

SPECIFICATIONS

Replacement of Vertical Multi-leaf Loading Door

Canadian Space Agency
David Florida Laboratory, Building 65,
Ottawa, ON

ISSUED FOR TENDER

SPECIFICATIONS:

<u>DIVISION</u>	<u>SECTION</u>	<u>NO. OF PAGES</u>
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DRAWINGS:

<u>DISCIPLINE</u>	<u>NUMBER</u>	<u>TITLE</u>
ARCHITECTURAL	A-100	Site Plan – Building Key Plan, Floor Plan (Partial) Exterior Elevation
	A-101	Floor Plans, Walls Sections, Demolition Plan

1. PRECEDENCE

- .1 For this project, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

2. MINIMUM STANDARDS

- .1 Materials shall be new unless identified otherwise and work shall conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code (NBC), the Quebec Construction Code and all applicable Provincial and Municipal codes including all amendments up to tender closing date and other codes of provincial or local application. In the case of conflict or discrepancy the most stringent requirement shall apply. Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

3. TAXES

- .1 Pay all taxes properly levied by law including Federal, Provincial and Municipal.

4. FEES, PERMITS AND CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

5. TIME OF COMPLETION

- .1 Commence work in accordance with notification of acceptance of your offer and complete the work by the end of September 2014.

6. FIRE SAFETY REQUIREMENTS

- .1 Comply with the Ontario Building Code (OBC) for fire safety in construction and the National Fire Code of Canada (NFC) for fire prevention, firefighting and life safety in building in use.
 - .2 Welding and cutting:
 - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit from the Fire Prevention Unit as directed by the Departmental Representative. Store flammable liquids in approved CSA containers inspected by the Fire Prevention Unit. No open flame shall be used unless authorized by the Fire Prevention Unit.
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- .2 At least 48 hours prior to commencing cutting, welding or soldering procedure, provide to Client:
 - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
 - .2 Completed welding permit as defined in FCC 302.
 - .3 Return welding permit to Owner immediately upon completion of procedures for which permit was issued.
- .3 A fire watcher as described in FCC 302 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.
- .3 Where work requires interruption of fire alarms or fire suppression, extinguishing or protection systems:
 - .1 Provide watchman service as described in FCC 301; In general, watchman service is defined as an individual conversant with Fire Emergency Procedures, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
 - .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by FCC, to isolate and protect all devices relating to:
 - .1 Modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
 - .2 Cutting, welding, soldering or other construction activities which might activate fire protection systems.
- .4 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
- .5 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation

7. SCHEDULING

- .1 **Schedule:** On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the schedule has been reviewed by the Departmental Representative, take necessary measures to complete work within scheduled time. Do not change construction schedule without notifying Departmental Representative.
 - .2 For work that is indicated as work under separate contracts, this means:
 - 1. Work will be done by contractors retained under separate contract;
 - 2. The Contractor will provide the appropriate window / time duration indicated on Sequencing Diagram, for the other contractors to complete their work.
 - 3. The Contractor may advance his work, upon approval of the Owner, to the extent that it does not impact contracted work of others.
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.7 Working Hours:

- .1 "Regular Hours" are defined as Monday to Friday from 07:00 to 17:00 hours excluding statutory holidays.
- .2 "Off Hours" are defined as Monday to Friday from 17:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
- .3 The Contractor may be permitted to carry out work during "Off Hours" subject to pre-authorization by the Owner.

.8 Work in Occupied Areas:

- .1 Carry out work during "off hours". Thoroughly ventilate areas painted and carpeted areas during "off hours".
- .2 Give the Owner seventy-two (72) hours' notice for work to be carried out during "off hours".
- .3 Carry out noise generating work during "off hours" Monday to Friday from 24:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.

8. FIELD QUALITY CONTROL

- .1 Carry out Work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
- .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.
- .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

9. REMOVED MATERIALS

- .1 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.
- .2 Materials identified to be removed, salvaged and/or recovered and reinstalled or reused are to be cleaned, inspected, maintained and are to be securely stored on site as approved by Owner.

