification:
    - .1 Hollow units: H/15/A/M
    - .2 Solid units: S/15/A/M.
  - .2 Size: metric modular, sizes as indicated on the Drawings, and complete with return corners and required shapes.
  - .3 Dry density shall not be less than 2,000 kg/m<sup>3</sup> concrete.
  - .4 All units shall have a uniform texture and shall be free of smears, slick spots and other surface imperfections.
  - .5 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
  - .6 Manufacturers of Standard concrete block units having Products considered acceptable for use:

- .1 Shaw Brick
- .2 Permacon
- .3 Boehmers Block
- .4 Contract Administrator approved equal.
- .5 Colour: Standard grey.

## **2.2 FACE BLOCK**

- .1 Standard concrete block units with architectural face in two textures to achieve pattern shown on drawings.
- .2 Products:
  - 1. FB-1 Low Bay:
    - a. Profile Series Concrete Block with water repellant additive by Brampton Brick – colour: Select from manufacturer's complete colour range (separate colour from FB-2). Size: D 90mm x H 190mm x W 390mm.
    - b. Contract administrator approved equivalent.
  - 2. FB-2 High Bay:
    - a. Profile Series Concrete Block with water repellant additive by Brampton Brick – colour: Select from manufacturer's complete colour range (separate colour from FB-1). Size: D 90mm x H 190mm x W 390mm.
    - b. Contract administrator approved equivalent.
- .3 Equivalent products by Permacon, Richvale York Block Inc., Alba Stone Products, or Contract Administrator approved equivalent.

## **2.2 MORTAR AND GROUT**

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar and grout: CSA A179.
- .3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
- .4 Colour: ground, coloured natural aggregates or metallic oxide pigments as approved by the Contract Administrator for use where coloured face block is indicated.
- .5 The proportions of Portland cement, masonry cement and sand aggregate shall be as shown in table below:

Mortar Type	Portland Cement	Masonry Cement	Sand	28-Day Compressive Strength (Laboratory Strength)
M	1	1 (Type H)	6	17.5 MPa
S	½	1 (Type H)	4½	12.5 MPa
N	0	1 (Type H)	3	5.0 MPa

- .6 Mortar for exterior masonry above grade:
  - .1 Loadbearing: type S as per table above.
  - .2 Non-Loadbearing: type S as per table above.
  - .3 Parapet walls, chimneys, unprotected walls: type S as per table above.
- .7 Mortar for foundation walls, manholes, sewers, pavements, walks, patios, and other exterior masonry at or below grade: type M as per table above.
- .8 Mortar for interior masonry.

- .1 Loadbearing: type S based on Proportion specifications.as per table above.
- .2 Non-Loadbearing: type S based on Proportion specifications.
- .9 Structural mortar:
  - .1 Mortar for bedding steel bearing plates and steel lintels shall be Type "M" as per table above.
- .10 Following applies regardless of mortar types and uses specified above:
  - .1 Mortar for grouted reinforced masonry: type M as per table above.
- .11 Pointing Mortar:
  - .1 Pointing mortar shall be Type S to which add ammonia stearate or calcium stearate not more than 2% of the cement volume.
  - .2 Pre-hydrate mortar for pointing by mixing the dry ingredients with sufficient water to produce a damp mass of such consistency that it will retain its form when pressed into a ball with hands, but will not flow under the trowel. Allow mortar to stand for a period of not less than one hour nor more than two hours, after which remix with addition of sufficient water to produce satisfactory workability.
- .12 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.
  - .1 Use coloured mortar for all exterior brickwork and block work, unless otherwise noted. Colour to suit colour of units.
- .13 Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.
- .14 Grout Mortar: to CSA-A179, Table 3.
  - .1 Grouting mortar shall consist of Type M mortar to which add a sufficient quantity of water to produce a pouring consistency without segregating the ingredients, while still retaining cohesiveness. After water has been added, stir at frequent intervals until used.

## **2.3 MASONRY ANCHORAGE AND REINFORCING**

- .1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400 (refer to architectural and structural drawings for extent).
- .2 Wire reinforcement: to CSA-A371 and CSA G30.14, galvanized to CSA-S304 and CSA-A370 where fully imbedded.
- .3 Connectors and Ties: to CSA-A370 and CSA-S304, stainless steel.
- .4 All masonry walls shall be reinforced by means of the following unless otherwise specified:
  - .1 Horizontal Joint Reinforcement: BL-10 HD ladder type masonry wall reinforcing fabricated of 4.8 mm parallel side rods welded to cross rods of 3 mm cold drawn steel wire, hot-dipped galvanized after fabrication. Overall width of reinforcing shall be approximately 50 mm less than the nominal wall thickness. At minimum provide ladder reinforcement in every other horizontal joint.
  - .2 For single wythe walls: use Blok-Lok Type BL-10 HD.
  - .3 Corner-Lok: of same gauge and finish material as specified for ladder reinforcement.
  - .4 Adjustable veneer anchors: Blok-Lok BL-607 (steel stud bayonette style) with BLT-9 Seismic Flex-o-lok ties, stainless steel.
  - .5 Manufacturers of Masonry Reinforcement and Anchors having Products considered acceptable for use:
    - .1 Blok-Lok
    - .2 Duro-O-Wal Limited
    - .3 Acrow-Richmond
    - .4 Fero
    - .5 Contract Administrator approved equal.

## **2.4 ACCESSORIES**

- .1 Control joint: Dur-O-Wall Wide Flange, DA 2003, Rubber or Contract Administrator approved equal.
- .2 Control joint filler: joint backing material for caulking of joints shall be white, non-absorbent, closed cell foam polyethylene of size and shape indicated.
- .3 Lap adhesive: recommended by masonry flashing manufacturer.
- .4 Cavity Wall Air Space Filler (Mortar Boards): Fibrous Material, nominal 10" high, thickness to suit cavity space width. Acceptable products:
  - .1 Mortar Net by J.V. Building Supply Ltd., Woodbridge, Ontario.
  - .2 Contract Administrator approved equivalent.
- .5 Weep hole vents: Dur-O-Wall Type DA1006, Cell Vent Weep Hole Ventilators or Contract Administrator approved equivalent. Finish colour to match mortar colour.
- .6 Mechanical fasteners: stainless steel.
- .7 Damp-proof Course and Base Flashings:
  - .1 Blueskin TWF, thru wall flashing sheet, as manufactured by Bakor.
  - .2 Flex-Guard 40 mil P.V.C. Masonry Flashing, as manufactured by W.R. Meadows of Canada.
  - .3 Contract Administrator approved equal.

## **2.5 FABRICATION OF MASONRY REINFORCING**

- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
- .2 Fabricate connectors in accordance with CSA-A370.
- .3 Obtain Contract Administrator's approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.
- .5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

## **2.6 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.
- .2 Upon request inform Contract Administrator of proposed source of material to be supplied.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 The Contractor shall co-ordinate all aspects of masonry work to ensure an efficient, satisfactory installation free from unnecessary delays.
- .2 All defects of work previously prepared shall be reported to the Contract Administrator and corrected before laying of concrete block or any other masonry work starts.
- .3 Provide scaffolding for all masonry work as required to properly carry out the work. Scaffolding shall be properly supported, strongly built and firmly braced, and shall not be

secured or braced against any part of the building. Scaffolding shall comply with all Federal and Provincial Safety Regulations and the General Requirements forming part of this Contract.

- .4 Remove excess mortar and projections. Take care to prevent breaking corners and to make the tooled joints uniform.
- .5 In laying masonry, avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after they are set in position. When an adjustment must be made after the mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.
- .6 Where flashing turns out and terminates in horizontal mortar joints, at lintels, shelf angles, spandrels, bases, and bottom of cavities in cavity walls, provide weepholes in the mortar joints of outer wythes at 600 mm horizontally. Make hole 10 mm diameter formed with breather and turn breather 100 mm up wythe. Heat seal inner end and leave outer end cut to fray.
- .7 All masonry walls and partitions, unless specifically noted on the Drawings, shall extend from bearing surface to the underside of the structure above, where they shall be wedged tightly with pieces of masonry, neatly cut to required shape and set in a full bed of mortar. Support tops of masonry walls with angles and anchors where shown on the drawings.

### **3.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### **3.3 PREPARATION**

- .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
- .2 Submit shop drawings for temporary bracing in accordance with Section 01 33 00 – Submittal Procedures. The temporary bracing shall be designed by a professional engineer licensed in the province of Ontario and shall bear the seal of the design engineer.
- .3 The designer of the temporary bracing (or their designate) shall visit the site to ensure the temporary bracing is installed in conformance with the design drawings and specifications. Submit a letter to the Contract Administrator detailing the results of the field review.

### **3.4 INSTALLATION**

- .1 Do masonry, mortar and grout work in accordance with CSA-A371 except where specified otherwise.
- .2 Concrete block units.
  - .1 Bond: running.
  - .2 Coursing height: 200 mm for one block and one joint.
  - .3 Jointing: concave where exposed.
  - .4 Lay concrete blocks in full bed of mortar, plumb, level, true to line and properly jointed with other connecting work. Blocks with open cells exposed in wall will not be permitted.
  - .5 Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
  - .6 All external corners to be bullnosed where concrete unit masonry will remain exposed in building.
- .3 Build masonry plumb, level, and true to line, with vertical joints in alignment.

- .4 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
- .5 Install continuous control joint fillers in control joints at locations indicated on drawings.
- .6 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

### **3.5 MIXING OF MORTARS**

- .1 Mix mortar ingredients thoroughly and only in such quantities as are needed for immediate use. Except for small jobs or batches, mixing shall be done by machine.
- .2 When the mixing is done in a mechanical mixer, the mortar shall be mixed for not less than 3 minutes after all the materials are in the drum. Hand mixing shall be continued until the mortar is completely and uniformly mixed.
- .3 Cement mortar shall be used and placed in final position within 2 hours after mixing, when the air temperature is above 25°C and within 3 hours after mixing when the air temperature is less than 25°C. Mortars that have stiffened within these time limits due to evaporation of moisture may be retempered to restore workability by adding water.
- .4 Mortar materials shall be measured by volume, and the methods of measurements shall be such that the proportions can be controlled with an error of not over 2%.
- .5 Colour and admixtures: mix grout to semi-fluid consistency.
- .6 Coloured mortars: incorporate colour and admixtures into mixes in accordance with manufacturer's instructions.
  - .1 Use clean mixer for coloured mortar.
- .7 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

### **3.6 CONSTRUCTION**

- .1 Exposed masonry.
  - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA-A165, Clause 82.1, in exposed masonry and replace with undamaged units.
- .2 Jointing
  - .1 Mortar joints shall be straight, clean and uniform in thickness.
  - .2 Strike flush joints concealed from view in walls or ceilings and joints in walls to receive rubber wall base, plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting.
  - .1 Minimize cutting of masonry. Where cutting of exposed masonry is required, cut with power drive abrasive cutting disc.
  - .2 Cut out for flush-mounted electrical switches, outlet boxes, grilles, pipes, conduit and other recessed or built-in objects, leaving 3 mm maximum clearance.
  - .3 Masonry shall be cut accurately to fit snugly around pipes, conduits and ducts, and all spaces around such work shall be filled solidly and neatly finished to reduce sound transmission throughout the building.
  - .4 Masonry shall be built around pipes and ducts only after they have been tested, covered where applicable and approved by the Contract Administrator.
  - .5 Make cuts straight, clean, and free from uneven edges.

- .6 Approval of the Contract Administrator shall be obtained before cutting into any parts which will impair the appearance or strength of the work.
- .4 Building-In.
  - .1 Build in materials supplied under this and other Sections such as door; louvre frames, loose steel lintels, sleeves, anchors, bolts, ties, and all other inserts which have to be built into masonry.
  - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .3 All frames set in masonry shall be well braced and lugs or anchors attached or provided shall be properly placed. Spaces at the back of and over metal frames shall be filled with the type of mortar used in surrounding work.
  - .4 Chases and openings in masonry work shall be built as the work progresses, and shall be accurately sized and located where shown, directed or required.
  - .5 Loose steel lintels.
  - .6 Build in loose steel lintels for all openings where indicated in masonry walls. Minimum 200 mm bearing at each end.
  - .7 Centre over opening width.
- .5 Support of loads.
  - .1 Fill concrete blocks bearing lintels and other structural members, solid with 25 MPa course masonry cavity grout unless otherwise noted.
  - .2 Use 30 MPa F1 concrete to Section 03 30 00 – Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
  - .3 Use grout to CSA-A179 where grout is used in lieu of solid units.
  - .4 Install building paper and wire mesh reinforcing below voids to be filled with concrete; keep paper 25 mm back from faces of units.
- .6 Provision for movement.
  - .1 Leave 3 mm space below shelf angles.
  - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .7 Control joints.
  - .1 Provide control joints in masonry walls as shown on Architectural Drawings and as follows:
    - .1 In continuous walls spaced not to exceed 6 m.
    - .2 Where there is a variation in the wall thickness.
    - .3 Where the wall changes in height.
    - .4 At door openings in accordance with accepted masonry practice.
  - .2 Shrinkage control joints shall consist of a straight vertical joint extending from structural foundation to top of wall.
  - .3 Vertical joint filler to extend to within 20 mm of masonry face, ready for caulking under Section 07 92 00.
- .8 Flashings.
  - .1 Build in all flashings, show or required, in masonry in accordance with CSA-A371.
  - .2 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
  - .3 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 200 mm, and as follows:
    - .1 For masonry backing embed flashing 25 mm in joint.
    - .2 For concrete backing, insert flashing into reglets.
    - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
    - .4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.

- .4 Lap joints in the running length and at angles 150 mm and seal with adhesive in accordance with the material manufacturer's instructions.
- .9 Interface with other work.
  - .1 Openings in walls: approved by Contract Administrator.
  - .2 Make good existing work. Use materials to match existing.

### **3.7 MASONRY ANCHORAGE AND REINFORCING GENERAL**

- .1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing concrete, mortar or grout, obtain Contract Administrator's approval of placement of reinforcement and connectors.
- .3 All masonry walls shall be reinforced continuously with horizontal masonry reinforcement. Place reinforcement at spacing indicated on drawings and lap splices in accordance with manufacturer's instructions. At minimum place horizontal joint reinforcement at 400mm o/c (maximum) and lap splices in accordance with manufacturer's instructions.
- .4 Above and below all openings, reinforcing shall be placed in both first and second joint and the additional reinforcing shall extend 600 mm beyond each side of the opening.
- .5 Install prefabricated corner sections in reinforced joints at corners and prefabricated tee sections at reinforced joints where partitions intersect other partitions or walls, unless lateral support is being provided, or walls or partitions are erected on separate foundations.
- .6 Where intersecting walls are erected on different foundations and lateral support is not required, provide straight joint full height of wall with crimped masonry ties at every second joint. Overall thickness of reinforcement shall be 50 mm less than the nominal thickness of the wall.
- .7 Supply and install additional reinforcement to masonry as indicated.

### **3.8 BONDING AND TYING**

- .1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.
- .2 Tie masonry veneer to backing in accordance with NBC, OBC, CSA-S304.1, CSA-A371 and as indicated.
- .3 Spacing of veneer anchors not to exceed 600 mm vertically and 600 mm horizontally per tie.
- .4 Provide additional ties at the top of walls and perimeter of openings within 300 mm of openings and top of parapets.

### **3.9 REINFORCED LINTELS AND BOND BEAMS**

- .1 Provide and install concrete block bond beam units where indicated and required for bearing of structural members.
- .2 Bond beams shall be made of special channel blocks with reinforcing bars placed in the bottom, and shall be filled with 30 MPa F1 concrete.
- .3 Reinforce masonry bond beams as indicated on the Drawings.
- .4 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

### **3.10 GROUTING**

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

### **3.11 ANCHORS**

- .1 Supply and install metal anchors as indicated.

### **3.12 LATERAL SUPPORT AND ANCHORAGE**

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

### **3.13 MOVEMENT JOINTS**

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

### **3.14 FIELD BENDING**

- .1 Do not field bend reinforcement and connectors except where indicated or authorized by Contract Administrator.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars and connectors which develop cracks or splits.

### **3.15 FIELD TOUCH-UP**

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

### **3.16 SITE TOLERANCES**

- .1 Tolerances in notes to Clause 6.2 of CSA-A371 apply.

### **3.17 CLEANING**

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .3 Standard and Decorative block.
  - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.
  - .2 To remove excess mortar, smears and stains, use a non-acid cleaning solution, recommended by the manufacturer, of type which will not harm completed masonry.
  - .3 Use non-metallic tools in cleaning operations, and sufficient amounts of clean water.
  - .4 Protect adjacent materials and work from damage while cleaning.
    - .1 Repeat cleaning process as often as necessary to remove mortar and other stains.
    - .2 Use acid solution treatment for difficult to clean masonry as described in Technical Note No.20 by the Brick Industry Association.

### **3.18 PROTECTION**

- .1 Masonry shall be protected during the execution of the work in an approved manner, and generally as follows:

- .1 Tops of walls under construction shall be covered with tarpaulins at nights, during inclement weather, and during delays in the work.
- .2 Projecting ledges, exposed facework and angles, shall be protected by means of boards to prevent damage or disfigurement, and such covering shall be secured in place so that finished work will not be affected.
- .3 Work which has been damaged due to a lack of or inadequate protection being provided shall be replaced to the satisfaction of the Contract Administrator at no expense to the Owner.
- .4 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

### **3.19 COMPLETION**

- .1 All surfaces shall be examined carefully upon completion and any holes or cracks in joints shall be tuck-pointed full with mortar, matching colour and finish of adjacent joints.

## **NMS DIVISION 8 SPECIFICATIONS**

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Special Provision (Page 173)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 8 National Master Specifications are included in this Contract.

## **NMS 081113 – HOLLOW METAL DOOR AND FRAMES**

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Special Provision

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### **Part 1 General**

#### **1.1 RELATED SECTIONS**

- .1 Section 04 20 00 – Masonry.
- .2 Section 07 92 00 – Joint Sealants.
- .3 Section 08 71 00 – Finish Hardware.
- .4 Section 08 81 00 – Glazing.

#### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA A370-94, Connectors for Masonry.
  - .2 CSA A440 Series 98, Windows.
  - .3 CSA G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steels/Structural Quality Steels.
  - .4 CSA W59-M1989 (R1999), Welded Steel Construction (Metal Arc Welding).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.
  - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
  - .3 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .4 CGSB 51-GP-21-M78, Thermal Insulation, Urethane and Isocyanurate, Unfaced.
  - .5 CAN/CGSB-82.5-M88, Insulated Steel Doors.

- .3 American Society for Testing and Materials (ASTM)
  - .1 ASTM C553-99 Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .2 ASTM A653/A653M-00 Standard Specification for General Requirements for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
  - .3 ASTM C665-98 Standard Specification for Mineral Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - .4 ASTM A1008/A1008M-00 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - .5 ASTM B29-92(1997) Standard Specification for Pig Lead.
  - .6 ASTM B749-97 Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
  - .7 ASTM E2074-00 Standard Method for Fire Tests of Door Assemblies Including Positive Pressure Testing of Side Hinged and Pivotted Swinging Door Assemblies.
- .4 Underwriters' Laboratories of Canada (ULC).
  - .1 CAN4-S104-1980(R1985), Fire Tests of Door Assemblies.
  - .2 CAN4-S105-1985(R1992), Fire Door Frames Meeting the Requirements Required by CAN4-S104.
- .5 Canadian Steel Door and Frame Manufacturers' Association, (CSDFMA).
  - .1 CSDFMA, Specifications for Commercial Steel Doors and Frames, 1990.
  - .2 CSDFMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.
- .6 National Fire Protection Association (NFPA).
  - .1 NFPA 80-1992, Fire Doors and Windows.
  - .2 NFPA 252-1990, Door Assemblies Fire Tests of.

### **1.3 WORK INCLUDED**

- .1 Work of this Section includes complete supply and installation of the following:
  - .1 Interior and exterior hollow metal doors and frames.
  - .2 Interior and exterior hollow metal door frames and screens.

### **1.4 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 Steel fire rated doors and frames: labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and NFPA 252 for ratings specified or indicated.
- .2 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E2074 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/ Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .3 Install any exterior hollow metal window openings in the Air Barrier system to CSA A440 and A440.1.

### **1.5 DESIGN REQUIREMENTS**

- .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35C to 35C.

### **1.6 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Division 1.
- .2 Indicate each type of door material, steel core thicknesses, mortises, reinforcements, location of exposed fastenings and finishes, any glazed or louvred openings, arrangement of hardware and required fire rating, if any.
- .3 Indicate each type frame material, steel core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

## **1.7 MANUFACTURERS**

- .1 All Steel Doors and Frames specified in this Section to be manufactured by one company.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Plain sheet steel: cold rolled commercial grade steel to ASTM A1008/A1008M, matte finish.
- .2 Galvanized steel sheet (Type 1): to ASTM A653/A653M with coating designation Z275.
- .3 Door Face Sheet Materials:
  - .1 Interior doors: plain steel sheet, Type 1, 1.2 mm (18 ga) base metal thickness.
  - .2 Exterior doors: galvanized steel sheet, Type 1, 1.6 mm (16 ga) base metal thickness.
- .4 Door Core Materials:
  - .1 Honeycomb: Standard structural core consisting of kraft paper having 20 mm (3/4") cell size to thickness indicated.
  - .2 Steel stiffened: hollow steel construction vertically stiffened with steel ribs and voids filled with semi-rigid fibrous insulation.
  - .3 Insulated (Bonded): Rigid urethane foam core bonded under pressure to both door face sheets, compressive strength 122 kg/sq m (25 psi), RSI 1.9 (R-11.1), U:0.09.
- .5 Frame Materials:
  - .1 Interior frames (commercial quality): plain galvanized steel sheet, Type 1, 1.6 mm (18 ga) base metal thickness.
  - .2 Exterior frames: galvanized steel sheet, Type 1, 1.6 mm (16 ga) base metal thickness. Frames to be thermally broken with integral thermal break.
- .6 Glazing stops: in accordance with CSDFMA requirements, minimum 1 mm (20 ga) base thickness sheet steel finished to match door, tamperproof screw fixed.
- .7 Glass: type and size indicated and as specified in Section 08 81 00 – Glazing.
- .8 Touch-Up Primer:
  - .1 For plain steel sheet: CAN/CGSB-1.40.
  - .2 For galvanized steel sheet: to CAN/CGSB-1.181, zinc-rich organic coating.
- .9 Floor anchors and channel spreaders: galvanized steel sheet, minimum 1.6 mm (16 ga) base metal thickness.
- .10 Wall anchors: to CSA A370, galvanized, purpose made to suit frame size and wall thickness indicated, wire type or corrugated.

## **2.2 FABRICATION**

- .1 Fabricate steel doors and frames as detailed, in accordance with CSDFMA "Canadian Manufacturing Specifications for Steel Doors and Frames" for hollow steel core, honeycomb core and insulated core construction.
- .2 Doors:
  - .1 Make provision for louvres and/or glazing that may be indicated and provide necessary glazing stops.
  - .2 Construct matching panels if indicated in same manner as doors.
  - .3 Fabricate doors with longitudinal edges seamless, welded, filled and sanded flush.
  - .4 Fabricate with top and bottom channels flush and filled solid, extending full width of door and welded to both faces.
- .3 Door Frames:
  - .1 All steel door frames on this project to be welded.
  - .2 All fire labeled frames to be welded construction.
  - .3 Provide adjustable jamb anchors for fixing at floor.
  - .4 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of doors.
  - .5 Cut mitres and joints accurately and weld continuously on inside of frame profile.
  - .6 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Doors:
  - .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
  - .2 Adjust operable parts for correct function.
  - .3 Install glazing or door grilles where scheduled.
- .2 Frames:
  - .1 Set frames plumb, square, level and at correct elevation.
  - .2 Secure anchorages and connections to adjacent construction. Provide a minimum three wall anchors per jamb.
  - .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm (4 ft) wide. Remove temporary spreaders after frames are built-in.
  - .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .3 Fire Doors and Frames:
  - .1 Install in accordance with NFPA-80, Volume 4, produced by National Fire Protection Association (NFPA).

### **3.2 FINISH REPAIRS**

- .1 Touch-up with primer any galvanized finish damaged during installation. Do not prime or paint over fire labels.

### **3.3 SCHEDULE**

- .1 Door and frame sizes, glazing, fire labels, finish requirements and profiles are indicated on the Door, Frame and Hardware Schedule on the Drawings.
- .2 Reference the Materials column on the Door, Frame and Hardware Schedule for hollow metal

door and frame construction types. Not all references applicable to this project. Select as follows:

- .1 Door construction:
  - .1 M: honeycomb core and insulated core, slab door.
  - .2 L: honeycomb core and insulated core, slab door with louver.
  - .3 NL1 and NL2: honeycomb core, narrow half upper lite.
  - .4 G: honeycomb core and insulated core, full lite.
- .2 Frame construction:
  - .1 F1: all welded, exterior locations with thermal break, refer to drawings for profile and attachment detail.

## **NMS 081116 – ALUMINUM DOORS, FRAMES AND SCREENS**

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### Special Provision

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#### **Part 1 General**

##### **1.1 RELATED SECTIONS**

- .1 Section 07 27 00 – Air Barriers.
- .2 Section 07 92 00 – Joint Sealants.
- .3 Section 08 51 13 – Aluminum Windows.
- .4 Section 08 71 00 – Finish Hardware.
- .5 Section 08 81 00 – Glazing.

##### **1.2 REFERENCES**

- .1 AA (Aluminum Association) DAF 45 1980 Designation System For Aluminum Finishes.
- .2 ASTM E330-97e1 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- .3 CAN/CGSB-1.108-M89 Bituminous, Solvent Type Paint.
- .4 CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.
- .5 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.
- .6 CAN/CGSB-12.8-M90 Insulating Glass Units.
- .7 CAN/CGSB-12.11-M90 Wired Safety Glass.
- .8 CSA A440-98 Windows.
- .9 CSA G40.20/G40.21-M92 Structural Quality Steels.
- .10 CAN/CSA-G164-98 Hot Dip Galvanizing of Irregularly Shaped Articles.

##### **1.3 WORK INCLUDED**

- .1 Work of this Section includes interior fixed storefront framing, interior glazed aluminum doors, sidelights, and screen frames.

- .2 For other fixed windows, see Section 08 51 13 – Aluminum Windows.

**1.4 DESIGN CRITERIA**

- .1 Products installed in the Air Barrier System shall comply with CSA A440 and A440.1.

**1.5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Division 1.
- .2 Indicate each type of door, frame and screen, extrusion profiles, method of assembly, section and hardware reinforcement, locations of exposed fasteners and finishes.
- .3 Submit catalogue details in accordance with Division 1 for each type of door and frame illustrating profiles, dimensions and methods of assembly.
- .4 Indicate alloy, temper, surface preparation and finish specifications for all aluminum components specified under this Section.

**1.6 MAINTENANCE DATA**

- .1 Provide maintenance data for cleaning and maintenance of aluminum finishes for incorporation into maintenance manual specified in Division 1.

**1.7 PROTECTION**

- .1 Apply Manufacturer's standard temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

**1.8 WARRANTY**

- .1 Provide written warranty against defective workmanship and materials of the work of this Section for a period of three years from the date of Substantial Completion as defined in the General Conditions.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aluminum alloys for both extrusions and sheet material shall have suitable metallurgical characteristics and surface qualities for the application of any protective or decorative coatings by anodizing or any other coating specified in this Section.
- .2 The aluminum alloy, temper and surface treatment methods to be used for applications under this Section shall be agreed upon by the Manufacturer and the Contract Administrator and shall fall within the applications guidelines set down by The Aluminum Association Incorporated (AA).
- .3 Generally, alloy and temper for tensile strength and corrosion resistance for extruded products shall be AA6063-T5 and for sheet products shall be AA1100. The use of special alloys developed by the Manufacturer for specific finishes is to be approved by the Contract Administrator.
- .4 Steel reinforcement: to CSA G40.20/G40.21, Grade 300W galvanized.
- .5 Fasteners: aluminum or stainless steel, finished to match adjacent material where exposed. Use aluminum or stainless steel for alum. to alum. contact; stainless steel for alum. to steel contact.
- .6 Weatherstrip: replaceable design, manufacturer's standard for framing system specified.

- .7 Isolation coating: to CAN/CGSB-1.108, Type 2, alkali resistant or bituminous paint or epoxy solution.
- .8 Glass and Glazing Materials: in accordance with Section 08 81 00 – Glazing.
- .9 Sealants: multi-component urethane to CAN/CGSB-19.24, coloured to match framing.

## **2.2 ALUMINUM FRAMES AND SCREENS**

- .1 Interior Screen Frames: extruded profile, suitable for glazing with single or insulated glass units, sizes as indicated. Provide door jamb fillers at door locations. Acceptable products:
  - .1 Tri-Fab II 450 Series (1 3/4" x 4 1/2") profile.
  - .2 Contract administrator approved equivalent.
- .2 Provide optional manufacturer's standard adjustable sidelight base where indicated. When used, adjust to match bottom rail height of adjacent door.

## **2.3 ALUMINUM FINISHES**

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System or Aluminum Finishes or with Manufacturer's finishes designation where specifically called for.
- .2 Anodic Finishes:
  - .1 Anodic finish: clear anodized.

## **2.4 OTHER FINISHES**

- .1 Finish steel clips and reinforcing steel with 380 g/sq m zinc coating to CSA G164. Framing manufacturer to determine need for reinforcement to meet performance requirements of system.

## **2.5 FABRICATION**

- .1 Construct doors, transom panels, frames and screens to profiles and maximum face sizes as shown. Provide minimum 22 mm (7/8") bite for factory-sealed double-glazed units.
- .3 Make allowances for deflection of structure. Ensure that structural loads are not transmitted to aluminum work.
- .4 Provide structural steel reinforcement for strength, stiffness and connections.
- .5 Fit intersecting members to flush hairline weather tight joints and mechanically fasten together, except where indicated otherwise.
- .6 Conceal fastenings from view. Exposed fastenings only where indicated.
- .7 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.
- .8 Field apply isolation coating to aluminum in contact with dissimilar metals or cementitious materials.
- .9 Provide replaceable weatherstripping at door openings. Weatherstrip bottom of doors with pile sweep strip applied to door rail.
- .10 Place manufacturer's name plates in semi-concealed locations.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install work plumb, square, level, free from warp, twist and superimposed loads.
- .2 Secure work in required position. Do not restrict thermal movement.
- .3 Install hardware required to be installed under this Section in accordance with templates.
- .4 Adjust operable parts for correct function.
- .5 Isolate from cementitious materials.
- .6 Where products of this Section occur in an air barrier system, install in accordance with CSA A440 and A440.1.

### **3.2 GLAZING**

- .1 Glaze fixed interior aluminum screens and sidelight frames on site. Aluminum swing doors to be factory glazed by the manufacturer.
- .2 Glass material and glazing methods are specified under Section 08 81 00 – Glazing. See door and screen elevations on the Drawings for types and locations.

### **3.3 CAULKING**

- .1 Where required seal between members of aluminum work.
- .2 Apply sealant in accordance with Section 07 92 00 – Joint Sealers. Conceal sealant within the aluminum work except where exposed use is permitted by the Contract Administrator.

## **NMS 081423.16 – PLASTIC LAMINATED WOOD FACED DOORS**

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### **Special Provision**

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## **Part 1 General**

### **1.1 SUMMARY**

- .1 Section includes:
  - .1 Solid core doors with high pressure plastic laminate.
  - .2 Factory finishing wood doors.
  - .3 Fire rated wood doors.

### **1.2 SUBMITTALS**

- .1 Submit required submittals in accordance with Division 1.
  - .1 Product data sheets:
    - .1 Product data sheets for Products proposed for use in the work of this section.

### **1.3 CERTIFICATION**

- .1 Submit test reports or certification of compliance that manufacturer doors have been tested and third party certified to meet or exceed performance duty level for door construction specified.

### **1.4 SHOP DRAWINGS**

- .1 Indicate door location using numbering system per door schedule, size, and hand of each door, elevation of each door type; undercuts, bevelling, construction type core and edge construction not covered in product data; and special blocking requirements.
- .2 Indicate dimensions and locations of factory machining criteria for hardware, extent of hardware blocking.
- .3 Indicate dimensions and locations of cut-outs including trim for openings.
- .4 Indicate doors to be factory finished and finish requirements.
- .5 Indicate fire ratings for fire rated doors.

#### **1.5 VERIFICATION SAMPLES**

- .1 Submit samples of proposed plastic laminate door faces for each colour, texture and pattern selected.

#### **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Manufacturer shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.
- .2 Quality standard:
  - .1 Work shall be in accordance with the Architectural Woodwork Standards, Edition 1, 2009, Premium Grade.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Door numbers shall be marked with door numbers used on shop drawings in the top hinge cavity created by the machining for hinges.
- .2 Identify doors with labels. Package with resilient packaging.
- .3 Store doors flat at the Place of the Work in piles with bottom face on bottom of pile. Protect from moisture by placing water resistant material under skids supporting piles. Cover top of piles and provide air at sides of piles.
- .4 Deliver the wood doors only after the building is closed and dry and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period. Do not receive the doors in a damp area. Do not drag the doors on the ground, floor or across one another.

#### **1.8 EXTENDED WARRANTY**

- .1 Warrant work of this section in accordance with Division 1 for a period of 2 years.
- .2 Repair or replace wood doors that fail or are defective within the specified warranty period. The warranty includes re-installation of hardware, re-hanging fitting, and finishing.
- .3 Failures shall include but not be limited to out of true alignment, failure to operate and swing freely, smoothly, and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.
- .4 Defects shall include, but not be limited to, delaminating, telegraphing of core construction in face veneers exceeding 0.254 mm (0.01") in a 75 mm (3") span, and warp exceeding 3 mm

(1/8") in a 1066 mm (42") x 2133 mm.

## **Part 2 Products**

### **2.1 MANUFACTURER**

- .1 Algoma Hardwoods, Inc.
- .2 Baillargeon Doors, Inc.
- .3 DoorLam Manufacturing.
- .4 Eggers Industries.
- .5 JWS Manufacturing Inc.
- .6 Lambton Doors.
- .7 Marshfield Door Systems.
- .8 Mohawk Flush Doors, Inc.
- .9 Contract administrator approved equivalent.

### **2.2 PERFORMANCE/DESIGN REQUIREMENTS FIRE RATING REQUIREMENTS**

- .1 Fire rated doors shall be fabricated, labelled and listed by an organization accredited by Standards Council of Canada in conformance with ULC CAN4-S104-M80 and ULC CAN4-S105-M85 for fire protection ratings as scheduled.
- .2 Install fire rated doors in accordance with NFPA 80.

### **2.3 GENERAL**

- .1 Single-source manufacturing and fabrication responsibility: Engage a qualified Manufacturer to assume undivided responsibility for wood doors and frames specified in this section, including fabrication and finishing.

### **2.4 FABRICATION DOOR CONSTRUCTION**

- .1 Performance duty level:
  - .1 Doors shall meet the requirements of WDMA I.S. 1A-04 for Extra Heavy Duty Performance Level unless otherwise indicated or scheduled.
  - .2 Non-rated doors: solid particle board core, high pressure decorative laminate faced, non fire rated and 20 minute fire rated wood door construction to Architectural Woodwork.
- .2 Standards Manual, Section 9 and as follows:
  - .1 Type PC-HPDL-5, particle core to ANSI A208.1-1999 LD-2.
- .3 Fire rated doors: solid fire resistant core; high pressure decorative laminate faced:
  - .1 Construction; high pressure decorative laminate; 45, 60 and 90 minute rated wood doors: Architectural Woodwork Standards Manual, Section 9, Type FD-HPDL-5.
- .4 Bonding:
  - .1 Bond stiles and rails to core; abrasive sand core assembly to achieve uniform thickness prior to lamination of door faces.
- .5 Panel edge types:

- .1 High pressure decorative laminate faced doors:
  - .1 For vertical edges (stiles) and exposed horizontal edges (rails). (Exposed horizontal edges are those edges that can be viewed from floors above.):
    - .1 Edge Type A
  - .2 Minimum 11 mm (7/16") thick, closed grain, solid hardwood edge.
    - .1 Wood edge transparent finish to match face.
  - .3 Non-rated or 20 minute fire rated doors: Solid hardwood edge to be laminated to minimum 25.4 mm (1") structural composite lumber backer.
  - .4 For 45, 60, or 90 minutes fire rated doors: Solid hardwood edge to be rated doors.
  - .5 For unexposed horizontal edges (rails):
    - .1 Non rated or 20 minute fire rated doors: Minimum 25 mm (1") structural composite lumber.
    - .2 45, 60, or 90 minute fire rated doors: fire rated material for fire rated doors.
  - .6 Blocking:
    - .1 Supply and install hardware blocking for doors as follows:
      - .1 Non-rated or 20 minute fire rated doors: Structural composite lumber for hardware blocking.
      - .2 Fire rated material for hardware blocking.
      - .3 HB-1, minimum 125 mm (5") wide, full door width, top-rail blocking for closure devices or flush bolts or for sliding door hardware.
      - .4 HB-2, minimum 125 mm (5") wide, full door width, bottom-rail blocking for doors with protection plates, concealed door seals, pivots or floor bolts.
      - .5 HB-4, minimum 114 mm (5") wide x 250 mm (10") high blocking for doors with mortise locks and pockets.
      - .6 HB-5, minimum 114 mm (5") wide x 250 mm (10") high blocking for hinges.
      - .7 HB-6, minimum 125 mm (5") wide, full door width, mid-rail blocking for exit devices.
      - .8 HB-7, minimum 125 mm (5") wide, full door height, for doors with continuous type hinges.
  - .7 Thickness:
    - .1 45 mm (1-3/4") minimum unless otherwise indicated or scheduled.

## **2.5 PLASTIC LAMINATE FACED DOORS**

- .1 Type: Grade 10 General Purpose, ANSI/NEMA LD3-2005.
- .2 Thickness: 1.2 mm.
- .3 Colours and patterns: to be selected at a later date by Contract Administrator from manufacturer's standard colour range. Plastic laminate by Formica or Contract Administrator approved equivalent.
- .4 Surface finish: to be selected at a later date by Contract Administrator from manufacturer's standard finish range.

## **2.6 ACCESSORIES**

- .1 Finishing hardware: in accordance with Section 08 71 00 – Finish Hardware.
- .2 Glass lite kit. Standard wood moulding, birch, clear finish. Acceptable products: Baillargeon Doors, Type S standard wood molding or Contract Administrator approved equivalent.

## **2.7 FABRICATION**

- .1 Fire rated doors shall be fabricated, labelled and listed by an organization accredited by Standards Council of Canada in conformance with ULC CAN4-S104-M80 and ULC CAN4-S105-M85 for fire protection ratings as scheduled.
- .2 Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - .1 Clearances: Refer to Part 3 for clearance tolerances.
  - .2 Fit doors for automatic door bottoms.
  - .3 Comply with NFPA 80 for fire-rated doors.
  - .4 Bevel non-fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock and hinge edges.
  - .5 Bevel fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock edge; trim stiles and rails only to extent permitted by labelling agency.
- .3 Fabricate doors with hardware blocking as specified in Part 2 of this Section.
- .4 Factory machine doors for finish hardware that is not surface applied. Do not machine for surface hardware. Locate hardware to comply with Door and Hardware Institute (DHI) edition. Comply with final reviewed hardware schedules, door and frame shop drawings and hardware templates.
  - .1 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  - .2 Metal astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire rated doors.
- .5 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.
- .6 Factory cut and trim openings:
  - .1 Glazing: Factory install glazing in doors indicated to be factory finished.

## **2.8 FACTORY FINISHING**

- .1 Finish work in factory in accordance with Architectural Woodwork Standards Manual, Section 9 and referenced quality standard.
- .2 Prior to finishing, handling marks or effects of exposure to moisture removed with a thorough final sanding over surfaces of the exposed portions, using appropriate grit sandpaper, and shall be cleaned prior to applying sealer or finish. Sanding shall be completed just prior to stain or finishing application.
- .3 Seal top and bottom door edges.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Supply and install necessary grounds, bracing and strapping for fitting and adequate for securing of the work.
- .2 Cooperate with work of other sections to ensure fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

### **3.2 INSTALLATION – GENERAL**

- .1 Execute installation and assembly at the Place of the Work using skilled forces under supervision of a competent joinery foreperson.

- .2 Install work plumb, level and straight, and fasten it securely to backing to support itself and anticipated superimposed loads.
- .3 Build into construction as indicated, or specified in other sections of this specification, or both.
- .4 Adequately fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.

### **3.3 INSTALLATION – DOORS/FRAMES**

- .1 Install wood doors after finishing of walls.
- .2 Install fire rated doors in accordance with NFPA 80.
- .3 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00 – Finish Hardware.
- .4 Align and fit doors in frames with uniform clearances as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
- .5 Pilot drill screw and bolt holes.

### **3.4 INSTALLATION – FINISHING HARDWARE**

- .1 Install finishing hardware in accordance with Section 08 71 00.
  - .1 Clearances: Provide 3.2 mm (1/8") maximum at heads, jambs, and between pairs of doors. Provide 3.2 mm (1/8") maximum from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, 6.4 mm (1/4") minimum from bottom of door to top of threshold unless otherwise indicated and a maximum of 12.7 mm (1/2").

### **3.5 ADJUSTING AND CLEANING**

- .1 Adjust doors to swing freely, smoothly and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.
- .2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by instructions.
- .3 Ensure that doors equipped with closers operate to close doors firmly against anticipated wind and building air pressure, and to enable doors to be readily opened as suitable for function, location and traffic.
- .4 Clean hardware after installation in accordance with instructions.
- .5 Seal top and bottom edges of wood doors are re-sealed if they are cut to fit, in accordance.

### **3.6 SCHEDULE**

- .1 Door and frame sizes, glazing, fire labels, finish requirements and profiles are indicated on the Door, Frame and Hardware Schedule on the Drawings.

- .2 Reference the Materials column on the Door, Frame and Hardware Schedule for plastic laminated wood door construction types. Select as follows:
  - .1 Door construction:
    - .1 WD1: slab door.
    - .2 WD2: slab door with glazing.

**NMS 083113 - ACCESS DOORS AND FRAMES**

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Special Provision

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 07 92 00 – Joint Sealants.

**1.2 COORDINATION**

- .1 Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies.
- .2 Coordinate delivery with other Work to avoid delay.

**1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures
- .2 Shop Drawings:
  - .1 Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
  - .2 Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
  - .3 General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.
- .3 Product Data:
  - .1 Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.
  - .2 Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.
- .4 Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

**1.4 WARRANTY**

- .1 Provide manufacturer's written warranty.
- .2 Warrant materials and fabrication against defects after completion and final acceptance of Work.
  - .1 Repair defects, or replace with new materials, faulty materials or fabrication developed during the warranty period at no expense to Owner.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Provide and maintain dry, off-ground weatherproof storage.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with General Conditions.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Divert unused paint and sealant materials from landfill to an approved, official hazardous material collections site.
- .5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.
- .6 Divert unused metal materials from landfill to an approved metal recycling facility.
- .7 Divert unused wood materials from landfill to an approved recycling facility.
- .8 Damaged or broken glazing materials are not recyclable. These materials must not be disposed of with materials destined for recycling.

**Part 2 Products**

**2.1 ACCEPTABLE MANUFACTURERS**

- .1 Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Acudor Products Inc or consultant approved equivalent.
- .2 Similar products by Bauco Access Panel Solutions, Nystrom Building Products or Cendrex Inc. of same materials, metal gauge and finishes are considered equal. All other products subject to Contract Administrator approval.

**2.2 MATERIALS**

- .1 Flush Non-Rated Access Doors and Frame with exposed flanges (non-rated insulated access door with gasket).
  - .1 Basis-of-Design Product: Subject to compliance with requirements, provide Acudor LT-4000, aluminum specialty door.
  - .2 Location: Ceiling.
  - .3 Door Size: 610mm x 914mm (24"x36").
  - .4 Material: Aluminum
    - .1 Door: 1.6mm (0.064"), flush to edge of frame, 33mm (1-5/16") mitered aluminum extrusion flange.
    - .2 Mounting Frame: 2mm (.080"), 38mm (1-1/2") deep.
    - .3 Hinge: Doors with width 610mm (24") or less to have concealed pin hinge. Doors with width over 610mm (24") to have continuous aluminum piano hinge with exposed knuckle, set to open to 180 degrees.
  - .5 Insulation: 19mm (3/4") Type 3 Expanded Polystyrene (EPS) Foil Lined Insulation, with a 3.18 R Value.
  - .6 Gasket: 3mm (1/8") x 9.5mm (3/8") closed cell neoprene gasketing.
  - .7 Standard Latch: Screwdriver operated cam latch.
  - .8 Finish: Mill finish.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION**

- .1 Comply with manufacturer's written instructions for installing access doors and frames.

**3.3 ADJUSTING**

- .1 Adjust doors and hardware, after installation, for proper operation.

**NMS 083613 – SECTIONAL DOORS**

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Special Provision

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 07 92 00 – Joint Sealant.
- .3 Section 08 71 00 – Finish Hardware.

**1.2 REFERENCES**

- .1 ASTM A653/653M -00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .2 ASTM A1008/A1008M-00 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .3 ASTM D523-89(R1999) Standard Test Method for Specular Gloss.
- .4 ASTM D822-96 Standard Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- .5 CAN/CGSB-1.105-M91, Quick-Drying Primer.
- .6 CAN/CGSB-1.181-M92, Ready-Mixed Organic Zinc-Rich Coating.
- .7 CAN/CGSB-1.213-95, Etch Primer (Pretreatment Coating) For Steel and Aluminum.
- .8 CAN/CSA S16.1-94(R2000), Limited Steel Design of Steel Structures.
- .9 CSA G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.3 DESIGN CRITERIA**

- .1 Design exterior door assembly to withstand wind load as specified in the latest adopted version of the Ontario Building Code with a maximum horizontal deflection of 1/240 of

opening width.

- .2 Design door panel assemblies with thermal insulation factor 2.84 RSI (R-16.4).
- .3 Steel door sections, stiles, back panels and tracks to meet ASTM A653/653M.
- .4 Door assembly to withstand minimum 200,000 door cycles or 10 years, when service/replacement program has been performed.

#### **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Division 1.
- .2 Indicate materials, operating mechanisms, required clearances and electrical connections.

#### **1.5 MAINTENANCE DATA**

- .1 Provide operation and maintenance data for overhead door hardware for incorporation into manual specified in Division 1.

#### **1.6 MAINTENANCE MATERIALS SPECIAL TOOLS AND SPARE PARTS**

- .1 Provide one complete replacement set of the following components for each sectional door size:
  - .1 Cable: multi-strand galvanized steel aircraft cable.
  - .2 Rollers: fill floating grease packed hardened steel, ball bearing 73 mm (2 7/8") diameter solid steel tire.
  - .3 Springs
  - .4 Bulb type extruded neoprene weatherstrip for door sill section, full width.
  - .5 Weatherstrip for jambs and head, to manufacturer's standard.
- .2 Store where directed. Identify each part and reference to appropriate overhead door.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Galvanized steel sheet: commercial quality to ASTM A653/653M with Z275 zinc coating.
- .2 Steel sheet: commercial quality to ASTM A1008/A1008M unexposed (U), exposed(E), with baked enamel finish.
- .3 Primer: Acceptable manufacturer's standard.
- .4 Insulation: Polyurethane foam, CFC-11 free to meet above design criteria (R-16.4).
- .5 Glazing: manufacturer's standard acrylic panels in rubber gaskets, where scheduled.
- .6 Cable: multi-strand galvanized steel aircraft cable.

#### **2.2 DOORS**

- .1 Fabricated 44 mm (1.73") thickness high strength aluminum profiles, solid insulated aluminum frame construction for bottom panels, scratch resistance acrylic double glass, double sealed for infills glazing. Flush exterior face, thermally broken, weatherstrip and weatherseal.
- .2 Use shop and field connections complying with CAN/CSA S16.1.

- .3 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self-tapping screws to manufacturer's recommendations.
- .4 Apply shop coat of primer after fabrication of door. Fabricate doors from manufacturer's standard prepainted steel stock. Colour white.
- .5 Acceptable products:
  - .1 Assa Abloy OH1042F by Assa Abloy.
  - .2 Contract administrator approved equivalent.