10. SHOP DRAWINGS

- .1 Submit for the Departmental Representative's review, five (5) copies of each shop drawing.
 - .2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the
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Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.

- .3 Do not commence manufacture or order materials before shop drawings are reviewed.

11. SAMPLES

- .1 Samples: examples of materials, equipment, quality, finishes, workmanship.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

12. PRODUCT DATA

- .1 Product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
- .2 Submit five (5) copies of product data.
- .3 Delete information not applicable to project.
- .4 Cross-reference product data information to applicable portions of Contract Documents.

13. PROTECTION

- .1 Protect finished work against damage until take-over.
 - .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
 - .3 Protect operatives and other users of site from all hazards.
 - .4 Protect all existing equipment, fixtures, finishes, etc. that are to remain against any and all damage until take over. Repair and clean any damaged or soiled existing equipment, fixtures, finishes, etc.
 - .5 Protect all existing duct sensitive sensors (smoke detectors) from construction-generated dust. If smoke detectors require to be by-passed, dust generating work shall be carried out after hours.
 - .6 All dust generating work preparatory work, i.e.: pipe/conduit, cutting, threading, etc., must be carried out outside of air handling plenum. Only assembly of materials is permitted in plenum area.
 - .7 Provide filter media on all return air openings from each floor for the duration of the project. Replace the filter media on a regular weekly schedule. The schedule shall continue until the end of construction in each Tower, at which point all temporary filters shall be removed.
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14. USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to the normal use of premises. Make arrangements with Owner to facilitate work as stated. Refer to article 1.6 Scheduling for work that must be done during "off hours".
- .2 Maintain existing services to building for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Sanitary facilities will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean.
- .6 The Owner will turn over rooms, spaces, and floors, including mechanical and electrical rooms to the contractor in accordance. The Owner will restrict access to building equipment, controls, and services. Access to be negotiated one (1) week in advance.
- .7 The Owner will schedule use of elevators, elevator lobbies, loading docks, and travel routes to loading docks. The Contractor must submit a request for access forty-eight (48) hours in advance for specified periods of time. Where approved for use, protect at all times from damage, safety hazards and overloading of existing equipment and exceeding operating requirements.
- .8 When the Contractor requires access through rooms including, spaces, or floors occupied by others, arrangements must be planned at the weekly Site Meeting.

15. SITE STORAGE

- .1 The Owner will assign storage space which shall be equipped and maintained by the Contractor.
- .2 Do not unreasonably encumber site with materials or equipment.
- .3 Move stored products or equipment which interferes with operations of Owner or other contractors.
- .4 Obtain and pay for use of additional storage or work areas needed for operations.

16. CUT, PATCH AND MAKE GOOD

- .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove all items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
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- .4 Perform scanning of existing concrete floor slabs for all areas to be subjected to cutting and/or coring. Submit copies of scanning reports/results to Departmental Representative.
- .5 Install fire stops and smoke seals in accordance with ULC-S115-1995 around pipe, ductwork, cables, and other objects penetrating fire separations to provide fire resistance not less than the fire resistance rating of surrounding floor, ceiling, and wall assembly. Fill in all openings resulting from removals with firestop and smoke seals in accordance with ULC-S115-1995.

17. SLEEVES, HANGERS AND INSERTS

- .1 Coordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Owner's approval before cutting into structure

18. EXAMINATION

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Dimensions of all existing building elements are for information only and must be verified on site. Contractor is responsible to verify all dimensions and report any discrepancies to the Departmental Representative.
- .3 Before starting the work on the site and/or any tower, submit a list and a photographic report of existing conditions with respect to work areas and indicate any observable previous damage to buildings or elements of buildings, etc. Provide 48 hours advance notice to the Departmental Representative before starting this inspection.
- .4 This report and list will be presented to the Departmental Representative for confirmation and acceptance.

19. PROJECT MEETINGS

1. Departmental Representative will arrange the project meetings every week and assume responsibility for setting times and recording and distributing minutes. The contractor's key personnel and subtrade key personnel will attend these meeting as noted:

20. ACCESS AND EGRESS

- .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, re-routing of operations and client deliveries etc., in both official languages or by the use of commonly-understood graphic symbols to the Owner's approval.
 - .2 No advertising will be permitted on this project
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- .3 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

21. SCAFFOLDS AND WORK PLATFORMS

- .1 Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.
- .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
- .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.