### **2.3 HEAVY DUTY INDUSTRIAL HARDWARE**

- .1 Track: hardware with 75 mm (3") size 3.1 mm (11 ga) core thickness Galvanized Steel track for torsion spring lifting and include ancillary hardware items.
- .2 Rollers: full floating grease packed hardened steel, ball bearing 73 mm (2 7/8") diameter solid steel tire.
- .3 Roller brackets: adjustable, minimum 3.1 mm (11 ga) galvanized steel.
- .4 Double end style hinges and rollers with continuous track angles.
- .5 Shaft and Spring: solid steel keyed shaft with 100,000 door cycles counter balancing springs.
- .6 Cable: galvanized steel aircraft cable.
- .7 Slide Locks in track surface mounted on door.
- .8 Track guards.
- .9 Chain Hoist.

### **2.4 ACCESSORIES**

- .1 Bumper leaf springs.
- .2 Bulb type extruded neoprene weatherstrip for door sill section, full width.
- .3 Weatherstrip for jambs and head, to manufacturer's standard.
- .4 Finish ferrous hardware items with minimum zinc coating of 300 g/m<sup>2</sup> to CAN/CSA-G164.

### **2.5 POWER OPERATOR**

- .1 Electrical jack shaft side mounted type operator: operator to include motors, speed reducers with all gears running in oil, sheaves, racks, levers, cables and brake, disconnect switches, reversing starters, controls and all conduit and wiring to make all connections required for a complete installation.
- .2 Provide operator with floor level disconnect device to allow for manual operation in event of power failure. Equip operator with electrical interlock switch to disconnect power to operator when in manual operation and built in chain hoist for operation in power failure.
- .3 Electrical motors, controller units, remote push button stations, relays and other electrical components: to CSA approval with CSA enclosure type 1.
- .4 Photo sensors and timer: UL approved, self-monitoring operator to open door when object is sensed and a timer to close function to close door at a programmable time from 5 seconds to 1 hour.

- .5 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming into contact with object on closing cycle.
- .6 Door speed: 300mm per second.
- .7 Control Transformer: for 24 V AC control voltage.
- .8 Acceptable Products:
  - .1 Richard-Wilcox, Dyna-Hoist DC750-100 Direct Drive.
  - .2 Contract administrator approved equivalent.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install doors and hardware to manufacturers' recommendations.
- .2 Touch-up steel doors with primer where galvanized finish damaged during fabrication.
- .3 Lubricate springs and adjust door operating components to ensure smooth opening and closing of doors.
- .4 Adjust weatherstripping to form a weathertight seal.

### **NMS 085113 – ALUMINUM WINDOWS**

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#### Special Provision

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### **Part 1 General**

#### **1.1 RELATED SECTIONS**

- .1 Section 06 10 11 – Rough Carpentry.
- .2 Section 07 21 29 – Sprayed Insulation.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 07 27 00 – Air Barriers.
- .5 Section 08 81 00 – Glazing.

#### **1.2 REFERENCES**

- .1 AA (Aluminum Association) DAF 45 1980 Designation System For Aluminum Finishes.
- .2 ANSI/ASTM E330-97e1 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- .3 ASTM C542-94(1999) Specification for Lock-Strip Gaskets.
- .4 ASTM D2240-00 Test Method for Rubber Property - Durometer Hardness.
- .5 ASTM E84-00a Test Method for Surface Burning Characteristics of Building Materials.
- .6 CAN4-S106-1980(R1985) Fire Tests of Window and Glass Block Assemblies.
- .7 CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.

- .8 CAN/CGSB-12.2-M76 Glass, Sheet, Flat, Clear.
- .9 CAN/CGSB-12.3-M76 Glass, Polished Plate or Float, Flat, Clear.
- .10 CAN/CGSB-12.4-M76 Glass, Heat Absorbing.
- .11 CAN/CGSB-12.8-M76 Insulating Glass Units.
- .12 CAN/CGSB-12.10-M76 Glass, Light and Heat Reflecting.
- .13 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.
- .14 CAN/CSA-Z91-M91 Safety Code for Window Cleaning Operations.
- .15 CSA A440 Series -98 Windows.
- .16 Flat Glass Manufacturers Association (FGMA) Glazing Manual.
- .17 Laminators Safety Glass Association Standards Manual.

### **1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Division 1.
- .2 Clearly indicate materials and large scale details for head, jamb and sill, profiles of components, elevations of unit, anchorage details, glazing details, glass specifications, location of isolation coating, description of related components and fasteners and specifications for all exposed finishes.

### **1.4 TEST REPORTS**

- .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
  - .1 Windows classifications.
  - .2 Finish, weathering characteristics wood preservative.
  - .3 Air tightness.
  - .4 Water tightness.
  - .5 Wind load resistance.
  - .6 Condensation resistance.
  - .7 Sash strength and stiffness.
  - .8 Forced entry resistance.

### **1.5 MAINTENANCE DATA**

- .1 Provide maintenance data for cleaning and maintenance of aluminum windows for incorporation into maintenance manual specified in Division 1.

### **1.6 WARRANTY**

- .1 Provide a warranty against leakage, defects and malfunction under normal usage in accordance with GC24, but for five years. Provide a 10 year warranty on manufacturer's standard insulating glass units.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Materials: to CSA A440 supplemented as follows:
  - .1 Main frame: extruded aluminum sash, thermally broken.

- .2 Glass: See Section 08 81 00 - Glazing for glass material specifications.
- .3 Exterior aluminum sills: extruded aluminum brake formed aluminum sheet metal of type and size as detailed; minimum 3 mm (1/8") thick, complete with joint covers, jamb drip deflectors, chairs, anchors and anchoring devices.
- .4 Isolation coating: alkali resistant bituminous paint.
- .5 Sealants: multi-component urethane to CAN/CGSB-19.24, coloured to match framing. See also Section 07 92 00 – Joint Sealers.
- .6 Fasteners: Aluminum or stainless steel for aluminum to aluminum contact, stainless steel for aluminum to steel contact.

## **2.2 WINDOW TYPES, SIZES AND CLASSIFICATION**

- .1 Type 1 – Fixed and operable sash window:
  - .1 Extruded aluminum, thermally broken, interior applied stops, anodized factory finished on interior and exterior exposed surfaces, glazed with insulating glass units.
  - .2 Acceptable Products:
    - .1 Kawneer 5500 Fixed window.
    - .2 Contract administrator approved equivalent.

## **2.3 CLASSIFICATION RATING:**

- .1 All windows in this Section must meet the following classification ratings when tested in accordance with CSA A440.
- .2 Air leakage: A3
- .3 Water leakage: B7
- .4 Wind load resistance: C5
- .5 Condensation resistance: Temperature Index, I-58
- .6 Forced Entry: F2
- .7 Glazing: see Schedule in Part 3 of Section 08 81 00 – Glazing.

## **2.4 FABRICATION**

- .1 Fabricate in accordance with CSA A440 supplemented as follows:
  - .1 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm (1/16") for units with a diagonal measurement of 1800 mm (72") or less and plus or minus 3 mm (1/8") for units with a diagonal measurement over 1800 mm (72").
  - .2 Face dimensions detailed are maximum permissible sizes.
  - .3 Brace frames to maintain squareness and rigidity during shipment and installation.
  - .4 Finish steel clips and reinforcement with shop coat primer to CAN/CGSB-1.40.

## **2.5 ALUMINUM FINISHES**

- .1 Finish exposed areas of aluminum components in accordance with Aluminum Association or with manufacturer's finishes, designation where specifically called for Designation System for Aluminum Finishes.
- .2 Anodized Finishes:
  - .1 Clear anodized.
- .3 Aluminum sills: Clear anodized.

## **2.6 ISOLATION COATING**

- .1 Isolate aluminum from dissimilar metals except stainless steel, zinc, concrete, mortar, masonry, and wood, by means of isolation coating.

## **2.7 GLAZING**

- .1 Glaze windows in accordance with CSA A440.
- .2 Site glaze windows with glass types as indicated on the Drawings and as specified in Section 08 81 00 Glass Glazing.

## **2.8 AIR BARRIER AND VAPOUR BARRIER**

- .1 Equip window frames with factory installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:
  - .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
  - .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

## **Part 3 Execution**

### **3.1 WINDOW FRAME INSTALLATION**

- .1 Install in accordance with CSA A440.
- .2 Arrange components to prevent abrupt variation in colour.
- .3 Windows installed in the Air Barrier system to comply with CSA A440 and A440.1.

### **3.2 ALUMINUM SILL INSTALLATION**

- .1 Install extruded aluminum sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.
- .2 Cut sills to fit window opening.
- .3 Secure sills in place with anchoring devices located at ends and at joints of continuous sills and evenly spaced 600 mm (24") oc in between.
- .4 Fasten expansion joint cover plates and drip deflectors where required with self tapping stainless steel screws.
- .5 Maintain 6 to 9 mm (approx 1/4" to 3/8") space between butt ends of continuous sills. For sills over 1200 mm (48") in length, maintain 3 to 6 mm (1/8" to 1/4") space at each end.

### **3.3 CAULKING**

- .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 Joint Sealants. Conceal sealant within aluminum work except where exposed use is permitted by the Contract Administrator.

## **NMS 087100 – FINISH HARDWARE**

## **Part 1 General**

### **1.1 REFERENCE STANDARDS**

- .1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Door and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

### **1.2 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 Use ULC listed and labelled hardware for doors in fire separations and exit doors.

### **1.3 HARDWARE SCHEDULE**

- .1 A detailed Hardware Schedule shall be prepared and submitted to the Contract Administrator by the Contractor's hardware supplier following the award of Contract, for the Contract Administrator's approval.
- .2 Clearly indicate manufacturer's name, catalogue identification description, purpose, location and finish for each item.
- .3 Upon review and acceptance of the detailed Hardware Schedule, the list shall be tendered among three approved suppliers by the General Contractor, with the award of sub-contract to the lowest bidder.

### **1.4 TEMPLATES**

- .1 Upon award of the Contract, furnish promptly to applicable trades any patterns, templates, template information and manufacturer's literature required for proper preparation for and application of hardware, in ample time to facilitate the progress of work.

### **1.5 DELIVERY AND STORAGE**

- .1 Store hardware in locked, clean and dry area. Maintain inventory list with Hardware Schedule.
- .2 Package each item of hardware separately or in like groups of hardware, and label each package as to item definition and location.

### **1.6 MAINTENANCE DATA**

- .1 Provide maintenance data, parts list, and manufacturer's instructions for door closers, locksets, door holders, and panic devices for incorporation into maintenance manual specified in General Requirements.
- .2 Brief maintenance staff regarding proper care of hardware including cleaning, and general maintenance.

### **1.7 MAINTENANCE MATERIALS**

- .1 Provide two sets of wrenches for door closers and locksets. Include keys for panic devices with dogging feature.

## **Part 2 Products**

### **2.1 QUALITY**

- .1 In every case, hardware shall be of quality, design and finish suitable for purpose to which it is intended, to the complete satisfaction of the Contract Administrator.

## **2.2 FINISHES**

- .1 Type and finish of hardware shall be in accordance with, and equal in all respects, to samples of hardware and finishes approved by the Contract Administrator.
- .2 Metal finishes shall be free from defects, clean and unstained, and of uniform colour and finish for each type of finish required.

## **2.3 FASTENINGS**

- .1 Hardware shall be complete with screws, bolts, expansion shields and other fastening devices as required for satisfactory installation and operation of hardware.
- .2 Fastening devices shall be of same finish as hardware which is to be fastened.
- .3 Use countersunk oval head screws for fastening push, pull and kickplates.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

## **2.4 KEYING**

- .1 Lay out keying system in consultation with the Owner. Keying system shall include keying alike, keying differently, keying in groups, submaster keying and grand master keying locks as necessary to meet the requirements of the Owner.
- .2 Keying chart and related explanatory data shall be prepared and submitted to the Owner for approval, and lock work shall not be commenced until written confirmation of keying arrangements is received from the Owner.
- .3 Provide keys in duplicate for every lock.
- .4 Provide three masterkeys for each MK or GMK group.
- .5 Stamp keying code numbers on keys and cylinders.
- .6 Provide cabinet for key control with two tag security system complete with key loan register, three-way cross reference index, and cabinet door locking device.

## **2.5 CONSTRUCTION CYLINDER CORES**

- .1 All locks shall be operated by a construction master key in construction cylinder cores while the building is under construction, but shall not operate when the temporary construction cores are replaced with permanent master keyed cylinders at completion of the building.

## **2.6 HARDWARE ITEMS**

- .1 Hinges: 5 knuckle, ball bearing, stainless steel, 114 mm x 102 mm. Exterior outswinging doors to have non-removable pins. Stanley or Consultant Approved equivalent.
- .2 Locksets: Standard duty, lever lock, cylindrical design meeting standard ANSI A156.2, 1996, Series 4000, Grade 2, ULC listed for all functions up to 3 hours. Schlage AL series or Consultant Approved equivalent.
- .3 Closers: Surface mounted, universal, heavy duty, fully adjustable, multi-sized, with cover,

meeting barrier - free requirements. Norton series 7500 or Consultant Approved equivalent.

- .4 Door Stops: Wall mounted, half dome design, stainless steel with rubber cushion, concealed fasteners.
- .5 Thresholds: Mill finished aluminum, extruded shape, with bevelled edges, thermally broken, to full width of opening, minimum 127 mm wide. CT-75, K.N. Crowder or Consultant Approved equivalent.
- .6 Weatherstripping: Extruded aluminum with neoprene rubber, K.N. Crowder W12 or Consultant Approved equivalent.
- .7 Door Sweep: Extruded aluminum, anodized finish, with 25 mm nylon brush, K.N. Crowder W24S or Consultant Approved equivalent.
- .8 Exit Device: Dor-O-Matic Model 1594, rim mounted, with exterior pull and night latch cylinder, satin nickel finish.
- .9 Door Push/Pulls: Kawneer "Architects Classic", mounted back-to-back on doors, or Consultant Approved equivalent.
- .10 Automatic Entrance: Stanley Magic Swing electric operator, surface mounted with concealed internal wiring, jamb mounted push plate controls, two per operator, adjustable time delay, adjustable force closer, internal controller, 120 V, 1/4 hp gear drive, in anodized clear aluminum finish.
- .11 Top and Bottom Flush Bolt: Manual Flush Bolts, Ives FB48 or Consultant Approved equivalent.
- .12 Barrier free washroom installations: Provide integrated automatic power operator system complete with "Push to Lock" and "Push to Exit" pads illuminated with red and green halo lighting on the interior and "Push to Enter" on the exterior of the room, that will indicate when the room is occupied, and when is not. Include electric strikes and interconnection with operator to prevent operation when locked. Provide visual and audible alarm operated by a button within the washroom to alert staff to an emergency that will also unlock the door.

### **Part 3            Execution**

#### **3.1            INSTALLATION**

- .1 Carefully follow manufacturer's instructions for installation of finish hardware.
- .2 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .3 Hardware for access doors provided for the handicapped, and mounting heights, to conform with Code requirements for Barrier Free Design.
- .4 Use butts with non-removable pins on exterior outswinging doors.

#### **3.2            HARDWARE SET SCHEDULE**

- .1 Set 01:
  - .1 3 – NRP Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Storeroom Function
  - .4 1 – Closer
  - .5 1 – OH Stop
  - .6 1 – Weatherstripping

- .7 1 – Threshold
- .8 1 – Door Sweep
- .9 2 – Kickplates
- .10 1 – Strike Latch Guard
- .11 1 – Electric Strike (Refer to Electrical)
- .12 1 – Punch Pad and Key Lock (Refer to Electrical)
  
- .2 Set 02:
  - .1 3 – NRP Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Storeroom Function
  - .4 1 – Weatherstripping
  - .5 1 – Threshold
  - .6 1 – Door sweep
  - .7 2 – Kickplates
  - .8 1 – Strike Latch Guard
  - .9 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
  - .10 1 – Electric Strike (Refer to Electrical)
  - .11 1 – Punch Pad and Key Lock (Refer to Electrical)
  
- .3 Set 03:
  - .1 3 – NRP Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Storeroom Function
  - .4 1 – Closer
  - .5 1 – OH Stop
  - .6 1 – Weatherstripping
  - .7 1 – Threshold
  - .8 1 – Door Sweep
  - .9 2 – Kickplates
  - .10 1 – Strike Latch Guard
  - .11 1 – Electric Strike (Refer to Electrical)
  - .12 1 – Punch Pad and Key Lock (Refer to Electrical)
  
- .4 Set 04:
  - .1 6 – Hinges
  - .2 1 – Construction Core
  - .2 1 – Lever Lockset, Entry Function (RH Leaf)
  - .3 1 – Top and Bottom Flush Bolts, Concealed
  - .4 1 – Closer
  - .5 2 – OH Stop
  - .6 4 – Kick Plates
  
- .5 Set 05:
  - .1 3 – Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Entry Function
  - .4 1 – Closer
  - .5 1 – OH Stop
  - .6 2 – Kickplates
  
- .6 Set 06:
  - .1 3 – Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Privacy Function
  - .4 1 – Closer
  - .5 1 – OH Stop
  - .6 2 – Kickplates

- .7 Set 07:
  - .1 3 – Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset, Storeroom Function
  - .4 2 – Kickplates
  - .5 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
  - .6 1 – Electric Strike (Refer to Electrical)
  - .7 1 – Universal Washroom Kit
- .8 Set 08:
  - .1 3 – Hinges
  - .2 1 – Lever Lockset, Passage Function
  - .3 1 – Closer
  - .4 1 – Floor Stop
  - .5 2 – Kick Plates
- .9 Set 09:
  - .1 3 – Hinges
  - .2 1 – Lever Lockset, Office Function
  - .3 1 – Floor Stop
  - .3 2 – Kickplates
- .10 Set 10:
  - .1 3 – Hinges
  - .2 1 – Construction Core
  - .3 1 – Lever Lockset
  - .4 2 – Kickplates
  - .5 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
  - .6 1 – Electric Strike (Refer to Electrical)

### 3.3 KEYING SCHEDULE

- .1 Keyset 1 – Doors w/ Access Control:
  - .1 Door Numbers: 103-1, 108-1, 111-1, 111-2, 112-1, 112-2, 300-3
- .2 Keyset 2 – Offices:
  - .1 Door Numbers: 109-1, 110-1
- .3 Keyset 3 – Service Spaces:
  - .1 Door Numbers: 100-1, 101-1, 102-1

### **NMS 088100 – GLAZING**

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Special Provision

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### **Part 1 General**

#### **1.1 RELATED SECTIONS**

- .1 Section 08 11 13 – Hollow Metal Doors.
- .2 Section 08 11 16 – Aluminum Doors, Frames & Screens.
- .3 Section 08 51 13 – Aluminum Windows.

## **1.2 REFERENCES**

- .1 ANSI/ASTM E330-97e1, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- .2 ASTM C542-94(1999) Standard Specification for Lock-Strip Gaskets.
- .3 ASTM D1003 00 Standard Test Method for Haze and Luminous Transmittance of Plastics.
- .4 ASTM D1929-96 Standard Test Method for Ignition Properties of Plastics.
- .5 ASTM D2240-00 Standard Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E84-00a Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM F1233-98 Standard Test Method for Security Glazing Materials and Systems.
- .8 CAN4-S106-1980(R1985) Fire Test of Window and Glass Block Assemblies.
- .9 CAN/CGSB-12.1M90 Tempered or Laminated Safety Glass.
- .10 CAN/CGSB-12.2-M91 Flat, Clear Sheet Glass.
- .11 CAN/CGSB-12.3-M91 Flat, Clear Float Glass.
- .12 CAN/CGSB-12.4-M91 Heat Absorbing Glass.
- .13 CAN/CGSB-12.5M86 Mirrors, Silvered.
- .24 CAN/CGSB-12.8-M90 Insulating Glass Units.
- .15 CAN/CGSB-12.9-M91 Spandrel Glass.
- .16 CAN/CGSB-12.10-M76 Glass, Light and Heat Reflecting.
- .17 Flat Glass Manufacturers Association (FGMA) Glazing Manual.
- .18 IGMAC Insulated Glass Manufacturers' Association of Canada.
- .19 Laminators Safety Glass Association Standards Manual.

## **1.3 WORK INCLUDED**

- .1 Glass and glazing of interior and exterior:
  - .1 Aluminum entrance doors.
  - .2 Hollow metal and wood doors.
  - .3 Exterior aluminum windows.
- .2 See Schedule in Part 3 of this Section.

## **1.4 SAMPLES**

- .1 Submit duplicate 300 x 300mm (12" x 12") size samples of glass and related sealant material, in accordance with Section 01 33 00 – Submittal Procedures.

## **1.5 DESIGN AND PERFORMANCE REQUIREMENTS**

- .1 Where glazing is provided by the door or window manufacturer, he is responsible for determining glass thicknesses of exterior windows. Base design on local positive and

negative wind loads. In all other instances, the glass supplier is responsible.

- .2 Thicknesses of individual panes of glass in this specification are the minimum acceptable.
- .3 Safety glass shall comply with the safety glazing requirements of the Hazardous Products Act and the OBC.
- .4 Where glazing is used in fire related window assemblies, ratings are to be determined from test results of CAN4-S106.

## **1.6 MANUFACTURERS**

- .1 All gasketing materials and glazing sealants shall be supplied and installed by a single manufacturer in order to ensure material compatibility. Glazing sealants manufacturer shall certify compatibility of their products with the perimeter seal of Insulating Glass Units specified.

## **1.7 ENVIRONMENTAL CONDITIONS**

- .1 Glazing to be undertaken at temperatures recommended by the manufacturer of the glazing materials.

## **1.8 QUALIFICATIONS**

- .1 Double Insulating Glass Units shall comply with the recommendations of the Insulated Glass Manufacturers Association of Canada (IGMAC).

## **1.9 WARRANTY**

- .1 The Contractor shall warrant the Insulating Glass Units against failure of the seal of enclosed air space and deposits on inner faces of glass detrimental to vision in accordance with GC 12.3 - Warranty, but for five (5) years.

## **Part 2 Products**

### **2.1 GLASS MATERIALS**

- .1 The following are single sheet glass material descriptions. Not all material listed is applicable to this project. For glass types used, as well as multi-layered applications and assemblies, see Schedule in Part 3 of this section.
  - .1 Sheet Glass: to CAN/CGSB-12.2, AA quality; thickness as indicated.
  - .2 Float Glass: to CAN/CGSB-12.3, glazing quality, thickness as indicated.
  - .3 Fire Rated Glass (clear): ceramic construction, 5 mm (3/16") thick, clear, polished.  
Acceptable products:
    - .4 FireLite Premium by Technical Glass Products, Toronto, Ontario.
    - .5 Safety Glass, Laminated: to CAN/CGSB-12.1, Type 1, Class B. Thickness to be determined from the Performance Requirements of this Section.
    - .6 Safety Glass, Tempered: to CAN/CGSB-12.1, Type 2, Class B. Thickness to be determined from the Performance Requirements of this Section.
    - .7 Safety Glass, Double Insulating Units: to CAN/CGSB-12.8. All safety insulating glass units to incorporate Low-E Glass and an argon gas filled air space.
    - .8 Heat Absorbing (standard tinted) Float Glass: to CAN/CGSB-12.4, Class A, B, C or D, Tint to be selected by the Contract Administrator, thickness as indicated.
    - .9 Heat Absorbing (hi-performance tinted) Float Glass: to CAN/CGSB-12.4, Class A, B, C or D, Tint to be selected by the Contract Administrator, thickness as indicated.
    - .10 Heat Reflecting (Low-E coated) Glass: to CAN/CGSB-12.10, clear or tinted glass with a low emissivity coating on one surface, Class A, B, C or D, used only in insulated sealed units.
    - .11 Double Light Reflecting (coated) Glass: to CAN/CGSB-12.10, clear or tinted glass with a reflective coating applied Insulating glass units: to CAN/CGSB-12.8,

incorporating two of glass types specified above and a hermetically sealed air space. All non-safety insulating glass units to incorporate Low-E Glass and an argon gas filled air space.

- .12 Mirrors: to CAN/CGSB-12.5, silvered, Type 1A (float), 6 mm (1/4") thick, unframed, ground and polished edges, supported with tamperproof concealed fasteners. Size of mirrors to be as indicated. Jobsite measure prior to installation to ensure a maximum 12.7 mm (1/2") clearance around the perimeter at adjacent walls.
- .13 Heat strengthened laminated safety glass for all openings requiring structural guards.

## **2.2 GLAZING AND SEALING COMPOUND MATERIALS**

- .1 Use glass manufacturer's recommended glazing tapes, setting blocks, spacer shims, compression gaskets, primer-sealers and cleaners purpose made for use with specified glass products.

## **2.3 PRIVACY FILM**

- .1 See Section 08 87 00 – Window Films

# **Part 3 Execution**

## **3.1 WORKMANSHIP**

- .1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.
- .2 Inspect all sash prior to glazing to ensure the opening is square, plumb and secure in order that uniform face and edge clearances are maintained. If any butt or mitre joints are open, seal with Type A sealant compound prior to glazing.
- .3 Apply primer-sealer to all contact surfaces.
- .4 Place glazing tapes, toe bead sealants and setting blocks as per manufacturer's instructions.
- .5 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.
- .6 Install removable stops, without displacing tape or sealant.
- .7 Provide edge clearance as recommended by the glass manufacturer but in no case less than 3mm (1/8").
- .8 Insert spacer shims to center glass in space. Place shims at 600 mm (24") oc and keep 6.5mm (1/4") below sight line.
- .9 Apply bead sealants to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.
- .10 Do not cut or abrade tempered, heat treated, or coated glass.

## **3.2 GLAZING OF EXTERIOR OPENINGS**

- .1 Follow glass and window frame manufacturer's recommendations and instructions for proper use of specialized glazing products and installation methods for glass installation for each application on this project.
- .2 Aluminum punched and strip windows to be glazed on site unless otherwise indicated.
- .3 Aluminum entrance doors to be factory glazed.

## **3.3 FINISHING**

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels

after work is completed.

**3.4 SCHEDULE - SEE DRAWINGS FOR LOCATIONS.**

- .1 Type G-1: single unit, fire rated glass, minimum 6.5mm (¼") thick.
- .2 Type G-2: single unit, safety glass, clear, tempered.
- .3 Type G-3: sealed insulating unit, with an exterior layer of 6mm (¼") thick tinted float, a sealed air space and an interior layer of clear float glass. Provide low E coatings on inside glass surfaces, argon gas filled cavity and high performance spacer. Total thickness of unit 25.4mm (1"). Grey tinted glass colour. Solarban 70XL or approved equal.
- .4 Type G-4: sealed insulating unit, clear tempered float glass both layers; PPG Twindow or HIS equivalent.

**NMS 088700 – WINDOW FILM**

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Special Provision

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**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 ASTM D 1004 – Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
- .2 ASTM D 1044 – Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
- .3 ASTM D 5895 – Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
- .4 ASTM E 84 – Standard Method of Test for Surface Burning Characteristics of Building Materials.

**1.2 PERFORMANCE REQUIREMENTS**

- .1 Tear Resistance:
  - .1 Minimum Graves Area Tear Strength of 1,000 lbs% as measured on coated film product, without liner, per ASTM D1004.
- .2 Adhesion to Glass:
  - .1 Minimum 8 lbs/in peel strength per ASTM D3330 (Method A).
- .3 Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
  - .1 Flame Spread Index: no greater than 25.
  - .2 Smoke Developed Index: no greater than 55.
- .4 Abrasion Resistance:
  - .1 Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to

**1.3 SUBMITTALS**

- .1 Submit under provisions of Section 01 30 00.

- .2 Product Data: Manufacturer's current technical literature on each product to be used, including:
  - .1 Manufacturer's Data Sheets.
  - .2 Preparation instructions and recommendations.
  - .3 Storage and handling requirements and recommendations.
  - .4 Installation methods.
- .3 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.
  - .1 Flammability Testing, ASTM E84.
  - .2 Film Properties Testing, ASTM D882.
  - .3 Abrasion Resistance Testing, ASTM D1044.
  - .4 Peel Strength Testing, ASTM D3330.
  - .5 Tear Resistance Testing, ASTM D1004.
- .4 Verification Samples: For each film specified, two samples representing actual film color and pattern.
- .5 Performance Submittals: Provide laboratory data of emissivity and calculated window UFactors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

#### **1.4 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
  - .1 Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
- .2 Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
  - .1 Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
- .3 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - .1 Finish areas designated by Architect.
  - .2 Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - .3 Refinish mock-up area as required to produce acceptable work.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Follow Manufacturer's instructions for storage and handling.
- .2 Store products in manufacturer's unopened packaging until ready for installation.
- .3 Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

#### **1.6 PROJECT CONDITIONS**

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

#### **1.7 WARRANTY**

- .1 At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
- .2 In order to validate warranty, installation must be performed by an Authorized dealer and according to Manufacturer's installation instructions. Verification of Authorized dealer can be confirmed by submission of active dealer code number.

## **Part 2 Products**

### **2.1 MANUFACTURERS**

- .1 Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241; Email: request info (jrice3@mmm.com);  
Web: [http://www.3m.com/3M/en\\_US/architectural-designus/?utm\\_medium=redirect&utm\\_source=vanityurl&utm\\_campaign=www.3M.com/AMD](http://www.3m.com/3M/en_US/architectural-designus/?utm_medium=redirect&utm_source=vanityurl&utm_campaign=www.3M.com/AMD) | [http://www.3m.com/3M/en\\_US/building-windowsolutions-us](http://www.3m.com/3M/en_US/building-windowsolutions-us)
- .2 Substitutions: As Approved by contract administrator.

### **2.2 ARCHITECTURAL FINISH FILMS**

- .1 Architectural Finish Films: 3M CRYSTAL Glass Finishes as manufactured by 3M Company - Commercial Solutions.
  - .1 Material Properties:
    - .1 General: Glass finishes field-applied application to glass or plastic material as visual opaque or decorative film.
    - .2 Film: Vinyl.
    - .3 Option to Electrocut (by other than Manufacturer).
    - .4 Adhesive: Acrylic, Pressure Sensitive, Permanent.
    - .5 Liner: Silicone-coated Polyester.
    - .6 Thickness (Film and Adhesive without Liner):
      - .1 Dusted - 3.2 mils (81 microns).
      - .2 Frosted - 4.7 mils (120 microns).
    - .7 Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:
      - .1 Flame Spread: 25 maximum.
      - .2 Smoke Developed: 450 maximum.
  - .2 Optical Performance:
    - .1 CRYSTAL Dusted Decorative / Privacy Glazing Film:
      - .1 Ultraviolet Transmittance (ASTM E 903): 27 percent.
      - .2 Visible Light Transmittance (ASTM E 903, ASTM E308): 85 percent.
      - .3 Visible Light Reflectance (ASTM E 903): 79 percent.
      - .4 Solar Heat Transmittance: 76 percent.
      - .5 Solar Heat Reflectance: 7 percent.
      - .6 Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.93.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Film Examination:
  - .1 If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
    - .1 Glass surfaces receiving new film should first be examined to verify that they

are free from defects and imperfections, which will affect the final appearance.

- .2 Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
- .3 Commencement of installation constitutes acceptance of conditions.

### **3.2 PREPARATION**

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

### **3.3 INSTALLATION**

- .1 Film Installation, General:
  - .1 Install in accordance with manufacturer's instructions.
  - .2 Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
  - .3 Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
  - .4 Apply film to glass and lightly spray film with slip solution.
  - .5 Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
  - .6 Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
  - .7 Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
  - .8 If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

### **3.4 CLEANING AND PROTECTION**

- .1 Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.
- .3 After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

### **NMS DIVISION 9 SPECIFICATIONS**

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Special Provision (Page 1, Addendum 1)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 9 National Master Specifications are included in this Contract.

**NMS 092216.13 – NON-STRUCTURAL METAL STUD FRAMING**

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Special Provision

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 09 29 00: Gypsum board.

**1.2 REFERENCES**

- .1 ASTM C645-00 Standard Specification for Nonstructural Steel Framing Members.
- .2 CAN/CGSB-1.210-93, Quick Drying Alkyd Primer for Structural Steel.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Non-load bearing Standard Channel Stud Framing:
  - .1 Fabricate to ASTM C645, stud size as required for wall thicknesses indicated on the Wall Schedule, roll formed from standard duty 0.53 mm (.021") (25ga) thickness electro-galvanized steel sheet; for screw attachment of gypsum board. Knock-out service holes at 460 mm (18") centres or to manufacturer's standard.
  - .2 Provide heavy gauge 0.914 mm (0.036") (20 ga) thickness studs where requirements.
  - .3 Floor and ceiling tracks: to ASTM C645 in widths to suit stud sizes, 32 mm (1 1/4") flange height.
  - .4 Provide special "C-H" shaped steel studs for shaft wall systems as indicated on the Drawings.
  - .5 Provide deflection track at all walls that extend to underside of roof deck.

**2.2 ACCESSORIES**

- .1 Metal channel stiffener: 40 mm (1 5/8") size, 1.4 mm (0.06") thick cold rolled steel, coated with rust inhibitive coating.

**Part 3 Execution**

**3.1 ERECTION**

- .1 Align partition tracks at floor and ceiling or underside of structure and secure at 600 mm (24") oc maximum.
- .2 Install dampproof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at 400 mm (16") oc and not more than 50 mm (2") from abutting walls, and at each side of openings and corners.
- .4 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to bottom and ceiling tracks using screws.

- .7 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .9 Provide two studs or heavy gauge single jamb studs extending from floor to ceiling at each side of opening wider than stud centres specified. Secure studs together using column clips or other approved means.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets and access panels on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40 mm (1 5/8") stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to u/s structure except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs where there is potential for deflection in order to avoid transmission of structural loads to studs.

## **NMS 092900 – GYPSUM BOARD**

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### Special Provision

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## **Part 1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 06 10 11 – Rough Carpentry.
- .2 Section 07 21 16 – Blanket Insulation.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 09 22 16.13 – Non-Structural Metal Stud Framing.

### **1.2 REFERENCES**

- .1 **Canadian General Standards Board (CGSB)**
  - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .2 **Underwriters Laboratories of Canada (ULC)**
  - .1 CAN/ULC-S102-1988, Surface Burning Characteristics of Building Materials and Assemblies.

- .3 **American Society for Testing and Materials (ASTM)**
- .1 ASTM A653/A653M-00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM C36/C36M-99e1 Standard Specification for Gypsum Wallboard.
  - .3 ASTM C79/C79M-00 Standard Specification for Gypsum Sheathing Board.
  - .4 ASTM C442/C442M-99a Standard Specification for Gypsum Backing Board, Gypsum Coreboard and Gypsum Shaftliner Board.
  - .5 ASTM C475-94 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .6 ASTM C514-96 Standard Specification for Nails for the Application of Gypsum Board.
  - .7 ASTM C630/630M-00 Standard Specification for Water-Resistant Gypsum Backing Board.
  - .8 ASTM C645-00 Standard Specification for Nonstructural Steel Framing Members.
  - .9 ASTM C840-99a Standard Specification and Finishing of Gypsum Board.
  - .10 ASTM C954-00 Standard Specification for Steel Drill Screws for the Application of Gypsum Board.
  - .11 ASTM C960/C960M-97 Standard Specification for Predecorated Gypsum Board.
  - .12 ASTM C1002-00 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .13 ASTM C1047-99 Accessories for Gypsum Wallboard and Gypsum Veneer.
  - .14 ASTM C1280-99 Standard Specification for Application of Gypsum Sheathing Board.
  - .15 ASTM C1178C1178M-99 Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel.

### **1.3 ENVIRONMENTAL REQUIREMENTS**

- .1 Maintain temperature minimum 10°C, maximum 21°C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.

## **Part 2 Products**

### **2.1 GYPSUM AND CEMENT BOARDS**

- .1 Gypsum board products are listed following. Where thicknesses are indicated, these are minimums. Provide products in all thicknesses listed or indicated on the Drawings. Equivalent product substitutions will be considered for approval by Contract Administrator.
- .2 **Abuse Resistant Board:** to ASTM C36/C36M for Abuse Resistant Gypsum Wallboard, 15.9 mm (5/8") thick, 1200 mm (4 ft) wide x maximum practical length, ends square cut, edges tapered or tapered with rounded edge. Acceptable materials:
  - .1 Sheetrock® Brand AR Firecode® X Panels.
- .3 **Fire Rated Shaftwall:** to ASTM C36/C36M for Fire Resistant gypsum wallboard, High-performance panels have a non-combustible core encased in a water-resistant 100% recycled green face and back paper, Underwriters Laboratories (UL)/Underwriters Laboratories Canada (ULC) Classified for fire resistance, 25.4mm (1") thick, 610 mm (2 ft) wide x maximum practical length, ends square cut, bevelled edges. Acceptable materials:
  - .1 Sheetrock® Gypsum Liner Panels by CGC.
- .4 **Fire Rated Board:** to ASTM C36/C36M, Type X, for Fire Resistant Gypsum Wallboard, 15.9 mm (5/8") thick, 1200 mm (4 ft) wide x maximum practical length, ends square cut, edges tapered or tapered with rounded edge. To be used in fire rated rooms. Acceptable products:
  - .1 Sheetrock® Brand AR Firecode® X Panels.
  - .2 Contract Administrator approved equivalent.
- .5 **Moisture Resistant/Abuse -Resistant Gypsum Panels:** to ASTM C840, high impact

resistant panels with a heavy natural finish paper on the face side and a strong liner paper on the back and reinforced folded paper edges, 15.9 mm (5/8") thick, Type 'X', 1200 mm (4 ft) wide x maximum practical length, ends square cut, edges tapered or tapered with rounded edge. To be used in washrooms, locker rooms, electrical and mechanical rooms. Acceptable products:

- .1 Fibreock Aqua Tough Brand Panels, Abuse/Moisture - Resistant panels by CGC Canadian Gypsum Company.
  - .2 Contract Administrator approved equivalent.
- .6 **Tile Backer Board:** to ASTM C1278 for Fiber Reinforced Gypsum Panel, 15.9 mm (5/8") thick, 1200 mm (4 ft) wide x maximum practical length, ends square cut, edges tapered or tapered with rounded edge. To be used in instances behind tile. Acceptable products:
- .1 Fiberock® Brand Tile Backer Board.
  - .2 Contract Administrator approved equivalent.
- .7 **General:** Door frames are designed for use with specific gypsum board thicknesses. Where alternate thicknesses are proposed, co-ordinate appropriate revisions to frame sizes and advise the Contract Administrator.

## **2.2 METAL FURRING AND SUSPENSION SYSTEMS**

- .1 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C645, galvanized.
- .2 Drywall furring channels: 22 x 67 mm (7/8" x 2 5/8") size, 0.46 mm (26 ga) core thickness galvanized steel channels for screw attachment of gypsum board.
- .3 Provide special resilient channel design where indicated.

## **2.3 FASTENINGS AND ADHESIVES**

- .1 Nails, screws and staples (standard light duty applications): to ASTM C514.
- .2 Nails, screws and staples (heavy duty applications with steel drill screws): to ASTM C954.
- .3 Steel drill screws: to ASTM C1002.
- .4 Stud adhesive: as recommended by the gypsum board manufacturer and conforming to CAN/CGSB 71.25.
- .5 Laminating compound: as recommended by the gypsum board manufacturer, asbestos-free.

## **2.4 ACCESSORIES**

- .1 Casing beads, corner beads, control joints and edge trim fill type: to ASTM C 1047, 0.46 mm (26 ga) base thickness commercial grade sheet steel with Z275 zinc finish; perforated flanges; one piece length per location.
- .2 **Joint compound:** to ASTM C475, asbestos free. Acceptable products:
  - .1 Gyproc Joint Compound by Domtar.
  - .2 Contract Administrator approved equivalent.
- .3 **Joint reinforcing tape:** Purpose made, paper material perforated, 50 mm (2") wide with chamfered edges. Acceptable products:
  - .1 Perf-A-Tape by CGC.
  - .2 Contract Administrator approved equivalent.
- .4 **Vapour Retarder:** Polyethylene to CAN/CGSB-51.34.

### **Part 3 Execution**

#### **3.1 ERECTION**

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm (6") of each corner and at maximum 600 mm (24") around perimeter of fixture.
- .4 Install work level to tolerance of 1:1200.
- .5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers and grilles,
- .6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .8 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .9 Furr openings and around built-in equipment, cabinets and access panels on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

#### **3.2 RESILIENT FURRING**

- .1 Erect drywall resilient furring transversely across studs and joists or between the layers of gypsum board, spaced maximum 600 mm (24") oc and not more than 150 mm (6") from ceiling/wall juncture except when wall is indicated to be carried to u/s structure in which case furring shall be carried to u/s structure also. Secure to each support with 38 mm (1.5") common nail or 25 mm (1") drywall screw.
- .2 Install 150 mm (6") continuous strip of 12.7 mm (1/2") gypsum board along base of partitions where resilient furring installed.

#### **3.3 APPLICATION**

- .1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.
- .2 Apply single and double layer gypsum board to metal furring or framing using screw fasteners for first layer, laminating adhesive or screw fasteners for second layer. Maximum spacing of screws 300 mm (12") oc.

#### **3.4 INSTALLATION**

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm (6") oc using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.

- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .5 Construct control joints of preformed units or two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints where indicated and at changes in substrate construction. Locate also at approximate 10 m (32 ft) spacing on long corridor runs at approximate 15 m (50 ft) spacing on ceilings.
- .8 Install control joints straight and true.
- .9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .10 Install expansion joint straight and true.
- .11 Install access doors to electrical and mechanical fixtures specified in respective Sections. Rigidly secure frames to furring or framing systems.
- .12 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .13 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .14 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .15 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .16 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

### **NMS 093013.13 – PORCELAIN TILING**

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#### Special Provision

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#### **Part 1 General**

##### **1.1 RELATED SECTIONS**

- .1 Section 03 30 00 – Cast-In-Place Concrete.
- .2 Section 07 92 00 – Joint Sealers.
- .3 Section 09 29 00 – Gypsum Board.

##### **1.2 REFERENCES**

- .1 ASTM C136-96a Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- .2 ASTM C207-91(1997) Standard Specification for Hydrated Lime for Masonry Purposes.
- .3 ASTM C847-95(2000) Standard Specification for Metal Lath (wire mesh).
- .4 ASTM C920-98e1, Standard Specification for Elastomeric Joint Sealants.
- .5 CSA A3000-98 Portland Cement/Masonry Cement/Blended Hydraulic Cement.
- .6 CAN/CGSB-8.1-88 Sieves, Testing, Woven Wire, Inch Series.
- .7 CAN/CGSB-8.2-M88 Sieves, Testing, Woven Wire, Metric.
- .8 CAN/CGSB-19.22-M89 Mildew Resistant Sealing Compound for Tubs and Tiles.
- .9 CAN/CGSB-51.34-M86 Vapour Barrier, Sheet, for Use in Building Construction.
- .10 CAN/CGSB-75.1-M88 Tile, Ceramic.
- .11 CGSB 71-GP-22M-78 Adhesive, Organic, for Installation of Ceramic Wall Tile.
- .12 CGSB 71-GP-29M-79 Adhesive, Elastomeric, for Installation of Quarry Tiles.
- .13 CGSB 71-GP-30M-79 Adhesive, Epoxy and Modified Mortar Systems, for Installation of Quarry Tiles.
- .14 Terrazzo Tile and Marble Association of Canada (TTMAC) Specification Guide 09300, Tile Installation Manual 2000.

### **1.3 SAMPLES**

- .1 Submit duplicate 300 x 300 mm (12" x12") sample panels of each type, colour, texture, size, and pattern of tile, in accordance with Section 01 33 00 – Submittals.

### **1.4 MAINTENANCE MATERIALS**

- .1 Provide one full carton of each type and colour of tile required for project. Store in fully labeled boxes on site where directed by the Owner.
- .2 Maintenance material to be of same production run as installed material.

### **1.5 PROTECTION**

- .1 Prohibit traffic over completed work for 24 hours.

### **1.6 WARRANTY**

- .1 Submit manufacturer's written warranty against material defects and normal wear for a period of 25 years.

### **1.7 ENVIRONMENTAL CONDITIONS**

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 deg C for 48 hours before, during, and 48 hours after, installation.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 All ceramic floor and wall tiles are to conform to CAN/CGSB-75.1.

- .2 Tiles are indicated by type on the Drawings and correspond to types specified in this Section.
- .3 Products listed in this Section are to be considered a base bid. Final selection of tiles to be made by the Contract Administrator at a later date.
- .4 Compatibility: The tile manufacturer shall ensure and report in writing to the Contract Administrator on the compatibility of all products specified under this Section.

## **2.2 CERAMIC TILE**

- .1 102mm x 406mm (4"x16") Colour & Dimension by Olympia Tile. Colour: Dusk. Finish: Bright. Base: matching 100mm (4") high.
- .2 Consultant approved equivalent.

## **2.3 MORTAR AND ADHESIVE MATERIALS**

- .1 Portland cement and Sand: to CSA A3000.
- .2 Hydrated lime: to ASTM C207.
- .3 Standard latex additive: synthetic liquid latex additive formulated for use in modifying portland cement mortar in thick set applications, as recommended by the tile manufacturer.
- .4 High strength latex additive: synthetic liquid latex additive formulated for use in modifying portland cement mortar used as a bond coat, as recommended by the tile manufacturer.
- .5 Water: potable and free of minerals which are detrimental to mortar and grout mixes.

## **2.4 BOND COATS**

- .1 For wall tile: Type 1 Organic bond coat: mastic or rubber type used on interior walls (only) and floors where water resistance is required to CGSB 71-GP-22M, Type 1 and ANSI A136.1, Type1.

## **2.5 GROUT**

- .1 For floor and wall Tile: (small joints) unsanded, narrow joint grout incorporating portland cement. Acceptable products:
  - .1 TA 610 Wall Grout by TEC.
  - .2 Ceramic-Mosaic Grout by L&M Ceramo.
  - .3 Flextile Grout by Flextile.
  - .4 550 Power Grout by TEC
  - .5 Contract administrator approved equivalent.
- .2 Latex Grout Additives: synthetic liquid latex additive used to modify portland cement grout, as recommended by the grout manufacturer.
- .3 Grout preparation: to manufacturers instructions.
- .4 Grout Colours: TEC grout colour selected from manufacturer's standard colours.
- .5 Where floor tile is to be installed on stairs and ramps, incorporate a metallic grit material in epoxy grout material to act as non-slip surface. See Drawings for locations.

## **2.6 ACCESSORIES**

- .1 Base Cap, Edge Cap and Corners: Extruded anodized aluminum trim designed for 9.5mm (3/8") thick tile. Acceptable products:
  - .1 Schluter-Rondec Model RO100AE by Schluter Systems Canada Inc.

- .2 Contract administrator approved equivalent.
- .2 Sealants: See Section 07 92 00 - Joint Sealers, for types.

## **2.7 MORTAR AND ADHESIVE MIXES**

- .1 Bond or setting coat: 1 part portland cement, 1/3 part hydrated lime, 1 part water, or organic bond coat premixed by the manufacturer.
- .2 Measure mortar ingredients by volume.
- .3 Dry set mortar: mix to manufacturer's instructions.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Tile installation to be in accordance with detail numbers listed in TTMAC Specification Guide 09300, Installation Manual published by Terrazzo, Tile and Marble Association of Canada.

### **3.2 WORKMANSHIP**

- .1 Apply wall tile or backing coats to clean and sound surfaces.
- .2 Fit wall tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even.
- .3 Maximum surface tolerance 1:800.
- .4 Make joints between tile uniform, approximately 1.5mm (1/16") wide for wall tile, plumb, straight, true, even and flush with adjacent tile. Ensure that sheet layout is not visible after installation when mosaic tile is specified. Align patterns if a pattern is specified.
- .5 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .6 Sound tiles after setting and replace hollow- sounding units to obtain full bond.
- .7 Make internal angles square; external angles to be rounded.
- .8 Use round or bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .9 Install divider strips at junction of tile flooring and dissimilar materials. At doors, locate joint so that strips are hidden when door is in a closed position.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean tile surfaces after installation and grouting cured.
- .12 Control Joints:
  - .1 Confirm locations of control joints with the Contract Administrator before installation.
  - .2 Provide control joints at 6m (20 ft) in each direction and where indicated.
  - .3 Make joint width same as tile joints.
  - .4 Utilize prefabricated rigid PVC control joint material specified above and install as directed by the manufacturer.
  - .5 Keep building expansion joints free of mortar and grout.