22. PUBLIC WAY PROTECTION

- .1 Design, erect and maintain hoarding and pedestrian walkways to support all loads including windloads and provide protection, complete with signs and electrical lighting as required by authority having jurisdiction.

23. WASTE MANAGEMENT

- .1 Comply with the Environmental Protection Act, Ontario Regulations R.S.O. 1990, CHAPTER E.19, for waste management program on construction and demolition projects.
 - .2 Conduct "waste audit" to determine waste generated during demolition or construction operations, prepare written "waste reduction work plan" and implement procedures to reduce, reuse and recycle materials to the extent possible.
 - .3 Provide a "source separation program" to disassemble and collect in an orderly fashion the following "materials designated for alternative disposal" from the "general waste" stream.
 - .1 Cardboard (corrugated)
 - .2 Steel
 - .3 wood (not including treated or laminated wood)
 - .4 Submit complete records of all removals from site for both "materials designated for alternative disposal" and "general waste" including:
 - .1 Time and date of removal
 - .2 Description of material and quantities.
 - .3 Proof that materials have been received at an Approved Waste Processing Site or certified Waste Disposal Site as required.
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24. OPERATION AND MAINTENANCE MANUALS

- .1 Two (2) weeks prior to any scheduled training, submit to Owner six (6) copies of approved Operations Data and Maintenance Manual in both official languages, compiled as follows:
 - .1 Bind data in vinyl hard cover 3 "D" ring type loose leaf binders for 212 x 275 mm size paper. Binders must not exceed 75 mm thick or be more than 2/3 full.
 - .2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
 - .3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

 - .2 Include following information plus data specified.
 - .1 Maintenance instruction for finished surface and materials.
 - .2 Copy of hardware and paint schedules.
 - .3 Description: Operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
 - .4 Maintenance: Use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
 - .1 lubrication products and schedules.
 - .2 trouble shooting procedures.
 - .3 adjustment techniques.
 - .4 operational checks.
 - .5 Suppliers names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
 - .5 Guarantees showing:
 - .1 Name and address of projects.
 - .2 Guarantee commencement date (date of Interim Certificate of Completion).
 - .3 Duration of guarantee.
 - .4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
 - .5 Signature and seal of Guarantor.
 - .6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.

 - .3 Spare parts: List all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).
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- .4 Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

25. RECORDS

- .1 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.

26. SECURITY

- .1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.
- .2 Personnel will be checked daily at start of work shift and given a pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

27. GUARANTEES AND WARRANTIES

- .1 Before completion of work collect all manufacturer's guarantees and warranties and deposit with Owner.

28. BUILDING SMOKING ENVIRONMENT

- .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.

29. DUST CONTROL

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non- construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
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- .4 Protect all occupied, operating finished areas and equipment from dust.

30. COST BREAKDOWN

- .1 Before submitting first progress claim submit breakdown of Contract Amount by Division, as directed by Departmental Representative; aggregating the Contract Amount. After approval by Departmental Representative, cost breakdown will be used as the basis of progress payments and any additional claims that may arise.
- .2 Monthly progress payments must use the approved cost breakdown.
- .3 Any additional claims that may arise must provide breakdown.

31. HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: Demolition of spray or trowel-applied asbestos is hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in course of demolition work, immediately stop work and notify Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 10 10 - General Instructions
- .2 Section 08 36 19.02 - Multi-Leaf Vertical Lift Metal Doors

1.2 REFERENCES

- .1 CSA International
- .2 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
- .4 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 10 10 - General Instructions.
- .2 Submit demolition drawings:
 - .1 Submit for review and approval by Departmental Representative any required shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Q Canada, showing proposed method.
- .3 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
 - .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions has been received from Departmental Representative.
 - .3 Notify Departmental Representative before disrupting building access or services.
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Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Inspect building site with Departmental Representative DCC Representative Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
 - .1 Immediately notify Departmental Representative DCC Representative Consultant and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Departmental Representative DCC Representative Consultant should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PREPARATION