### **3.3 FLOOR TILE**

- .1 Install using a thin set organic bond coat application with a Portland cement grout in accordance with TTMAC Detail No. 303W-97. All joints to be 1.5mm (1/16") maximum width.

## **NMS 095113 – ACOUSTIC PANEL CEILINGS**

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### **Special Provision**

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#### **Part 1 General**

##### **1.1 RELATED SECTIONS**

- .1 Section 09 53 23 – Metal Acoustic Ceiling Suspension Assemblies.
- .2 Division 15 – Sprinklers and air handling.
- .3 Division 16 – Lighting and communications.

##### **1.2 REFERENCES**

- .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
- .2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 CAN/ULC-S102-1988, Surface Burning Characteristics of Building Materials and Assemblies.
- .4 CSA B111-1974, Wire Nails, Spikes and Staples.

##### **1.3 SAMPLES**

- .1 Submit duplicate 600 x 600 mm (24" x 24") samples of each type of acoustical unit and each type of open cell wire unit in accordance with Division 1.

##### **1.4 REGULATORY REQUIREMENTS**

- .1 Fire-resistance rated floor/ceiling of/ceiling assembly: certified by a Canadian Certification Organization accredited by Standards Council of Canada.

##### **1.5 ENVIRONMENTAL REQUIREMENTS**

- .1 Permit wet work to dry before commencement of installation.
- .2 Maintain uniform minimum temperature of 15 deg C and humidity of 20 to 40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

##### **1.6 MAINTENANCE MATERIALS**

- .1 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type required for the project, to the nearest full carton.
- .2 Materials to be same production run as installed materials.

## **Part 2 Products**

### **2.1 MANUFACTURERS**

- .1 Acoustical panels and tiles manufactured by the following companies are recommended for use on this project. Products specified are based on Armstrong; other manufacturers listed will be considered suitable if specifications can be met:
  - .1 Armstrong World Industries, Mississauga, Ontario.
  - .2 Domtar Construction Materials Inc., Montreal, P.Q.
  - .3 Canadian Gypsum Company Limited, Toronto, Ontario.

### **2.2 MATERIALS**

- .1 All acoustic ceiling panels on this project shall conform to CAN/CGSB-92.1.
- .2 Panels to be suitable for installation in an exposed tee suspended grid system.
- .3 Panels are identified on the Drawings by Type, and are described below.

### **2.3 CEILING PANELS**

- .1 PANEL TYPE ACT:
  - .1 Construction: mineral fiberboard with a factory applied vinyl latex paint finish.
  - .2 Flame spread rating: 25 or less.
  - .3 Edge type: square, suitable for use in standard 15/16" wide suspended exposed tee grid.
  - .4 Texture: medium
  - .5 Colour: white
  - .6 Size: 610 x 1220 x 16 mm (24 x 48 x 5/8").
  - .7 Acceptable products:
    - .1 Cortega, Second Look II, 2767.

### **2.4 ACCESSORIES**

- .1 Adhesive: as recommended by acoustic unit manufacturer.
- .2 Staples, nails and screws: to CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.
- .3 Hold down clips: purpose made clips to secure tile to suspension system approved for use in fire-rated systems.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Do not install acoustical panels and tiles until work above ceiling has been inspected by the Contract Administrator.

### **3.2 INSTALLATION**

- .1 Install acoustical panels and tiles in ceiling suspension system as recommended by the manufacturer.
- .2 In fire rated ceiling systems and vestibule areas secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organization's design requirements.

### 3.3 INTERFACE WITH OTHER WORK

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

## **NMS 095223 – METAL ACOUSTIC CEILING SUSPENSION ASSEMBLIES**

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### Special Provision

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## **Part 1 General**

### **1.1 REFERENCES**

- .1 ASTM C635-00 Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .2 ASTM C636-96 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .3 ASTM C645-00 Standard Specification for Non-structural Steel Framing Members.

### **1.2 DESIGN CRITERIA**

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

### **1.3 REGULATORY REQUIREMENTS**

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 **Intermediate Duty system** to ASTM C635.
- .2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .3 Non Fire Rated Suspension System:
  - .1 For square edge and tegular edge tile, two directional exposed tee bar grid.  
Acceptable products:
    - .1 Lance-Lock 900 BEH by Bailey Metal Products Ltd.
    - .2 DONN DXL Exposed Tee System by CGC Inc.
    - .3 Contract Administrator approved equivalent.
- .4 Exposed tee bar grid components:
  - .1 Shop painted satin sheen, white colour. Components die cut. 1 ½" intermediate duty tees with double web, rectangular bulb and rolled cap on exposed face.
  - .2 Provide standard 23.8 mm (15/16") exposed cap face width.
  - .3 See Section 09 51 13 - Acoustical Ceilings, for Acoustic Tile types. See the Drawings for location and extent of each type of tile.
  - .4 Provide cross tee with rectangular bulb, web extended to form positive interlock with main tee webs, lower flange extended and offset to provide flush intersection.
  - .5 Components to satisfy requirements of ULC where used in fire rated ceilings. See Drawings for locations of fire rated ceilings.

- .5 Hanger wire: galvanized soft annealed steel wire, minimum 3.6 mm (8 gauge) purpose made for access tile ceilings to ULC tested design requirements for fire rated assemblies, if indicated.
- .6 Tie wire: similar to hanger wire, 1.2 mm (0.047") (18 gauge) minimum.
- .7 Carrying channels: 38 mm (1.5") channel, galvanized steel.
- .8 Accessories: splices, clips, wire ties, retainers and flush and reveal wall mouldings to complement suspension system components, as detailed. If not detailed, as recommended by system manufacturer.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install suspension system to grid sizes indicated in accordance with ASTM C636 to ULC tested design requirements and to manufacturer's instructions.
- .2 Install suspension system to a 600 x 1200 mm (2 ft x 4 ft) grid except where other sized grids are indicated.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by the Contract Administrator.
- .4 Lay out with border units not less than 50% of standard unit width in accordance with reflected ceiling plan.
- .5 Ensure suspension system is co-ordinated with location of related components.
- .6 Install wall mold to provide correct ceiling height. Finished ceiling system to be level within 1:1000.
- .7 Super-imposed loads such as diffusers, light fixtures, grilles and speakers are not to be carried on the ceiling suspension system. Obtain the weights of all such fixtures and install extra suspension hangers independent of the ceiling suspension system to support them.
- .8 Support light fixtures and diffusers independently from ceiling suspension system with additional ceiling suspension hangers within 150 mm (6") of each corner and at maximum 600 mm (24") around perimeter of fixture.
- .9 Interlock cross member to main runner to provide rigid assembly.
- .10 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .11 Install free-form edging system to ceiling heights and layout indicated.

#### **3.2 EXPANSION JOINTS**

- .1 Provide if indicated on reflected ceiling plans.
- .2 Erect two main runners parallel, 25 mm (1") apart, on building expansion joint line. Lay in strip of acoustic tile/board, painted black, 25% narrower than tight fit.
- .3 Supply and install "Z" shaped metal trim pieces at each side of expansion joint. Design to accommodate plus or minus 25 mm (1") movement and maintain visual closure. Finish metal components to match adjacent exposed metal trim. Provide backing plates behind butt joints.

### **3.3 CLEANING**

- .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

## **NMS 096516 – RESILIENT SHEET FLOORING**

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### **Special Provision**

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#### **Part 1 General**

##### **1.1 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM F1303-04 (2021), Standard Specification for Sheet Vinyl Floor Covering with Backing.

##### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.  
Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient sheet flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Samples:
  - .1 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long edge strips.
- .3 Seam Layout Diagram:
  - .1 Provide seam layout diagram for consultant approval prior to lay in.

##### **1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Provide 9 m2 of each colour, pattern and type flooring material required for project for maintenance use.
  - .3 Extra materials one piece and from same production run as installed materials.
  - .4 Identify each roll of sheet flooring and each container of adhesive.
  - .5 Deliver to Owner, upon completion of the work of this section.
  - .6 Store where directed by Owner.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.5 SITE CONDITIONS**

- .1 Install resilient products after other finishing operations, including painting, have been completed.
- .2 Maintain ambient temperatures within range recommended by Tarkett, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
  - .1 48 hours before installation.
  - .2 During installation.
  - .3 48 hours after installation.
- .3 Maintain the ambient relative humidity between 40% and 60% during installation.
- .4 Until Substantial Completion, maintain ambient temperatures within range recommended by Tarkett, but not less than 13 deg C or more than 29 deg C.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Heterogenous Vinyl Sheet Flooring
- .2 Products:
  - .1 Tarkett Acczent 27818 Washed Oak Natural
  - .2 Tarkett iQ Granit Safe.T 21153 507 Light Sand WB
- .3 Cove Filler Strip: Tarkett CFS-00-A.
- .4 Cove Cap: Tarkett, profile compatible with vinyl sheet flooring, colour as selected by Consultant from full range of industry colours.
- .5 Rubber wall base; 102 mm (4"), standard toe, Johnsonite Sandstorm.
- .6 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
  - .1 Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation.
  - .2 Adhesives: As recommended by Tarkett to meet site conditions
    - .1 Tarkett 925 Resilient Flooring Adhesive
    - .2 Tarkett 975 Two-Part Urethane Adhesive
    - .3 Tarkett RollSmart Adhesive
    - .4 Cold Weld Liquid
- .7 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- .2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- .1 Prepare substrates according to Tarkett written instructions to ensure proper adhesion of Resilient Flooring.
- .2 Prepare concrete substrates in accordance with ASTM F 710.
- .3 Concrete floors must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitence, mold, mildew, and other foreign materials that may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.
- .4 Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
- .5 Perform moisture testing as recommended by manufacturer. Proceed with installation only after substrates have been tested and meet the minimum requirements from the manufacturer in accordance with ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- .6 A pH test for alkalinity must be conducted on the concrete floor prior to installation with results between 7 and 9. If the test results are not within the acceptable range, then installation must not proceed until the problem has been corrected.
- .7 Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- .8 Floor covering shall not be installed over expansion joints.
- .9 Do not install resilient products until they are same temperature as the space where they are to be installed.
- .10 Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- .11 Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### **3.3 APPLICATION: FLOORING**

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system.
- .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with seams as per reviewed seam layout diagram. Border widths minimum 1/3 width of full material.
- .4 Run sheets in direction of traffic. Double cut sheet joint and continuously seal heat weld according to manufacturer's printed instructions.
- .5 Heat weld seams of sheet flooring in accordance with manufacturer's printed instructions.

- .6 As installation progresses, roll flooring with 45 kg three-section roller to ensure full adhesion.
- .7 Cut flooring around fixed objects.
- .8 Continue flooring over areas which will be under built-in furniture.
- .9 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .10 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

### **3.4 APPLICATION: INTEGRAL COVE BASE**

- .1 Lay out base to keep number of joints at minimum.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Provide cove filler strip, fillet joint inside and outside corners.
- .4 Apply adhesive to back of base.
- .5 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .6 Install straight and level to variation of 1:1000.
- .7 Heat weld base in accordance with manufacturer's printed instructions.
- .8 Net fit flooring material into cove cap.
- .9 Provide tamper-resistant sealant along top edge of cove cap.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Perform the following operations immediately after completing resilient product installation:
  - .1 Remove adhesive and other blemishes from exposed surfaces.
  - .2 Sweep and vacuum surfaces thoroughly.
  - .3 Damp-mop surfaces to remove marks and soil.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
  - .1 Clean flooring surfaces to flooring manufacturer's printed instructions.

### **3.6 PROTECTION**

- .1 Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
  - .1 No traffic for 24 hours after installation.
  - .2 No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- .2 Wait 72 hours after installation before performing initial cleaning.
- .3 A regular maintenance program must be started after the initial cleaning.

**NMS 096700 – EPOXY FLOOR FINISH**

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Special Provision

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**Part 1 General**

**1.1 ENVIRONMENTAL CONDITIONS**

- .1 Ensure that minimum ambient and surface temperatures are 16C (60F) at time of application and maintained for curing period.
- .2 Ensure that work areas are properly ventilated.
- .3 Observe health and safety regulations including use of approved respirators, safety goggles and impervious gloves as required.

**1.2 STORAGE**

- .1 Store materials in original containers at minimum 16C (60F) in clean, dry area. Avoid excessive heat and do not freeze.

**1.3 QUALITY ASSURANCE**

- .1 Use only skilled personnel with proven quality experience to expediently complete the work under this Section in an efficient and workmanlike manner.
- .2 Report to the Contract Administrator in writing, defective surfaces prepared by other trades which affect the work of this Section. Commencement of work shall imply acceptance of surfaces.
- .3 Ensure that sufficient material, labour and finishers are available to maintain continuous placement of epoxy finishes over entire area once application commences.
- .4 Apply epoxy finishes only on clean, sound, properly prepared substrates.

**1.4 SAMPLES**

- .1 Submit material samples of manufacturer's complete range of standard colours for floor finishes and sealants, as requested by Contract Administrator.

**1.5 PROTECTION**

- .1 Post legible signs at all points of entry to areas in which work of this Section is being applied, to warn against smoking and the use of open flame, such as torches, matches and lighters.
- .2 Erect suitable barriers to prevent traffic and other trades from working in areas during application of coatings.

**Part 2 Products**

**2.1 ACCEPTABLE SYSTEMS**

- .1 Epoxy systems specified are based on products of STONHARD Inc.
- .2 Comparable epoxy systems of following manufacturers conforming to the requirements of this Section are acceptable:
  - .1 Armorproxy Commercial FB—801.
  - .2 Contract Administrator-approved equal.

## **2.2 SYSTEMS**

- .1 Stoneshield ESD:
  - .1 Standard Primer: two-component, penetrating, epoxy primer.
  - .2 Stoneshield Conductive Undercoat: two component, conductive epoxy formulation consisting of resin and curing agent.
  - .3 Stoneshield ESD Aggregate: brightly coloured, quartz broadcast aggregate combined with conductive element.
  - .4 Stoneshield Conductive Sealer: three-component, high performance, conductive, UV resistant, clear epoxy sealer.
  - .5 Thickness: nominal thickness of 3/16 in./5 mm.
  - .6 Colour: Selected from manufacturer's standard colour range.

## **2.3 ACCESSORIES**

- .1 Cap strip, flooring manufacturer's standard, 100 mm (4") high as indicated.
- .2 Plastic filler; for sealing joints between top of wall base or integral cove cap and irregular wall surfaces: Low VOC, plastic filler applied according to flooring manufacturer's recommendations.
- .3 Fillet support strip; cove base: minimum radius of 25 mm (1") of metal or plastic, flooring manufacturer's standard.
- .4 Rubber wall base; 102 mm (4"), standard toe, refer to Colour Schedule for colour.

## **2.4 SEALANTS**

- .1 Control Joint Sealant, to suit application, as recommended by epoxy system manufacturer, at control joints and junction with other surfaces and finishes.
- .2 Colour: to match samples approved by Contract Administrator.

## **Part 3 Execution**

### **3.1 SURFACE PREPARATION**

- .1 Allow concrete substrates to cure at least 28 days prior to commencing work.
- .2 Prepare concrete surfaces in strict accordance with recommendations of the epoxy coating manufacturer.
- .3 Prepare concrete floors by utilizing a self-contained dust controlled machine, such as Blast-Trac, to produce a dry, clean, rough surface profile prior to epoxy application, to CSP 4-6 or other method approved by manufacturer.
- .4 For concrete stair treads, landings, and other concrete surfaces inaccessible to shot-blasting preparation, use abrasive grinding methods recommended by epoxy system manufacturer to provide required surface profile prior to epoxy application.
- .5 Site Fabricated Epoxy Cove Wall Base Installation
  - .1 For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
  - .2 Provide top edge resilient cove caps for integral flash cove applied according to the manufacturer's recommendations. Install straight and level to variation of 1:1000. Scribe and fit to door frames and other obstructions. Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners. Provide joints in base over substrate control joints.
  - .3 Provide a fillet support strip for integral cove base.

### **3.2 APPLICATION**

- .1 Use application methods and procedures in strict accordance with the product manufacturer's directions.
- .2 Apply coatings to produce smooth surface, uniform in sheen, colour and finish, free from marks, dirt, particles, runs, holes, airpockets and other defects.

### **3.3 SEALANTS**

- .1 Apply sealants only on clean, sound, properly prepared substrates.
- .2 Prime substrates, mix and apply sealants in accordance with manufacturer's directions.

## **NMS 099100 – PAINTING**

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### **Special Provision**

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#### **Part 1 General**

##### **1.1 REFERENCES**

- .1 Canadian Painting Contractors' Architectural Painting Specifications Manual, latest revision, available from the Ontario Painting Contractors Association (OPCA) and referenced herein as the OPCA Manual.
- .2 National Standard of Canada CAN/CGSB-85.100-93, Painting.
- .3 National Standard of Canada CAN/CGSB-85.10-99, Protective Coating for metals.

##### **1.2 WORK INCLUDED**

- .1 General:
  - .1 Furnish all materials and equipment and provide all labour required to complete the interior painting section of the Contract including all priming, retouching work, cleaning and completion.
  - .2 Notify appropriate trades when fixtures, doors or hardware are required to be removed and later replaced by that trade in order to enable the proper execution and completion of the work of this Section.
  - .3 In areas indicated as unfinished on the Drawings, painting or decorating is not required with the exception of all wood, and corrosive metal surfaces, (including mechanical and electrical equipment, piping, conduits, and fittings, as well as all pipe insulation overs).
  - .4 On areas where painting or finishing is indicated in the Drawings, all surfaces and objects within the room or area to be painted or finished, except where expressly indicated or specified otherwise.
  - .5 Include painting of steel treads and all steel plates.
- .2 Priming work:
  - .1 In general, the priming of metal is specified as a shop coat. All wood or metal to be painted, varnished, stained, or enameled and not specified to have a shop coat shall be primed at the site, in accordance with the recommendations of the Coating Manufacturer and to the approval of the Contract Administrator.
  - .2 Screwheads, holes and other defects in metalwork shall be neatly filled with mineral filler. Nail holes, cracks and other defects in work, other than metalwork, shall be neatly puttied to match finish intended. All such work shall be carried out after the priming coat is dry and before the second coat is applied.

- .3 Mechanical and Electrical Equipment:
  - .1 All mechanical and electrical equipment to be finish painted by the manufacturer in plant.
- .4 Retouching work:
  - .1 Make a close inspection of all surfaces decorated prior to completing this work.
  - .2 Ensure that all surfaces decorated are properly and perfectly retouched where damaged.
  - .3 The job shall be turned over to the Owner in perfect condition, free of all spattering, fingermarks, rust, water marks, scratches, and blemishes.
- .5 Cleaning and completion:
  - .1 Sweep rooms to be worked in broom clean, and maintain the areas being worked in in this condition while work of this trade is being done.
  - .2 All oily rags and other waste must be removed from the building every night, under no circumstances will they be allowed to accumulate.
  - .3 Upon completion, all spots, stains and other disfigurement resulting from this work shall be removed and the premises left clean, and free from all dirt and debris.

### **1.3 ENVIRONMENTAL REQUIREMENTS**

- .1 Conform to requirements of OPCA Manual.

### **1.4 QUALITY ASSURANCE**

- .1 Retain purchase orders, invoices and other documents to prove that all materials utilized in this contract meet requirements of the specifications. Produce documents when requested by Engineer.
- .2 Standard of Acceptance:
  - .1 Walls. No defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Ceilings. No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Acceptable products: Per Chapter 5 of OPCA Manual and as listed.
- .2 Provide highest grade, first line quality of the manufacturer.
- .3 Paint and coating materials for each system to be products of a single manufacturer.

### **2.2 COLOURS**

- .1 The Contract Administrator will provide Colour Schedule after contract award. Selection of colours will be from manufacturers full range of colours.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Prepare surfaces to receive paint and coatings per Chapter 3 of OPCA Manual.

### **3.2 APPLICATION**

- .1 Sand and dust between each coat to remove defects visible from distance up to 1.5m (5ft).
- .2 Finish closets and alcoves the same as adjoining surfaces of rooms.

### **3.3 MECHANICAL AND ELECTRICAL EQUIPMENT**

- .1 Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas as well as inside cupboards and cabinet work. Colour and texture to match adjacent surfaces, except as noted otherwise. Coordinate with mechanical trades applying banding and labeling after pipes have been painted.
- .2 Paint gas piping gas standard yellow where visible in service spaces and on roof/walls exterior.
- .3 Paint surface inside of duct work and elsewhere behind grilles where visible using primer and one coat of matte black paint.
- .4 Paint both sides and edges of plywood backboards for equipment before installation.
- .5 Leave factory finished equipment in original finish except for touch-up as required, as paint conduits, mounting accessories and other unfinished items.

### **3.4 FIELD INSPECTION**

- .1 Examine surfaces scheduled to receive finishes specified under this Section for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work and report any discrepancies or unacceptable surfaces to the Contract Administrator. If any such defective work is painted over, such areas shall be removed and repaired at no extra expense to the Owner.
- .2 Do not proceed with paint or coating application until conditions are suitable.
- .3 Material shall not be applied on surfaces where moisture content is in excess of 12 per cent as measured on a moisture meter.
- .4 All work where a coat of material has been applied must be inspected and approved by the Contract Administrator before application of the succeeding coat, otherwise no credit for the coat applied will be given, and the Contractor automatically shall assume the responsibility to recoat the work in question.
- .5 Arrange to have the painting operations of the Contract inspected by a representative of the Paint Manufacturer.

### **3.5 PAINTING AND COATING SYSTEMS**

- .1 System references listed are based on Chapters 4A (Exterior) and 4B (Interior) of OPCA Manual and are Premium Grade, unless noted otherwise.

### **3.6 EXTERIOR PAINTING**

- .1 Steel pipe railings, vehicle bumper posts, miscellaneous support brackets for electrical signal lights and sign supports:
  - Prime: by fabricator
  - Touch-up: spot prime Alkyd Rust Paint Moore Primer 163.
  - Finish: two coats Moorestyle 589 Alkyd gloss enamel.
- .2 Roof hatch, interior and exterior surfaces of cover and curb:

Prime: by fabricator  
Touch-up: spot prime Alkyd Rust Paint Moore Primer 163.  
Finish: two coats Moorestyle 589 Alkyd gloss enamel.

- .3 Hollow metal doors and frames:  
Prime: one coat Alkyd Rust Paint Moore Primer 163.  
Finish: two coats Moorestyle 589 Alkyd gloss enamel.
- .4 Insulated ductwork and piping:  
Prime and finish: two coats Moorestyle 564, acrylic flat latex.
- .5 Gas piping:  
Prime: one coat Alkyd Rust Paint Moore Primer 163.  
Finish: two coats Moorestyle 589 Alkyd gloss enamel.

### **3.7 INTERIOR PAINTING**

- .1 Galvanized steel roof deck surfaces (when exposed to view):  
Prime: one coat Moore 023, galvanized metal primer, sealer  
Finish: one coat Moorespec 591, acrylic latex flat.
- .2 All exposed structural steel framing, including beams, columns, anchors etc. (when exposed to view);  
Prime: by fabricator  
Touch-ups: Moorespec 163, alkyd flat primer.  
Finish: two coats Moore 599, alkyd semi-gloss.
- .3 Insulated ductwork and piping: Prime and finish: two coats Moorestyle 564, acrylic latex flat.
- .4 Galvanized ductwork (where exposed in areas with no ceiling):  
Prime: one coat Moorespec 563 primer  
Finish: one coat Moorespec 556 top coat.
- .5 Block masonry:  
Prime: Moorespec 595, latex block filler to fill voids  
Finish: two coats Moorespec 556 Alkyd interior eggshell.
- .6 Hollow metal doors and frames:  
Prime: one coat primer 163.  
Finish: two coats Moorespec 599 alkyd semi-gloss.
- .7 Drywall partitions:  
Prime: one coat Moorespec 586 acrylic primer sealer.  
Finish: two coats Moorespec 556 alkyd eggshell.
- .8 Drywall ceilings:  
Prime: one coat Moorespec 586, acrylic primer sealer  
Finish: two coats Moorespec 591 acrylic latex flat.
- .9 Wood, where natural finish indicated:  
Stain: one coat Wood Stain  
Filler: one coat Filler Sealer  
Sealer: two coats Clear  
Finish, Urethane Satin.
- .10 Metal fabrications including:
  - .1 Exposed metal lintels and equipment supports, miscellaneous metal, bench supports.
  - .2 Steel ladders.
  - .3 Steel pipe railings.  
Prime: by fabricator

Touch-up: Moorespec 163 primer  
Finish: two coats Moorestyle 579, Alkyd Gloss enamel.

## **NMS DIVISION 11 SPECIFICATIONS**

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Special Provision (Page 224)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 11 National Master Specifications are included in this Contract.

## **NMS 112010 – WATER TREATMENT SYSTEMS**

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Special Provision

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### **Part 1 General**

#### **1.1 INTENT**

- .1 The intent of this specification is to provide details related to a fully complete and operational water treatment system. The treatment system shall include all materials, labour, software, hardware, equipment and design effort required for the design, supply, delivery, construction, installation, testing, startup, commissioning and operator training of two water treatment systems as specified herein. One water treatment system will be required for the well servicing the plumbing fixtures of the Vehicle Maintenance Garage and another water treatment system will be required for the well servicing the wash bay of the Vehicle Maintenance Garage.

#### **1.2 ALTERNATIVE PROPOSALS**

- .1 Alternate proposals and innovative designs may be considered in addition to the main proposal. Any deviations to the specifications herein shall be clearly identified in the alternative proposal, accompanied by a detailed explanation for the proposed deviation. If the alternative proposal is accepted, all process warranties and guarantees specified shall apply.

#### **1.3 WORK INCLUDES**

- .1 This Specification is intended to cover the design, supply, delivery, installation, testing, startup, commissioning and operator training of two water treatment systems for the new Fenelon Falls Maintenance Patrol Yard (MPY) in Kawartha Lakes, Ontario.
- .2 The treatment system shall be supplied, installed, and maintained by a single Supplier.
- .3 The Contractor shall be responsible for coordinating and completing all work necessary for a fully functional systems.
- .4 The Contractor shall be responsible for sampling the raw water supply from each well and confirming that the Contractor designed treatment system is capable of meeting the Canadian Guidelines for Drinking Water Quality for both aesthetic and health-based parameters for the well servicing the administration area. For the well servicing the vehicle wash bay the treatment system is expected to consist of filtration and UV disinfection only.
- .5 The supply of the treatment system shall also include a two-year maintenance contract including routine system maintenance, media changes, inspections and repairs throughout the two-year period.

#### **1.4 REFERENCE STANDARDS**

- .1 Equipment and work shall comply with the latest edition of all applicable codes, standards, and regulations including, but not limited to, the following:
  - .1 National Sanitation Foundation (NSF).
  - .2 American Water Works Association (AWWA).
  - .3 Canadian Standards Association (CSA).
  - .4 American Society of Mechanical Engineers (ASME).
  - .5 American Gear Manufacture Association (AGMA).
  - .6 Canadian Electrical Manufacturers Association (CEMA).
  - .7 National Electrical Manufacturer Association (NEMA).
  - .8 American Society for Testing and Materials (ASTM).
  - .9 American National Standard Institute (ANSI).
  - .10 Electrical and Electronic Manufacturers Association of Canada (EEMAC).
  - .11 Hydraulic Institute Standards.
  - .12 Ontario Building Code (OBC).
  - .13 Underwriter's Laboratories of Canada (ULC).
  - .14 Guidelines for Canadian Drinking Water Quality (GCDWQ).
  - .15 Ontario Design Guidelines for Drinking Water Systems.

#### **1.5 RELATED WORKS AND PROCESS CONTROL**

- .1 Design criteria are specified herein. The Suppliers shall propose more stringent criteria if, in the opinion of the Supplier, more stringent criteria are required to achieve the requirements of the Performance Guarantee stated in the Contract Documents.
- .2 Process Logic Description (PLD).
- .3 Raw water quality data for the new well sites are not currently available. The contractor shall draw samples from the new well systems prior to designing or procuring the treatment systems to confirm system requirements. The treatment system may need to remove the following: iron, hardness, sodium, chlorides, dissolved solids. Sulfur odour has been a noted issue in wells in the project area, the system shall be furnished to eliminate odours prior to the point of use.

#### **1.6 QUALIFICATIONS OF EQUIPMENT MANUFACTURERS**

- .1 All items of equipment supplied shall be produced by companies regularly engaged in manufacturing this type of equipment and who maintain service and parts departments from which service, repairs and replacements may be obtained quickly at all times. Mechanical details of the equipment offered shall have been tried and tested by the actual construction and operation of mechanisms of the exact type and of comparable size and operating in similar service.

#### **1.7 SAMPLES AND TESTS**

- .1 If the Contract Administrator has reason to believe that any product does not meet the specifications, contract documents or reference standards, he shall request samples to be provided by the Contractor to be tested. Should the results of the testing indicate that the product is in accordance with the aforementioned, the Contractor shall be reimbursed for the testing costs by the Owner (at no markup). Should the testing indicate that the samples are not in accordance with the aforementioned, the Contractor shall replace the defective products and re-test at their own expense. If requested by the Contract Administrator:
  - .1 Before shipment to site, submit results of sieve analysis test for soundness of aggregates per ASTM C88, and Acid Solubility as per AWWA B100 Standards for each of the filter materials. Analysis shall be by an independent testing laboratory for sand and anthracite of the actual materials to be shipped to site. The number of samples shall be according to the AWWA B100 Standards. The independent testing laboratory may be chosen by the Supplier but must be acceptable to the Contract

- .4 Administrator. Testing at the point of origin is not accepted as a substitute.
  - .2 Sieve no less than 3 samples from each material regardless of quantity.
  - .3 Test additional samples at no cost to the Owner if any sieve results are unsatisfactory.
  - .4 Certify that all sieve analysis and tests submitted are carried out in accordance with the requirements of this specification and are a true representation of the results.
- .2 Gravel, sand and anthracite shall be purchased from sources that are expressly qualified to produce and furnish these materials for potable water treatment and shall meet NSF61 Drinking Water System Components - Health Effects.

## **1.8 COORDINATION**

- .1 The General Contractor shall be responsible for overall supply, sampling, installation, construction, startup, testing and training. The General Contractor shall coordinate with all of his suppliers and sub-contractors to ensure a successful project completion. The General Contractor shall coordinate with the regulating authority to secure any required approvals to put the system into service.
- .2 The Equipment Supplier shall provide all details and requirements pertaining to the installation, handling, storage, and operation of equipment to the Contract Administrator and the Contractor. Costs of providing such information shall be included in the Contractor's bid price.

## **Part 2 Products**

### **2.1 TREATMENT SYSTEM PACKAGE**

- .1 The treatment system shall be designed to accept, regulate and treat raw water (groundwater) from a single production well located on the site with the ability to accept water from additional wells in the future. The system shall produce water that meets or exceeds the Guidelines for Canadian Drinking Water Quality (GCDWQ), and as specified herein. Where discrepancies exist in performance requirements, the more stringent shall apply.
- .2 All equipment shall be CSA approved and all electrical wiring and controls performed by a licensed electrician to the requirements of the CEC.
- .3 The system shall operate as a pressure system, with the capability to operate in-line, under pressure without the need for additional pumping or boosting.
- .4 The treatment process must include, at a minimum, all necessary equipment and appurtenances to achieve the following:
  - .1 Flow control valves.
  - .2 Filtration for turbidity, iron and manganese reduction.
    - .1 Pressure media filter requiring no chemical regeneration.
  - .3 Water softening;
    - .1 Pressure vessel complete with mineral tank and resin.
  - .4 Greensand filtration (iron, manganese and hydrogen sulfide) (if required).
  - .5 Filter/media backwashing.
  - .6 Filter/media regeneration (if required).
  - .7 UV disinfection (duty/standby) – to occur after water is drawn from the cistern
    - .1 Design dose: minimum 40 m2/cm2 at end of lamp life.
    - .2 Material: 304 stainless steel.
    - .3 Rated for a minimum operating pressure of 100 psi.
    - .4 Lamps: high output, low pressure.
    - .5 UV intensity monitor and controller per reactor.
    - .6 Duty and stand by UV disinfection is only required for the treatment system feeding the building plumbing fixtures. Only duty UV disinfection is required for the wash bay treatment system.
  - .8 Automatic operation of treatment system.

- .9 Whole system reverse osmosis treatment to remove sodium (if required)
  - .1 If whole system RO treatment is required to remove salts it is only required for the treatment system feeding the building plumbing fixtures. The wash bay treatment system does not require RO treatment
- .10 Sulfur or Hydrogen Sulfide removal mechanism required to achieve no detectable sulfur smell at any plumbing fixture
- .5 The scope of supply for the treatment package shall include all items necessary to achieve the desired performance. This may include:
  - .1 Filter vessels.
  - .2 Support gravels, filter media.
  - .3 Valving.
  - .4 Interconnection piping.
  - .5 UV disinfection.
  - .6 Control panel complete with alarms.

## **2.2 DESIGN PARAMETERS**

- .1 Average Day Design Flow: 6,800 L/day for the wash bay treatment system  
5000 L/day for the building plumbing fixture treatment system
- .2 Design Flow: 38.0 L/min (10 GPM) for the wash bay treatment system  
37 L/min (15 GPM) for the building plumbing fixtures treatment system
- .3 Raw Water Feed:
  - .1 Raw water will be fed directly from the well to the treatment systems, where flow to the treatment system will be controlled by valving and pressure switches supplied under this contract.
- .4 Backwash water (if required) will be provided from the existing domestic water plumbing inside the mechanical room (40-55 psi). Any tankage for backwash water volume required by the system should be provided under this contract.
- .5 The treatment system shall treat the raw water and provide potable water that meets the Canadian Drinking Water Quality Guidelines and the maximum acceptable limits presented in Table 1 (as measured in the softener effluent).

<b>Water Quality Parameter</b>	<b>Objectives and Warranty Targets</b>
Colour (TCU)	< 5
Turbidity (NTU)	< 1.0
Total Iron (mg/L)	< 0.3
Total Manganese (mg/L)	< 0.02
Sulphide (mg/L)	< 0.05
pH	7-9
Hardness (mg/L CaCO <sub>3</sub> )	< 100
Alkalinity (mg/L CaCO <sub>3</sub> )	> 40

- .6 The treatment system will be located indoors in a heated area.

## **2.3 TREATMENT SYSTEM COMPONENTS**

- .1 Filtration equipment shall meet the requirements of ANSI/AWWA C653 Standards for Disinfection of Water Treatment Plants. An integral and overall control system shall be provided and plant functions shall be automated to the extent specified herein and in the Preliminary Process Control Description in the contract documents.
  - .1 All filter materials and their installation procedures shall meet the requirements of ANSI/AWWA B100 Standards for Filter Materials.
  - .2 Design Parameters:
    - .1 Number of media filters: 1 duty, 1 standby. Note standby filters are only required for the treatment system feeding the building plumbing fixtures. The

- wash bay treatment system only required duty filtration.
- .2 Only one filter shall be backwashed at a time.
- .3 Filtered water turbidity shall not exceed 1.0 NTU when operating at the design rate.
- .3 Extra Quantities:
  - .1 Supply an additional 10% of filter/greensand media, above and beyond the required amount in 50 lb bags.
  - .2 Double bag the material in 6 mil plastic bags. Deliver the bags to the site and store in a place to be determined by the Contract Administrator.

## **2.4 EQUIPMENT CONTROL PANEL**

- .1 All processes shall be automated by a controller. Provide a PLC system(s) that allows automatic and manual control of the well and treatment system.
- .2 General faults shall be annunciated by flashing light on a display screen or dedicated strobe.
- .3 The system shall be capable of receiving inputs from all instrumentation and equipment whether supplied under this contract or through another.
- .4 The control system shall include, but not be limited to, the necessary relays, timers, indicators, software, programming and controls necessary to monitor, operate and control the packaged plant.
- .5 The package plant shall be supplied complete with integral panel boards and PLC based control panel located on the package plant structure. The control panel shall be factory assembled and pre-wired.

## **2.5 MATERIALS**

- .1 All materials shall be suitable their intended use under normal and upset conditions (including, pressure, flows, temperature, pH, chlorine concentration).
- .2 All components shall be corrosion resistant.
- .3 All materials and coatings shall be suitable for use in potable water.
- .4 Control panel enclosure to be NEMA 4.

## **2.6 STANDARD OF ACCEPTANCE**

- .1 Filtration:
  - .1 Katalox.
  - .2 Culligan Filtration.
  - .3 Approved equal.
- .2 Softener:
  - .1 Waterite.
  - .2 Culligan Softener.
  - .3 Approved equal.
- .3 Chemical Injection System:
  - .1 Qdos.
  - .2 Approved equal.
- .4 UV System:
  - .1 UV Dynamics.
  - .2 Trojan.
  - .3 Approved equal.

- .5 Wellfield PLC:
  - .1 Micrologix.
  - .2 Approved equal.
- .6 Flow Meter
  - .1 Neptune.
  - .2 Sensus.
  - .3 Approved equal.

### **Part 3 Execution**

#### **3.1 EQUIPMENT HANDLING**

- .1 The Contractor shall include costs associated with loading, shipping, insuring, delivering, unloading and storing all equipment to the site. The Contractor shall be responsible for receiving unloading and setting into place all equipment.
- .2 Provide instructions to the Contract Administrator for loading, unloading and storage requirements emphasizing any precautions or procedures required. These instructions to precede delivery of equipment to site by minimum five (5) business days.
- .3 Coordinate delivery and unloading with contractor to prevent double handling.

#### **3.2 SUPERVISION AND START-UP**

- .1 The contractor shall be responsible for organizing, coordinating, directing and general oversight of the start and commissioning process.
- .2 The supplier shall provide a skilled factory trained technician to inspect the installation of the equipment and to provide start-up services and conduct operator training.
- .3 Start-up for each piece of equipment shall consist of inspecting the installation, starting and running the equipment and making any adjustments. Start-up for each piece of equipment shall be considered complete when the Contract Administrator is notified, in writing, by the Supplier that the equipment is installed, checked and in working order and ready to be put in continuous operation.
- .4 Each filter shall undergo at least 3 full cycles during commissioning. Filtered water shall be sampled for turbidity, general chemistry, bacteriological, metal scan, THMs, bromodichloromethane, TOC and pH. The sample locations and times shall be coordinated in advance with the Owner. All results shall be in accordance with the performance requirements listed in this section.
- .5 The site visit schedule for the factory trained technician shall be the following, unless otherwise specified by the Contract Administrator during construction:
  - .1 The supplier shall be responsible for providing any technical assistance during installation/construction, and oversee/direct startup, testing, commissioning and training.
  - .2 Submit a report to the Contract Administrator following successful start-up and testing and confirming equipment has been installed correctly and in full accordance with manufacturer's instructions within five working days.

#### **3.3 PERFORMANCE, GUARANTIES AND WARRANTIES**

- .1 Refer to Contract Documents and herein for warranties on workmanship, materials, equipment and performance guarantee. The treatments systems shall have a 2 year warranty on workmanship, materials, equipment and performance guarantee.
- .2 The supplier and contractor guarantees and warrants that all equipment covered by or supplied pursuant to his submission shall:
  - .1 Comply with the specifications for said equipment.

- .2 Be free from defects in design, manufacture, workmanship or materials.
  - .3 Have any breakage, damage, defects or deterioration (other than those due to the direct negligence of parties other than the supplier or contractor or to the imposition on the equipment of extraordinary working conditions or to normal wear and tear) in the said equipment that occur or are detected and are reported to the Supplier within the guarantee/warranty period referred to above made good promptly by the Supplier at his entire expense including the expense of all necessary labour, supervision, traveling, replacement parts and transportation. (To assist the Supplier in having work carried out on installed equipment or in removing or replacing installed equipment or parts thereof, the Owner will take all reasonable steps to provide the Supplier with ready access to such equipment.).
  - .4 Meet or exceed the parameters identified in this specification and the Canadian Drinking Water Quality Guidelines.
- 
- .3 The Contractor shall, to the satisfaction of the Owner, rectify any defects in the work or which may appear therein during the warranty period.
  - .4 Treatment performance shall be achieved with no more than 2% of treated water being required for filter backwashing on a daily basis.

### **NMS DIVISION 26 SPECIFICATIONS**

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Special Provision (Page 323)

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All information under the above special provision is deleted in its entirety and replaced with the following:

The following Division 26 National Master Specifications are included in this Contract.

### **NMS 260500 – COMMON WORK RESULTS - ELECTRICAL**

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Special Provision

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#### **Part 1 General**

##### **1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
  - .2 CAN/CSA-C22.3 No.1-10, Overhead Systems.
  - .3 CAN3-C235-83 (R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC):
  - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

##### **1.2 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 For the purposed of this section
  - .1 "PROCESS AREA" an area inside the building where chemical or industrial operations are conducted, and which emits or has the potential to emit air

contaminants and refers to the Vehicle Maintenance Garage and Material Storage Building.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for all electrical equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit for review single line electrical diagrams and locate the approved Single Line Diagrams in glazed frames as below:
  - .1 Electrical distribution system in main electrical room.
  - .2 Electrical power generation and distribution systems in power plant rooms.
- .3 Shop drawings:
  - .1 Submit drawings for all equipment for review by engineer.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .4 Indicate drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 Submit one copy of drawings and product data to Contract Administrator.
  - .6 If changes are required, notify the Contract Administrator of these changes before they are made.
- .4 Certificates:
  - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
  - .2 Submit test results of installed electrical systems and instrumentation.
  - .3 Permits and fees: in accordance with General Conditions of contract.
  - .4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.
- .5 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within five days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

### **1.4 CLOSEOUT SUBMITTALS**

- .1 Operation and Maintenance Data: submit operation and maintenance data for all electrical equipment for incorporation into manual.
- .2 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .3 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures. Safety precautions.
  - .3 Procedures to be followed in event of equipment failure.
  - .4 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .4 Print or engrave operating instructions and frame under glass or in approved laminated

plastic.

- .5 Post instructions where directed.
- .6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect all electrical equipment from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new
- .4 Material Delivery Schedule: provide Contract Administrator with schedule within 2 weeks after award of Contract.
- .5 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

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

### **2.2 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with their respective specification section requirements.
- .2 Material and Equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

### **2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring specified in mechanical sections as shown on mechanical drawings.

## **2.4 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction or inspection authorities or Owner's Representative and Contract Administrator.
- .2 Decal signs, minimum size 175 x 250 mm.

## **2.5 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

## **2.6 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: Limacoid 3 mm matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
  - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 × 50 mm	1 line	3 mm high letters
Size 2	12 × 70 mm	1 line	5 mm high letters
Size 3	12 × 70 mm	2 lines	3 mm high letters
Size 4	20 × 90 mm	1 line	8 mm high letters
Size 5	20 × 90 mm	2 lines	5 mm high letters
Size 6	25 × 100 mm	1 line	12 mm high letters
Size 7	25 × 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Owner's Representative and Contract Administrator prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

## **2.7 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## **2.8 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code conduits, boxes and metallic sheathed cables.

- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour:

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

## **2.9 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel:
- .1 Paint outdoor electrical equipment light gray to EEMAC 2Y-1.
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 or ASA-61.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

### **3.2 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 and No. 7 except where specified otherwise.

### **3.3 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

### **3.4 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete:
- .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

### **3.5 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors, where possible

### **3.6 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation. Install electrical equipment at following heights unless indicated otherwise:
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 450 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
- .3 Panelboards: as required by Code or as indicated.
- .4 Telephone and data/computer outlets: 450 mm or as indicated.
- .5 Wall mounted telephone and interphone outlets: 1500 mm.
- .6 Fire alarm stations: 1120 mm.
- .7 Fire alarm bells: 2100 mm.
- .8 Television outlets: 1500 mm.

### **3.7 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others as part of the work.
- .2 The Contractor shall gather all equipment and cable data and hire a testing firm to perform the short circuit, protective device co-ordination and Arc flash studies including all breakers, generator protection and utility interface requirements. All studies shall be reviewed and stamped by a professional engineer in the Province of Ontario.
- .3 The testing firm hired by the contractor shall evaluate the adequacy of all equipment including but not limited to power circuit breakers, load interrupter switches, molded case breakers, automatic transfer switches and fuses. Any areas or inadequacies in the equipment shall be reported to the Contract Administrator.
- .4 The protective device co-ordination study shall be performed by the contractor to select the final fuse sizing, protective relay characteristics and settings. The object of the study is to obtain optimum protective and co-ordination performance for these devices. The phase and ground overcurrent protection, protective relay settings, and utility interface protections shall

be included.

- .5 Complete study to be reviewed and approved by the Owner, Contract Administrator and ESA prior to settings being applied to the equipment.

### **3.8 FIELD QUALITY CONTROL**

- .1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others.
- .2 The Contractor shall engage the services of a recognized independent testing firm for the purposes of protective device testing and inspections. The testing firm shall be experienced with this type of project and selection is subject to the approval of the Contract Administrator. A final report signed by the testing technician shall be submitted indicating test methods, test equipment used, test results and final settings for all relays.
- .3 Where electronic relays are programmed, the final electronic settings files shall be submitted as part of the O&M Manual.
- .4 The testing agency shall perform visual and mechanical testing of all equipment to ensure that the equipment has been installed per the manufacturer's specifications, the meagering and high-potential testing of cables and equipment, any adjustments to the equipment in the field application of the final relay settings and testing of all relays during commissioning.
- .5 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .6 Testing shall include all contractor purchased equipment, Owner Pre-purchased equipment, or equipment supplied by others as part of this work:
  - .1 Power generation and distribution systems including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Systems: fire alarm system and communications.
  - .6 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
    - .4 Check potential difference between ground and neutral. Potential difference between ground and neutral shall not exceed 2V.
- .7 The testing firm shall maintain written records of all tests, calibrations and settings and upon completion of the project, assemble and certify final test reports. Submit digital copies of all test reports to the Contract Administrator.
- .8 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

- .9 Carry out tests in presence of Owner's Representative or Contract Administrator.
- .10 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .11 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 – Submittals.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in Part 1 – Quality Assurance.

### **3.9 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

## **NMS 260520 – WIRE AND BOX CONNECTORS – (0-1000V)**

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### Special Provision

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#### **Part 1 General**

##### **1.1 SECTION INCLUDES**

- .1 Materials and installation for wire and box connectors.

##### **1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-C22.2 No.18-98 (R2003), Outlet Boxes, Conduit Boxes and Fittings.
  - .2 CAN/CSA-C22.2 No.65-03 (R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMJ-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

#### **Part 2 Products**

##### **2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper or copper alloy sized to fit copper conductors 10 AWG or less.

- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
  - .1 Connector body and stud clamp for stranded round copper conductors or bar.
  - .2 Clamp for stranded round copper conductors or bar.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors or bar.
  - .5 Sized for conductors or bars as indicated.
- .4 Clamps or connectors for armoured cable, and flexible conduit, as required to: CAN/CSA-C22.2 No.18.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
  - .2 Install fixture type connectors and tighten. Replace insulating cap.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

### **NMS 260521 – WIRE AND BOX CABLES – (0-1000V)**

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#### **Special Provision**

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### **Part 1 General**

#### **1.1 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

#### **1.2 REFERENCES**

- .1 CSA C22.2 No .0.3-01 R2005, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-M89 (R2007), Type TECK 90 Cable.

#### **1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

#### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

### **Part 2 Products**

#### **2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V or 1000V insulation of chemically cross

linked thermosetting polyethylene material rated RW90 or RWU90.

- .3 Use RW90 for building installations in above ground applications.
- .4 Use RWU90 for grade slab in embedded conduits systems or for underground installations.
- .5 Neutral supported cable: 3 phase insulated conductors of aluminium and one neutral conductor of aluminium steel reinforced, size as indicated. Insulation: Type NSF 2 flame retardant rated 600 V.

## **2.2 TECK CABLE**

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
  - .1 Grounding conductor: copper.
  - .2 Circuit conductors: copper, size and number as indicated.
- .3 Insulation:
  - .1 Chemically cross linked thermosetting polyethylene rated type RW90, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking galvanized steel.
- .6 Overall covering: polyvinyl chloride material.
- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables at 300 mm centers.
  - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
  - .1 Watertight, approved for TECK cable.
  - .2 Explosion proof for hazardous locations, approved for TECK cable.