- .1 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.
 - .3 Protect building systems, services and equipment.
 - .2 Demolition/Removal:
 - .1 Remove items as indicated.
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- .2 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
- .3 Protect adjacent joints and load transfer devices.
- .4 Protect underlying and adjacent materials.
- .5 Remove parts of existing building to permit new construction.
- .6 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative DCC Representative Consultant to suit future use.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 10 10 - General Instructions.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 10 10 - General Instructions.
- .4 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 10 10 - General Instructions.
- .6 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1- GENERAL

1.1 SCOPE OF WORK

- . 1 Provision of a three (3) leaf, electrically operated, interior-mounted, Type 1 vertical lift door including all necessary components. The door, when fully open, shall provide minimum unobstructed opening approximately 5300mm wide and 7800mm high. Exact dimensions to be verified on site.
- . 2 Provision of door includes the door sections, guides, side tracks, overhead mounted drive assembly, counterweight system, counterweight material, cables, sheaves, related hardware, electric operator and controls, weatherstripping, installation, tests and operating instructions.
- . 3 Work by others includes:
 - . 1 Any and all required repairs to the exterior and interior sheeting,

1.2 RELATED REQUIREMENTS

- . 1 Section 01 10 10 General Instructions.

1.3 REFERENCES

- . 1 Aluminum Association (AA)
 - . 1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
 - . 2 ASTM International
 - . 1 ASTM A36 / A36M - 08 Standard Specification for Carbon Structural Steel
 - . 2 ASTM A48 / A48M - 03(2012) Standard Specification for Gray Iron Castings
 - . 3 ASTM A1011 / A1011M - 12b Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High Strength Low Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength
 - . 4 ASTM A 1008/A 1008M-10, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - . 5 ASTM D 523-08, Standard Test Method for Specular Gloss.
 - . 6 ASTM D 822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - . 3 Canadian General Standards Board (CGSB)
 - . 1 CAN/CGSB-1.213-04, Etch Primer (Pretreatment Coating or Tie Coat) for Steel and Aluminum.
 - . 2 CAN/CGSB 1.181-99, Ready-Mixed, Organic Zinc-Rich Coatings.
 - . 4 CSA International
 - . 1 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
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- . 5 Environmental Choice Program (ECP)
 - . 1 CCD-016-97(R2005), Thermal Insulation.
 - . 2 CCD-047-98(R2005), Architectural Surface Coatings.
 - . 3 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- . 6 Green Seal Environmental Standards (GS)
 - . 1 GS-11-2008, 2nd Edition, Paints and Coatings.
- . 7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - . 1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.4 ADMINISTRATIVE REQUIREMENTS

- . 1 Pre-Installation Meetings:
 - . 1 Convene pre-installation meeting one (1) week prior to beginning work of this Section and on-site installation, with Contractor's Representative and Departmental Representative and in accordance with Section 01 10 10 General Instructions to:
 - . 1 Verify project requirements.
 - . 2 Review installation and substrate conditions.
 - . 3 Co-ordination with other construction subtrades.
 - . 4 Review manufacturer's written installation instructions and warranty requirements.
 - . 2 Arrange for site visit with Departmental Representative and prior to start of Work to examine existing site conditions adjacent to demolition Work.
 - . 3 Hold project meetings every week.
 - . 4 Ensure key personnel, contractor's site supervisor, project manager and subcontractor representatives attend.
 - . 5 Departmental Representative will submit written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- . 1 Submit in accordance with Section 01 10 10 General Instructions.
- . 2 References:
 - . 1 Manufacturer shall submit a reference list including names and telephone numbers of five (5) successful installations of this type within the past two (2) years.
- . 3 Product Data:
 - . 1 Submit manufacturer's instructions, printed product literature and data sheets for doors, hardware, and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