## **2.3 ARMoured CABLES**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.

## **2.4 CONTROL CABLES**

- .1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type polyethylene insulation with shielding of metallized tapes over each pair and over all conductors and overall covering of PVC jackets interlocked armour of flat galvanized steel. Cables shall be tray rated
- .2 600 V type: stranded annealed copper conductors, sizes as indicated with cross linked polyethylene type RW90 (x link).

## **Part 3 Execution**

### **3.1 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:

- .1 In conduit systems in accordance with Section 26 05 34.

### **3.2 INSTALLATION OF TECK CABLE 0-1000 V**

- .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 – 1000 V.

### **3.3 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

### **3.4 INSTALLATION OF CONTROL CABLES**

- .1 Install control cables in conduit or cable trays as indicated
- .2 Ground control cable shield at one end only.

### **3.5 HOT SURFACES**

- .1 Where exposed to hot surfaces, maintain 1-5/8" clearance from hot surfaces and provide thermal break between support steel and conduit, cables, etc.

## **NMS 260528 – GROUNDING SECONDARY**

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### Special Provision

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#### **Part 1 General**

##### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results For Electrical.

##### **1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):
  - .1 ANSI/IEEE 837-2002, Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International).
- .3 CAN/CSA Z32-2009, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

##### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.

- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Contract Administrator.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 20 mm dia. by 3 m long.
- .4 Plate electrodes: copper, surface area 0.2 m<sup>2</sup>, 1.6 mm thick.
- .5 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .6 Insulated grounding conductors: green.
- .7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .8 Non corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

## **Part 3 Execution**

### **3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process or permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both one ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not

inherently provided with equipment.

- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .13 Ground secondary service pedestals.

### **3.2 MAINTENANCE HOLES**

- .1 Install conveniently located grounding stud, electrode, size 4/0 stranded copper conductor in each maintenance hole.
- .2 Install ground rod in each manhole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made.

### **3.3 ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod, plate electrodes and make grounding connections.
- .5 Bond separate, multiple electrodes together.
- .6 Use size 4/0 AWG copper conductors for connections to electrodes.
- .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

### **3.4 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of secondary 600 V system.

### **3.5 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

### **3.6 GROUNDING BUS**

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

### **3.7 COMMUNICATION SYSTEMS**

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
  - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
  - .2 Sound, fire alarm, intercommunication systems as indicated.

### **3.8 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

## **NMS 260529 – HANGERS AND SUPPORTS**

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### Special Provision

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#### **Part 1 General**

##### **1.1 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal bonding, flatten and place in designated area for recycling.

#### **Part 2 Products**

##### **2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted on walls and ceilings.

#### **Part 3 Execution**

##### **3.1 INSTALLATION**

- .1 Secure equipment to solid masonry with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

- .6 Fasten exposed conduit or cables to building construction or support system using straps:
  - .1 One hole malleable iron steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems:
  - .1 Support individual cable or conduit runs with 6 mm dia. threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia. threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 2.5 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

## **NMS 260531 – SPLITTERS, JUNCTION, PULL BOXES, AND CABINETS**

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### Special Provision

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#### **Part 1 General**

##### **1.1 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets for review.

##### **1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

#### **Part 2 Products**

##### **2.1 SPLITTERS**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position. NEMA 12 indoors, NEMA 3R outdoors, and NEMA 4X in hazardous areas.
- .2 Main and branch lugs or connection bars to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.

## 2.2 JUNCTION AND PULL BOXES

- .1 Junction and pull shall be of size as indicated on the drawing. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.
- .2 Welded construction with screw on flat covers for surface mounting.
- .3 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

## 2.3 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, two keys, containing sheet steel backboard for surface mounting. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.
- .3 Cabinets and enclosures located in process areas or outdoors shall be stainless steel. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.

## Part 3 Execution

### 3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

### 3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

### 3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Install size 2 identification labels indicating system name and/or voltage and phase.

## **NMS 260532 – OUTLET BOXES, CONDUITS BOXES AND FITTINGS**

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Special Provision

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## Part 1 General

### 1.1 REFERENCES

- .1 Canadian Electrical Code (latest edition).

## **1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

## **Part 2 Products**

### **2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Provide weatherproof covers in process areas and outdoors. Covers to be extra deep to facilitate closure of cover with cord plugged in.
- .5 Blank cover plates for boxes without wiring devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.
- .7 Stainless steel or PVC boxes and fittings in process areas or outdoors.

### **2.2 OUTLET BOXES**

- .1 Stainless steel or PVC single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 Stainless steel or PVC utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster tile walls.

### **2.3 MASONRY BOXES**

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

### **2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

### **2.5 FLOOR BOXES**

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12

mm and 19 mm conduit. Minimum size: 73 mm deep.

## **2.6 CONDUIT BOXES**

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle. Use non-metallic boxes in corrosive areas.
- .2 Explosion proof boxes in hazardous areas as required by the Canadian Electrical Code.

## **2.7 OUTLET BOXES FOR NON METALLIC SHEATHED CABLE**

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

## **2.8 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Stainless steel or PVC in process areas or outdoors.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

## **NMS 260533.01 – SURFACE AND LIGHTING FIXTURE RACEWAYS**

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### Special Provision

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## **Part 1 General**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-C22.2 No. 62-93 (R2003), Surface Raceway Systems.

## **Part 2 Products**

### **2.1 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)**

- .1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.

- .2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.
- .3 Finish: grey enamel.
- .4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

## **2.2 SURFACE RACEWAY SYSTEM (WIRING LAID IN)**

- .1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
  - .1 Finish: grey enamel.
- .2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

## **2.3 SURFACE FLOOR RACEWAY SYSTEM**

- .1 Two piece steel assembly manufactured for floor lay-in type raceway to CAN/CSA-C22.2 No. 62.
- .2 Finish: grey enamel.

## **2.4 CHANNEL RACEWAY**

- .1 Channel type raceway: to CAN/CSA-C22.2 No. 62, steel, solid.

## **2.5 PLASTIC RACEWAY**

- .1 Plastic raceway: to CAN/CSA-C22.2 No. 62, rigid extruded polyvinyl chloride or reinforced thermosetting plastic with slots on either side of raceway for exit of wiring.
- .2 Channel: with solid snap-on cover throughout entire length.

## **2.6 LIGHTING FIXTURE RACEWAY**

- .1 LED fixture support system using channel type raceway with snap-on cover.
- .2 Channel: minimum 1.6 mm thick.
- .3 Clamp hangers with threaded rod, rod hangers, or chain.

## **2.7 FITTINGS**

- .1 Elbows, tees, supports, connectors couplings and fittings: to CAN/CSA-C22.2 No. 62.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install raceway systems as indicated and in accordance with manufacturer's instructions.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets and connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways for different services where required by code.
- .6 Install wiring after installation of raceway system is complete.

**NMS 260534 – CONDUITS, CONDUIT FASTENINGS, AND CONDUIT FITTINGS**

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Special Provision

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**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA):
  - .1 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 45-M1981, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3, Flexible Non-metallic Tubing.

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

**Part 2 Products**

**2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel or aluminum in process areas threaded at both ends.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with water tight couplings. Set screw couplings and connectors are not allowed.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2. Use Schedule 40 for corrosive areas, duct banks, reinforce concrete and direct buried installation.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .5 Flexible PVC conduit: to CAN/CSA C22.2 No. 227.3.

**2.2 CONDUIT FASTENINGS**

- .1 One hole stainless steel or PVC straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m oc.
- .4 Threaded rods, 6 mm dia. to support suspended channels.

## **2.3 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit, non-painted.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.
- .4 Use explosion proof flexible connection for connection to explosion proof devices.
- .5 Install conduit sealing fittings in hazardous areas. Fill with compound.

## **2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

## **2.5 FISH CORD**

- .1 Polypropylene.

# **Part 3 Execution**

## **3.1 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .4 Use rigid PVC in corrosive areas.
- .5 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .6 Use rigid PVC conduit underground.
- .7 Use flexible metal conduit for connection to motors in dry areas.
- .8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations. Use liquid tight fittings.
- .9 Where exposed to hot surfaces, maintain 1-5/8" clearance from hot surfaces and provide thermal break between support steel and conduit.
- .10 Use explosion proof flexible connection for connection to explosion proof motors.
- .11 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .12 Minimum conduit size for lighting and power circuits: 21 mm.
- .13 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

- .14 Mechanically bend steel conduit over 21 mm dia.
- .15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .16 All conduit threads to be sealed. Conduits entering on top of enclosures in process areas shall utilize O-rings.
- .17 Install fish cord in empty conduits.
- .18 Run 2 - 27 mm spare conduits up to ceiling space and 2 - 27 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .19 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .20 Dry conduits out before installing wire.

### **3.2 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.3 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

### **3.4 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel. Install in centre one third of slab. Confirm with structural engineer that the depth of concrete is appropriate for conduits.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete. Confirm minimum cover with structural engineer.
- .7 Organize conduits in slab to minimize cross overs.

### **3.5 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE**

- .1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

### **3.6 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC accepted) with heavy coat of bituminous paint.

## **NMS 260543.01 – INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS**

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### **Special Provision**

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#### **Part 1 General**

##### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results For Electrical.

##### **1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

#### **Part 2 Products**

##### **2.1 CABLE PROTECTION**

- .1 38 × 140 mm planks pressure treated with clear, coloured, or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

##### **2.2 MARKERS**

- .1 Coloured plastic tape (150 mm wide) suitable for marking and detecting buried underground cables. Low density polyethylene tape with stainless steel wires labeled “Caution Electrical Cable Below”.

#### **Part 3 Execution**

##### **3.1 DIRECT BURIAL OF CABLES**

- .1 After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
  - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.

- .4      Underground cable splices not acceptable.
- .5      Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6      Cable separation:
  - .1      Maintain 75 mm minimum separation between cables of different circuits.
  - .2      Maintain 300 mm horizontal separation between low and high voltage cables.
  - .3      When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
  - .4      At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
  - .5      Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
  - .6      Install treated planks on lower cables 0.6 m in each direction at crossings.
- .7      After sand protective cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run as indicated.

### **3.2      CABLE INSTALLATION IN DUCTS**

- .1      Install cables as indicated in ducts.
  - .1      Do not pull spliced cables inside ducts.
- .2      Install multiple cables in duct simultaneously.
- .3      Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4      To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.
- .5      Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .6      After installation of cables, seal duct ends with duct sealing compound.

### **3.3      MARKERS**

- .1      Mark cable every 150 m along cable duct runs and changes in direction.

### **3.4      FIELD QUALITY CONTROL**

- .1      Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2      Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3      Check phase rotation and identify each phase conductor of each feeder.
- .4      Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 mega ohms.
- .5      Pre-acceptance tests.
  - .1      After installing cable but before splicing and terminating, perform insulation resistance test with 1000V megger on each phase conductor.
  - .2      Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6      Acceptance Tests
  - .1      Ensure that terminations and accessory equipment are disconnected.

- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 High Potential (Hipot) Testing.
  - .1 Conduct hipot testing at 100% of original factory test voltage in accordance with ICEA recommendations.
- .4 Leakage Current Testing.
  - .1 Raise voltage in steps from zero to maximum values as specified by ICEA for type of cable being tested.
  - .2 Hold maximum voltage for specified time period by ICEA manufacturer.
  - .3 Record leakage current at each step.
- .7 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in commissioning manual.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

### **3.5 PROTECTION**

- .1 Repair damage to adjacent materials caused by cables installation.

## **NMS 260573 – SHORT CIRCUIT, PROTECTIVE SYSTEM COORDINATION & ARC FLASH STUDY**

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### Special Provision

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#### **Part 1 General**

##### **1.1 DESCRIPTION**

- .1 Provide a coordination/protective study, short circuit, and arc flash incident energy analysis per IEEE Std 1584-2018 and to the requirements of CSA Z462:21 on the electrical distribution system of all equipment specified herein and submit for review.
- .2 Include the following:
  - .1 600V cable thermal damage curves.
  - .2 600V circuit breaker overcurrent, overload, ground fault devices, and zone interlocking.
  - .3 347/600V and 120/208V panelboards, MCCs, Switchboards, and switchgear, and connecting feeder cables.
  - .4 600V transformer damage curves, magnetizing currents for all transformers 150kVA and larger.
  - .5 Locked rotor currents, acceleration times and damage curves for motors 75kW and larger.
  - .6 Any additional data necessary for successful completion of the coordination and short circuit study.
- .3 Data shall clearly state the operating time in cycles of each breaker and indicate whether the time current curves for relays are inclusive of breaker trippings time or otherwise.
- .4 Prepare a summation chart showing all ratings and settings with easy reference to the appropriate curve.
- .5 Symmetrical and asymmetrical fault current calculations shall be submitted to verify the correct choice of the protective elements of the system.
- .6 Prepare a systems single line diagram on which the resultant short circuit values, device numbers and equipment ratings are shown.
- .7 Include a list of recommended settings for each relay.

##### **1.2 QUALIFICATIONS**

- .1 This study shall be provided by the supplier of the motor control center or the main electrical distribution equipment.
- .2 This study shall be performed by and bear the stamp of a Professional Engineer registered in the Province of Ontario.

### **1.3 SUBMITTALS**

- .1 Submit the complete study for review prior to carrying out calibration and verification.
- .2 Submit typed results of coordination and short circuit study in maintenance manuals.

## **PART 2 PRODUCTS**

### **2.1 TRIPPING DEVICES AND CABLES**

- .1 Relay style, CT ratios and fuse/breaker, and cables sizes have been selected on a preliminary basis for design purposes. Final selection shall be based on the results of this study and shall be included at no extra cost.

## **PART 3 EXECUTION**

### **3.1 DATA**

- .1 Provide the main switchboard/MCC and/or the distribution Equipment supplier with all relevant data for equipment not provided by that supplier.
- .2 Provide Arc Flash Hazard Level labels for all electrical equipment.

## **NMS 260923.01 – METERING AND SWITCHBOARD INSTRUMENTS**

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### **Special Provision**

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### **Part 1 General**

#### **1.1 SECTION INCLUDES**

- .1 Materials, components, cabinets, instruments and installation for metering and switchboard Instruments.

#### **1.2 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - Common Work Results - Electrical.

#### **1.3 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C39.1-1981, Requirements, Electrical Analog Indicating Instruments.
- .2 CSA Group (CSA)
  - .1 CAN3-C17-M84 (R2008), Alternating - Current Electricity Metering.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metering and switchboard instruments and include product characteristics,

- performance criteria, physical size, finish and limitations.
- .2 Include meter, instrument, outline dimensions, panel drilling dimensions and installation cutout template.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Contract Administrator.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 METER**

- .1 Include digital metering system (DMS) (3 total) with remote accessibility via web interface (if necessary provide CT's/PT's). PM5500 or approved equal
  - .1 Provide 1 unit to monitor utility power (mount on MDS as per drawing).
  - .2 Provide 1 unit to monitor generator power (mount on MDS as per drawing).
  - .3 Provide 1 unit at each system to monitor Heat Trace system power (mount to door of heat trace enclosure. Reference Div 238314).
- .2 Display the following quantities (but not limited to):
  - .1 3ph voltages
  - .2 Power
  - .3 Demand
  - .4 Energy
  - .5 Frequency
  - .6 Power factor.

### **2.2 METER SOCKET**

- .1 Weatherproof meter socket to suit meter with automatic current transformer shorting devices when metre removed.

### **2.3 METER CABINET**

- .1 Sheet steel CSA enclosure NEMA 12 indoors or stainless steel Nema 3R/NEMA 4X in process areas or outdoors with meter backplate, to accommodate meters, test terminal block and associated equipment, factory installed and wired.

### **2.4 TEST TERMINAL BLOCKS**

- .1 Test terminal blocks: Where the customer or authorities require sampling data.

### **2.5 INDICATING INSTRUMENTS**

- .1 Digital indicating instruments: 1% accuracy, switchboard mounting:
  - .1 Current: true RMS range as indicated.
  - .2 Voltage: true RMS range as indicated.
  - .3 Watt: range as indicated.
  - .4 Vars: range as indicated.

- .5 Frequency: range as indicated.
  - .6 Power factor: range as indicated.
  - .7 Ethernet communications.
- .2 ION 7550 as indicated or equal.

## **2.6 SHOP INSTALLATION**

- .1 Install customer metering as shown on drawings.
- .2 Ensure adequate spacing between current transformers installed on each phase.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

## **Part 3 Execution**

### **3.1 METERING INSTALLATION**

- .1 Install meters and instruments in location free from vibration and shock.
- .2 Make connections in accordance with diagrams.
- .3 If applicable, ensure power factor corrective equipment connected on load side of meter.
- .4 Connect meter and instrument transformer cabinets to ground.

### **3.2 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00 - Common Work Results - Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

### **3.3 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metering and switchboard instrument installation.

## **NMS 261216.01 – DRY TYPE TRANSFORMER UP TO 600V PRIMARY**

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Special Provision

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## **Part 1 General**

### **1.1 SECTION INCLUDES**

- .1 Materials and components for dry type transformers up to 600 V primary, equipment

identification and transformer installation.

## **1.2 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – Common Work Results For Electrical.

## **1.3 REFERENCES**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-C22.2 No.47-M90 (R2007), Air-Cooled Transformers (Dry Type).
  - .2 CSA C9-02 (R2007), Dry-Type Transformers.
  - .3 CAN/CSA-C802.2-06, Minimum Efficiency Values for Dry Type Transformers.
- .2 National Electrical Manufacturers Association (NEMA)

## **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Contract Administrator.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 DESIGN DESCRIPTION**

- .1 Use transformers of one manufacturer throughout project and in accordance with CAN/CSA-C22.2 and No.47 CSA-C9.
- .2 Meets NEMA TP1 and CSA C802.2 efficiencies.
- .3 Design:
  - .1 Type: ANN.
  - .2 1 phase units and 3 phase units, kVA as indicated, V input as indicated, V output as indicated, 60 Hz.
  - .3 Voltage taps:  $\pm 2 \frac{1}{2}\%$  above and below neutral.
  - .4 Insulation: Class H, 220 degrees C temperature rise.
  - .5 Windings: 2, copper.
  - .6 Basic Impulse Level (BIL): standard.
  - .7 Hipot: standard.
  - .8 Average sound level: standard.
  - .9 Impedance at 170 degrees C: standard.
  - .10 Enclosure: NEMA CSA, removable metal front panel.
  - .11 Mounting: wall or floor.
  - .12 Finish: in accordance with Section 26 05 00 - Common Work Results for Electrical.

### **2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Label size: 7.

- .3 Nameplate wording: Unit ID plus kVA rating plus primary and secondary voltage.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Mount dry type transformers up to 75 kVA on wall brackets above distribution panels.
- .2 Mount dry type transformers above 75 kVA on floor.
- .3 Ensure adequate clearance around transformer for ventilation.
- .4 Install transformers in level upright position.
- .5 Remove shipping supports only after transformer is installed and just before putting into service.
- .6 Loosen isolation pad bolts until no compression is visible.
- .7 Make primary and secondary connections in accordance with wiring diagram.
- .8 Energize transformers after installation is complete.
- .9 Ensure clearances around electrical equipment meet current CEC requirements.
- .10 Make conduit entry into bottom 1/3 of transformer enclosure.

#### **3.2 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by dry type transformers installation.

### **NMS 262300 – LOW VOLTAGE SWITCHGEAR**

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#### Special Provision

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### **Part 1 General**

#### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No.31-10, Switchgear Assemblies.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC G8-3.3-89, Metal Enclosed Interrupter Switchgear Assemblies.

#### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for low voltage switchgear and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit shop drawings for review by contract administrator.

- .2 Indicate on drawings:
  - .1 Floor anchoring method and foundation template.
  - .2 Dimensioned cable entry and exit locations.
  - .3 Dimensioned position and size of bus.
  - .4 Overall length, height and depth of complete switchgear.
  - .5 Dimensioned layout of internal and front panel mounted components.
- .4 Certificates:
  - .1 Submit certified factory test results.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for low voltage switchgear and components for incorporation into manual.

### **1.4 EXTRA STOCK MATERIALS**

- .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 3 fuses for each type above 600 A.
  - .2 6 fuses for each type up to and including 600 A.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Switchgear assembly: to CSA C22.2 No.31.

### **2.2 RATING**

- .1 Secondary switchgear: indoor, 600/347V, 400A, 3 phase, 4 wire, 60 Hz, minimum short circuit capacity 18 kA (rms symmetrical).

### **2.3 ENCLOSURE**

- .1 Main incoming section to contain:
  - .1 Moulded case circuit breaker sized as indicated.
  - .2 Digital metering system to Section 26 09 23.01 - Metering and Switchboard Instruments.
  - .3 Provision for electrical power supply authority metering.
- .2 Distribution sections to contain:
  - .1 Moulded case circuit breaker sized as indicated.
  - .2 Copper bus, from main section to distribution sections.
- .3 Blanked off spaces with bus stabs and hardware for mounting future units.
- .4 Metal enclosed, free standing, floor mounted, dead front, indoor, CSA Enclosure 1 cubicle unit.
- .5 Ventilating louvres: vermin, insect proof.
- .6 Access from front.
- .7 Steel channel sills for base mounting in single length common to multi-cubicle switchboard.
- .8 Provision for future extension on both sides.

- .9 Include manually operated breaker lifting device mounted on the top of the switch gear.
  - .1 Where air circuit breakers are mounted in multiple cubicles, lifting device to travel on rail on top of switch board.
- .10 Receptacle: 120 V, single phase, 60 Hz, duplex, U-ground. For overall panel, provide 2 outlets.

## **2.4 BUSBARS**

- .1 Three phase and 100% rated bare busbars, continuous current rating 400 A self-cooled, extending full width of cubicle, suitably supported on insulators.
- .2 Main connections between bus and major switching components to have continuous current rating to match major switching components.
- .3 Busbars and main connections: 99.30 % minimum conductivity copper.
- .4 Allow for extension of bus on both sides of unit without need for further drilling or preparation in field.
- .5 Tin plated joints, secured with non-corrosive bolts and Belleville washers.
- .6 Identify phases of busbars by suitable marking.
- .7 Busbar connectors, when switchboard shipped in more than one section.

## **2.5 GROUNDING**

- .1 Copper ground bus not smaller than 50 mm x 6 mm extending full width of multi-cubicle switchboard and situated at bottom.
- .2 Lugs at each end for size 4/0 AWG grounding cable.

## **2.12 POWER SUPPLY AUTHORITY METERING**

- .1 Separate compartment and metal raceway for exclusive use of power supply authority metering.
- .2 Arrange with authority having jurisdiction for supply of mounting accessories and wiring for metering as follows:
  - .1 Potential transformers.
  - .2 Current transformers.
  - .3 Watthour meter.
  - .4 Demand metre with kWh register.
  - .5 Ammeter.
  - .6 Voltmeter.
  - .7 Ammeter phase selector switch.
  - .8 Voltmeter phase selector switch.

## **2.13 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.
  - .1 Cubicle exteriors gray.
  - .2 Cubicle interiors white.

## **2.14 EQUIPMENT IDENTIFICATION**

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

- .2 Nameplates:
  - .1 White plate, black letters, size 7.
  - .2 Complete switchgear labelled: voltage, system configuration and main bus ampacity.
  - .3 Main cubicle labelled: "Main Switch".
  - .4 Distribution units labelled: "Feeder No.1 ", "Feeder No.2 ".

## **2.15 SOURCE QUALITY CONTROL**

- .1 Contract Administrator to witness final factory tests.
- .2 Notify Contract Administrator in writing 5 days minimum in advance that switchgear assembly is ready for testing.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate switchgear assembly as indicated and bolt to floor.
- .2 Connect main secondary power supply to main breaker.
- .3 Connect load side of breakers in distribution cubicles to distribution feeders.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Run one grounding conductor 4/0 AWG bare copper in 25 mm conduit from ground bus to ground.
- .6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

### **3.2 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by low voltage switchgear installation.

## **NMS 262401 – SERVICE EQUIPMENT**

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### **Special Provision**

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## **Part 1 General**

### **1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for service equipment and include product characteristics, performance criteria, physical size, finish and limitations.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Fused disconnect switch: in accordance with Section 26 28 23 - Disconnect Switches - Fused

and Non-Fused, rating as indicated.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install service equipment.
- .2 Connect to incoming service.
- .3 Connect to outgoing load circuits.
- .4 Install ground fault equipment.
- .5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.
- .6 Make provision for power supply authority's metering.

#### **NMS 262402 – SERVICE ENTRANCE BOARD**

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##### Special Provision

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### **Part 1 General**

#### **1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.2 No.31-10, Switchgear Assemblies.

#### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

#### **1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide:
  - .1 3 extra fuses for each type above 600 A.
  - .2 6 extra fuses for each type up to and including 600 A.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location, indoors, off ground, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect service entrance board from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 SERVICE ENTRANCE BOARD**

- .1 Service Entrance Board: to CSA C22.2 No.31.
- .2 Rating: 600/347 V, 3 phase, 4 wire, 400 A, short circuit current 18 kA (rms symmetrical).
- .3 Cubicles: wall-mounted, dead front, size as indicated.
- .4 Barrier metering section from adjoining Sections.
- .5 Provision for installation of power supply authority metering in barriered Section.
- .6 Owners metering.
- .7 Distribution section.
- .8 Hinged access panels with captive knurled thumb screws.
- .9 Bus bars and main connections: 99.3% copper.
- .10 Bus from load terminals of main breaker to main lugs of distribution section.
- .11 Cable from load terminals of main breaker to metering section and cable from metering section to lugs of distribution section.
- .12 Identify phases with colour coding.

### **2.2 MOULDED CASE CIRCUIT BREAKERS**

- .1 As per Section 26 28 21 Moulded Case Circuit Breakers.

### **2.3 FUSIBLE DISCONNECTS AND FUSES**

- .1 As per Section 26 28 23 Disconnect Switches - Fused and Non-Fused.

### **2.4 GROUNDING**

- .1 Copper ground bus extending full width of cubicles and located at bottom.
- .2 Lugs at each end for size 4/0 AWG grounding cable.

### **2.5 POWER SUPPLY AUTHORITY METERING**

- .1 Separate compartment and metal raceway for exclusive use of power supply authority metering.
- .2 Mounting accessories and wiring for metering supplied by power supply authority:
  - .1 Potential transformers.
  - .2 Current transformers.
  - .3 Watthour meter.
  - .4 Demand metre with kWh register.

### **2.6 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.

- .1 Service entrance board exterior: gray.

## **2.7 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplates:
  - .1 White plate, black letters, size 7.
  - .2 Complete board labelled: "600 V."
  - .3 Main disconnect labelled: "Main Breaker Switch".
  - .4 Branch disconnects labelled: "Feeder No. 1 ", "Feeder No. 2 ", "Feeder No. 3 ", as indicated.

## **2.8 SOURCE QUALITY CONTROL**

- .1 Contract Administrator to witness final factory tests.
- .2 Notify Contract Administrator in writing 5 days in advance that service entrance board is ready for testing.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate service entrance board and fasten to wall.
- .2 Connect main secondary service to line terminals of main breaker.
- .3 Connect load terminals of distribution breakers to feeders.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Run one grounding conductor 4/0 AWG bare copper in 1" conduit from ground bus to building ground.
- .6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

## **NMS 264717 – PANELBOARDS BREAKER TYPE**

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### **Special Provision**

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## **Part 1 General**

### **1.1 SECTION INCLUDES**

- .1 Materials and installation for standard and custom breaker type panelboards.

### **1.2 RELATED SECTIONS**

- .1 Section 01 33 00 Submittal Procedures.
- .2 Section 26 05 00 – Common Work Results – Electrical.
- .3 Section 26 28 21 Moulded Case Circuit Breakers.

### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

#### **1.4 SHOP DRAWINGS**

- .1 Submit Shop Drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

### **Part 2 Products**

#### **2.1 PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No.29 and product of one (1) manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 600 V panelboards: bus and breakers rated for 18kA (symmetrical) interrupting capacity or as indicated on the drawings.
- .3 250 V panelboards: bus and breakers rated for 10kA (symmetrical) interrupting capacity or as indicated on the drawings.
- .4 Panelboard width to be less than 230 mm.
- .5 Integral TVSS.
- .6 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .7 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on plans.
- .8 Two (2) keys for each panelboard and key panelboards alike.
- .9 Copper bus with neutral of same ampere rating as mains.
- .10 Mains: suitable for bolt on breakers.
- .11 Trim with concealed front bolts and hinges.
- .12 Trim and door finish: baked grey enamel.
- .13 Panelboards to be surface mounted with enclosure rated NEMA 1 with drip-hood or as indicated on the drawings.
- .14 Service entrance rated panelboard shall be rated as such.
- .15 Approved manufacture: Eaton, Siemens, Schneider Electric or equal.

#### **2.2 BREAKERS**

- .1 Breakers: to Section 26 28 21 Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock on devices for fire alarm clock outlet, emergency lights, door supervisory, intercom,

stairway, exit and night light circuits.

## **2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results – Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Mount panelboards in MCC, surface mount to walls, or as indicated on the plans.
- .2 Connect loads to circuits.
- .3 Connect neutral conductors to common neutral bus with respective neutral identified.
- .4 Measure load current on each phase and adjust phase loading for a balanced system.

## **NMS 262716 – ELECTRICAL CABINETS AND ENCLOSURES**

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Special Provision

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## **Part 1 General**

### **1.1 REFERENCES**

- .1 The Munsell System of Colour Notation.

### **1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 All enclosures shall be NEMA 12 indoors or stainless steel NEMA 3R/NEMA 4X in process areas or outdoors.
- .2 Enclosure constructed with 2.7 mm thick minimum steel, with weather and corrosion resistant finish, Munsell Notation 7.5GY3.5/1.5, size as indicated.
- .3 Entire enclosure capable of withstanding maximum impact force of 86 MN/m<sup>2</sup> area without rupture of material.

- .4 Removable enclosure panels with formed edges, galvanized steel external fasteners removable only from inside enclosure.
- .5 Enclosure equipped with hot dipped galvanized mounting rails 1 m adjustable horizontally and vertically to enable mounting of equipment at any location within housing:
  - .1 Rails: 14 mm holes and 50 x 14 mm slots on 100 mm centres for horizontal adjustment.
  - .2 Holes in side panel flanges in 60 mm increments for vertical adjustment.
- .6 Cover: tamperproof, bolt-on, domed to shed water.
- .7 Door: minimum 1 m wide, hinged, 3 point latching, with padlocking means.
- .8 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, vermin.
- .9 Door interlocks: as required.
- .10 Enclosure construction such as to allow any configuration of single or ganged enclosures.
- .11 Enclosure capable of being shipped in knocked-down condition.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Assemble enclosure in accordance with manufacturer's instructions.
- .2 Mount equipment in enclosure.

### **NMS 262726 – WIRING DEVICES**

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#### Special Provision

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### **Part 1 General**

#### **1.1 SECTION INCLUDES**

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

#### **1.2 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results for Electrical.

#### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.42 10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA C22.2 No.42.1-13, Cover Plates for Flush Mounted Wiring Devices (Bi national standard, with UL 514D).
  - .3 CSA C22.2 No.55 15, Special Use Switches.
  - .4 CSA C22.2 No.111 10 (R2015), General Use Snap Switches (Bi national standard, with UL 20).

#### **1.4 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Submittal Procedures.

## **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Construction Waste Management and Disposal Work plan.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

## **Part 2 Products**

### **2.1 SWITCHES**

- .1 15 or 20 A, 120 V, single pole, double pole, three-way, four-way switches to: C22.2 NO. 55-15 and C22.2 NO. 111-10 (R2015).
- .2 Manually operated general purpose ac switches with following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Explosion proof switches where required.

### **2.2 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5 20 R, 125 V, 15 A, U ground, to: C22.2 NO. 42-10 (R2015) with following features:
  - .1 white urea moulded housing or as indicated.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and riveted grounding contacts.
- .2 Single receptacles CSA type 5 20 R, 125 V, 15 A, U ground with following features:
  - .1 white urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Four back wired entrances, two side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

### **2.3 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1-13.
- .2 Cover plates from one manufacturer throughout project.

- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Type 302 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Switches:
  - .1 Install single throw switches with handle in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results – Electrical as indicated.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results – Electrical as indicated.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
  - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
  - .2 Install suitable common cover plates where wiring devices are grouped.
  - .3 Do not use cover plates meant for flush outlet boxes on surface mounted boxes.

### **NMS 262821– MOLDED CASES CIRCUIT BREAKERS**

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#### **Special Provision**

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### **Part 1 General**

#### **1.1 SECTION INCLUDES**

- .1 Materials for moulded-case circuit breakers.

#### **1.2 RELATED SECTIONS**

- .1 Section 01 33 00 Submittal Procedures.

#### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the

second edition of NMX-J-266-ANCE).

## **1.4 SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 Submittal Procedures.
- .2 Include time current characteristic curves for breakers with ampacity of 90 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

## **Part 2 Products**

### **2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers: to CSA C22.2 No. 5.
- .2 Bolt on moulded case circuit breaker: quick make, quick break type, for manual and automatic operation with temperature compensation for 40 degrees Celsius ambient.
- .3 Common trip breakers: with single handle for multi pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
  - .1 Trip settings on breakers with adjustable trips to range from three (3) to eight (8) times current rating.
- .5 Circuit breakers to have minimum symmetrical rms interrupting capacity rating matching panel board or switchboard containing breaker or as indicated.

### **2.2 THERMAL MAGNETIC BREAKERS**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

### **2.3 MAGNETIC BREAKERS**

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

### **2.4 SOLID STATE TRIP BREAKERS**

- .1 Moulded case circuit breaker to operate by means of solid state trip unit with associated current monitors and self powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase and ground fault short circuit protection.

### **2.5 OPTIONS**

- .1 Provide enclosures for individual circuit breakers rated for the proper area (Weatherproof, hazardous rated, or as indicated on the drawings).
- .2 If the circuit breaker is the main service device, it must be service entrance rated.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.
- .2 Set adjustable trip settings according to coordination study.

**NMS 262822– GROUND FAULT CIRCUIT INTERRUPTERS – CLASS A**

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Special Provision

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**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA C22.2 No.144-M91 (R2006), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA PG 2.2-1999 (R2009), Application Guide for Ground Fault Protection Devices for Equipment.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings for review by contract administrator.
- .4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Contract Administrator and certificate that system as installed meets criteria specified.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.

- .2 Components comprising ground fault protective system to be of same manufacturer.

## **2.2 GROUND FAULT PROTECTOR UNIT**

- .1 Self-contained with 15/20 A, 120 V circuit interrupter and duplex receptacle complete with:
  - .1 Solid state ground sensing device.
  - .2 Facility for testing and reset.
  - .3 CSA Enclosure 1, flush mounted with painted face plate.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors including neutral through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical
- .2 Demonstrate simulated ground fault tests.

## **NMS 262823 – DISCONNECT SWITCHES – FUSED AND NON-FUSED**

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### Special Provision

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## **Part 1 General**

### **1.1 SECTION INCLUDES**

- .1 Materials and installation for fused and non-fused disconnect switches.

### **1.2 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results For Electrical.

### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International):
  - .1 CAN/CSA C22.2 No.4-04), Enclosed Switches.
  - .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

### **1.4 SUBMITTALS**

- .1 Submit product data for all disconnect switches for review.

### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 DISCONNECT SWITCHES**

- .1 Fusible and Non-fusible, horsepower rated disconnect switch in CSA enclosures, size as indicated
- .2 Enclosure NEMA 1 or NEMA 12 indoor, NEMA3R, NEMA 4X outdoor, to CAN/CSA C22.2, size as indicated.
- .3 Provision for padlocking in off switch position by three locks.
- .4 Mechanically interlocked door to prevent opening when handle in ON position.
- .5 Quick-make, quick-break action.
- .6 ON-OFF switch position indication on switch enclosure cover.
- .7 Provide auxiliary contacts were required. Refer to schematics.

### **2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install disconnect switches complete with fuses if applicable.

## **NMS 262901 – CONTACTORS**

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Special Provision

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## **Part 1 General**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No.14-10, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.
- .3 Include operating information required for start-up, synchronizing and shut-down of generating units.

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

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect contactors from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 CONTACTORS**

- .1 Contactors: to CSA C22.2 No.14.
- .2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Breaker combination contactor as indicated.
- .4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in NEMA Enclosure NEMA 12 unless otherwise indicated.
- .6 Include following options in cover:
  - .1 Green indicating lamp.
  - .2 Stop-Start pushbutton.
  - .3 Hand-Off-Auto selector switch.
  - .4 On-Off selector switch.
- .7 Control transformer: in accordance with Section 26 29 03 - Control Devices, factory wired and installed in contactor enclosure.

### **2.2 EQUIPMENT IDENTIFICATION**

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Size 4 nameplate indicating as indicated.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install contactors and connect power wires and auxiliary control devices.
- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

**3.2 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by contactor installation.

**NMS 262903 – CONTROL DEVICES**

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Special Provision

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**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results - Electrical.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.14, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

**1.4 SHOP DRAWINGS**

- .1 Submit Shop Drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Include schematic, wiring, interconnection diagrams.

**1.5 QUALITY ASSURANCE**

- .1 Submit to Contract Administrator copy of test results.

**Part 2 Products**

**2.1 AC CONTROL RELAYS**

- .1 Control Relays: to CSA C22.2 No.14.
- .2 Fixed contact plug in type: general purpose heavy duty with two (2) poles. Coil rating: 120 V.

Contact rating: 240V, minimum 15A@120V.

## **2.2 RELAY ACCESSORIES**

- .1 Standard contact cartridges: normally open convertible to normally closed in field.

## **2.3 OILTIGHT LIMIT SWITCHES**

- .1 Snap action type: roller, rod, fork, lever, top, side, push, wobble stick actuator, CSA type 4 enclosure. Contact rating 240VAC, minimum 15A@120V.

## **2.4 SOLID STATE TIMING RELAYS**

- .1 Construction: AC operated electronic timing relay with solid state timing circuit to operate output contact.
- .2 Operation: on delay or off delay.
- .3 Potentiometer: self contained to provide time interval adjustment.
- .4 Supply voltage: 120 V, AC, 60 Hz.
- .5 Temperature range: minus 20 to 60 degrees Celsius.
- .6 Output contact rating: maximum voltage 300 V AC or DC. Current: 2A
- .7 Timing ranges: field adjustable, 0 to 30 minutes or as shown on the drawings.

## **2.5 OPERATOR CONTROL STATIONS**

- .1 Enclosure: CSA Type 4, or rated for the applicable hazardous, weather, wet/damp or other areas. Surface mounting:

## **2.6 PUSHBUTTONS**

- .1 Illuminated, Heavy duty Oil and water tight. Operator extend type, as indicated. Black, with 2 NO and 2 NC contacts rated at 10 A, AC, labels as indicated. Stop pushbuttons coloured red. Start pushbuttons coloured green. Rated for the applicable hazardous, weather, wet/damp or other areas.

## **2.7 EMERGENCY STOP PUSHBUTTONS**

- .1 Illuminated, Heavy duty oil and water tight. Mushroom head, 2-position, Push-Pull operator, Red, with 2 NO and 2 NC contacts rated at 10 A, AC/DC, labels as indicated. Rated for the applicable hazardous, weather, wet/damp or other areas.

## **2.8 SELECTOR SWITCHES**

- .1 Maintained 2 or 3 position labelled as indicated heavy duty oil and water tight, operators wing lever contact arrangement as indicated, rated 120 V, 10A, AC. Rated for the applicable hazardous, weather, wet/damp or other areas.

## **2.9 INDICATING LIGHTS**

- .1 Heavy duty Oil and water tight, full voltage, LED type, push to test, lens colour: as indicated, supply voltage: 120 V, lamp voltage: 120 V, labels as indicated. Rated for the applicable hazardous, weather, wet/damp or other areas.

## **2.10 CONTROL AND RELAY PANELS**

- .1 CSA Type 12 sheet steel enclosure with hinged pad lockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.
- .2 Finished panel must have CSA approval.

## **2.11 CONTROL CIRCUIT TRANSFORMERS**

- .1 Single phase, dry type.
- .2 Primary: 600, 208, or 240V, 60 Hz AC.
- .3 Secondary: 120V, or 24V AC.
- .4 Rating: 150 VA, or larger as required.
- .5 Secondary fuse: ampacity as required.
- .6 Close voltage regulation as required by magnet coils and solenoid valves.

## **2.12 THERMOSTAT LINE VOLTAGE**

- .1 Wall mounted, for exhaust fan or heating control.
- .2 Full load rating: 8A at 120 V.
- .3 Temperature setting range: 0 to 30 degrees Celsius.
- .4 Thermometer Range: 0 to 30 degrees Celsius.
- .5 Markings in 5 degree increments.
- .6 Differential temperature fixed at 1 degree Celsius.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install pushbutton stations, control and relay panels, control devices and interconnect.

### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.

## **NMS 265000 – LIGHTING**

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Special Provision

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## **Part 1 General**

## **1.1 REFERENCES**

- .1 CSA Standards
  - .1 CAN/CSA-C22.2 No. 250, Light Emitting Diode (LED) Equipment for Lighting Applications.

## **1.2 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Works for Electrical.

## **1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings in accordance with Submittal Procedure for Shop Drawings, Product Data and Samples.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Contract Administrator.
- .3 Photometric data to include: spacing criterion.

## **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 LUMINAIRES**

- .1 Refer to Fixture Schedule and drawings.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Final installation shall be co-ordinated to avoid interference with piping, equipment and other materials.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Through rigid conduit for luminaire designs.

### **3.3 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

**NMS 265212.12-EMERGENCY LIGHTING**

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Special Provision

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**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect emergency lighting from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**1.5 WARRANTY**

- .1 For batteries in this Section 26 52 12.12 - Emergency Lighting, 12 months warranty period is extended to 120 months.

**Part 2 Products**

**2.1 EQUIPMENT**

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, AC.
- .3 Output voltage: 12 V DC.
- .4 Operating time: 30 minutes.
- .5 Battery: sealed, maintenance free.

- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 4 W.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: grey.
- .13 Auxiliary equipment:
  - .1 Ammeter.
  - .2 Voltmeter.
  - .3 Test switch.
  - .4 Time delay relay.
  - .5 Battery disconnect device.
  - .6 AC input and DC output terminal blocks inside cabinet.
  - .7 Bracket.
  - .8 Cord and plug connection for AC.
  - .9 RFI suppressors.

## **2.2 WIRING OF REMOTE HEADS**

- .1 Conduit: type in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: type in accordance with manufacturer's recommendations.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.

### **3.2 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by emergency lighting installation.

## **NMS 265300 – EXIT SIGNS**

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Special Provision

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## **Part 1 General**

## **1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.2 No.141-15, Emergency Lighting Equipment.
  - .2 CSA C860-11(R2016), Performance of Internally-Lighted Exit Signs.
- .2 International Organization for Standardization (ISO)
  - .1 ISO 3864-1 2011, Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings.
  - .2 ISO 7010 2011, Safety colours and safety signs - Registered safety signs.

## **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures.
  - .2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

## **Part 2 Products**

### **2.1 STANDARD UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: Aluminum frame.
- .3 Face and back plates: cast aluminum or extruded aluminum.
- .4 Lamps: LED.
- .5 Letters: Pictogram.
- .6 Third lamp socket for emergency lamp lighting circuit. Third lamp: 6 V dc.
- .7 Supply voltage: 120 V, ac.
- .8 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.
- .9 Cabinet: finish: white.
- .10 Single or Double face.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.

- .4 Lock exit light circuit breaker in on position.

**WATER WELL AND PUMP SYSTEM - Item No. 74**

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**Special Provision (Page 446)**

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All information under the above special provision is deleted in its entirety and replaced with the following:

**1.0 SCOPE**

This specification covers the requirements for the supply and placement of two new water wells and pump systems at the Arnprior Maintenance Patrol Yard (MPY), as shown on the Contract Drawings and as specified herein. One well will service the plumbing fixtures in the Vehicle Maintenance Garage and the other well will be dedicated for the truck wash bay in the Vehicle Maintenance Garage. The scope of work shall include the design, supply and construction of the new well systems including the drilled wells with steel casings, pitless adapters, decorative well head covers, submersible pumps, water supply lines from the wells to the building, well controls including pressure tanks and pressure switches and all appurtenances and other items required for complete functioning well systems. This item does not include the water treatment systems required for each well. See the National Master Specification documents for information regarding the well water treatment systems.

The requirements for the water well and pump system shall be coordinated with the Vehicle Maintenance Garage Building plumbing system requirements specified in the National Master Specifications (NMS) elsewhere in the Contract.

**2.0 REFERENCES – Not Used**

**3.0 DEFINITIONS – Not Used**

**4.0 DESIGN AND SUBMISSION REQUIREMENTS**

Contractor shall submit product documentation to Contract Administrator for review. Shop drawings shall be submitted with the Contractor's stamp and approval as evidence of the Contractor's review and coordination with the affected trades as well as sealed and signed by a Professional Engineer registered in Ontario. Shop drawings shall convey or be accompanied by calculations or other sufficient information to explain the system such as product data. Product data includes catalogue information, material lists, diagrams, performance curves and other descriptive information clearly identifying components being provided. Review of the shop drawings is for compliance with the design intent and does not relieve the Contractor of responsibility for its accuracy or for compliance with the contract documents.

A Request to Proceed shall be submitted to the Contract Administrator at least 10 business days prior to commencement of the work.

The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

**5.0 MATERIALS – Not Used**

**6.0 EQUIPMENT**

The 150 mm dia wells shall be installed at a depth suitable to provide the minimum target pumping rate of 57 LPM (15GPM) for the well servicing the plumbing fixtures of the Vehicles Maintenance Garage and 38 LPM (10GPM) for the well servicing the wash bay of the Vehicle Maintenance Garage. It can be assumed, based on nearby well record information, that the well will be less than 75 m deep. A submersible pump rated for the achieved pumping rate and well depth shall be utilized.

The size of the water supply lines from the well to the building shall be determined by the Contractor as part of the integrated system design. 38mm supply lines are currently shown on the Contract Drawings, but the size shall be confirmed by the Contractor.

The well heads shall be covered with a decorative well casing cover. The decorative well casing cover shall be fiberglass and secured to the surrounding ground surface or concrete sidewalk. Three options for the well head cover shall be provided to the Contract Administrator for review and to select the cover for this site.

## **7.0 CONSTRUCTION**

The well system, water pump and associated appurtenances shall be installed according to and at the location specified in the Contract Documents. Bedding to be 19 mm clear stone with Terrafix 270 R geotextile or approved equal.

Construction and development of the well must comply with Ontario Regulation 903 under the Ontario Water Resources Act to provide water to the Fenelon Falls MPY. The well system shall include a submersible pump complete with steel casing, pressure tank, pressure switches, pitless adapters, site piping and all appurtenances. All water lines feeding the building shall be installed below the frost line or have adequate insulation to protect the lines from freezing. Note, insulation will only be accepted as a method of freeze protection directly adjacent to the building foundation where the water lines enter the building since penetrations through the foundation wall will be made above the footing. All other locations shall have frost protection from ground cover.

A licensed well contractor is required when installing a new water supply well under O. Reg. 903 under the Ontario Water Resources Act (OWRA).

Licensed contractors are required to use licensed well technicians who have the proper class of licence to conduct or supervise any work being done on the well.

## **8.0 QUALITY ASSURANCE**

Provide a written warranty for the installed equipment that includes travel and incidentals for one year and provide three sets of O&M Manuals.

Provide the Contract Administrator with licenses for all well contractors and well technicians working on the new well construction. The license information shall be provided to the Contract Administrator a minimum of 10 days prior to starting construction on the well.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship, design, and dimensional requirements of this specification and the Contract Documents.

Material not in compliance shall be removed and properly disposed off site and replaced by the Contractor at no additional cost to the Owner.

## **9.0 MEASUREMENT FOR PAYMENT**

Payment for Water Well and Pump System shall be by Lump Sum.

## **10.0 BASIS OF PAYMENT**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment and Material required to do the work.

**CONTRACT DRAWINGS**

The following drawing sheet(s) are cancelled and replaced as indicated:

Cancelled	Replaced By
38	38A
47	47A
72A	72B
73A	73B
74A	74B
75A	75B
76A	76B
90-1	90-1A
94	94A
95	95A
110	110A
111	111A

The following drawing sheet(s) are added:

N/A

**QUANTITY SHEETS**

N/A



Leonard Niyonkuru  
Team Lead  
Contract Tendering Section  
15 January 2025