- . 4 Shop Drawings:
 - . 1 Review of existing structure to be provided by professional engineer registered or licensed in Province of Ontario, Canada, complete with all reinforcing details required for installation of new door.
 - . 2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - . 3 Review of existing electrical wiring and connections to be provided by professional engineer registered or licensed in Province of Ontario, Canada to ensure existing power and interlock connections as well as motor requirements are met.
 - . 4 Provide drawings showing fabrication and installation of vertical lift doors including plans, elevations, sections, details of components, hardware, operating mechanism and attachments to the other units of work and required clearances. Include structural details required, wiring diagrams and coordination with electrical trade.
- . 5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- . 6 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- . 7 Manufacturers Reports:
 - . 1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.
- . 8 Sustainable Design Submittals:
 - . 1 Construction Waste Management:
 - . 1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - . 2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - . 2 Recycled Content:
 - . 1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - . 3 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
 - . 4 Low-Emitting Materials:
 - . 1 Submit listing of primers, paints and coatings used in building; comply with VOC and chemical component limits or restriction requirements.

1.6 CLOSEOUT SUBMITTALS

- . 1 Submit in accordance with Section 01 10 10 General Instructions.
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- . 1 Operation and Maintenance Data: submit operation and maintenance data for overhead door hardware for incorporation into manual.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- . 1 Submit in accordance with Section 01 10 10 General Instructions.
- . 2 Spare parts:
 - . 1 Supply spare parts for vertical lift doors as follows:
 - . 1 Door panels
 - . 2 Door rollers
 - . 3 Weatherstripping: two (2) sets.
 - . 2 Store where directed. Identify each part and reference to appropriate door.

1.8 QUALITY ASSURANCE

- . 1 Door to be provided as one complete unit produced by one manufacturer; including hardware, accessories, mounting and installation components.
- . 2 Door manufacturer shall have not less than ten (10) years' experience in manufacturing doors of the type specified.
- . 3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.9 DELIVERY, STORAGE AND HANDLING

- . 1 Deliver, store and handle materials in accordance with Section 01 10 10 General Instructions and with manufacturer's written instructions.
 - . 2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled 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 multi-leaf vertical lift metal doors, hardware and accessories from nicks, scratches, and blemishes.
 - . 3 Replace defective or damaged materials with new.
 - . 4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.
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1.10 WARRANTY

- . 1 The door manufacturer shall provide a written guarantee against all defects in material and workmanship for a period of five (5) years from the date of acceptance
 - . 1 Include cost for transportation, insurance, import duties, taxes, licenses, repair, labour, parts, tools, materials and replacement during warranty period.
 - . 2 Warranty period for Contract equipment on all portions of Contract equipment, beginning on Date of Substantial Completion, and determined separately for the doors delivered under Contract.
 - . 3 Warranty period for spare parts from date of delivery of spare parts or beginning from installation of spare parts, whichever period is sooner.
 - . 4 After expiration of warranty period of Contract equipment, Manufacturer will offer after-sale services to Departmental Representative, including technical support.

PART 2 – PRODUCTS

2.1 ACCEPTABLE PRODUCTS

- . 1 Design is based on materials and system of:
 - . 1 Electric Power Door, 522 West 27th Street, Hibbing, MN 55746, 1-800-346-5760, or preapproved equivalent.
 - . 2 Supply and Installation by Edwards Door Systems of Canada, or preapproved equivalent.

2.2 DESIGN CRITERIA

- . 1 Design exterior door assembly to withstand wind load of 1.2 kPa with a maximum horizontal deflection of 1/240 of opening width. Design doors to withstand external horizontal wind loads of 1.2kPa in the closed position and designed to operate in a maximum wind load of 0.24 kPa.
- . 2 Design door panel assemblies with thermal insulation factor 16 RSI.
- . 3 Design door assembly to withstand minimum 900-1,000 cycles per annum, and 25,000 total life cycle.
- . 4 The use of cold formed shaped fir structural members of stiffeners fabricated from sheets or strips of any material is not permitted.

2.3 VERTICAL LIFT DOORS

- . 1 Construction:
 - . 1 Door framing shall be structural steel tube with 16-gauge minimum flat sheet steel on the exterior and interior faces.
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- . 2 Deflection:
 - . 1 All frames and framing members shall be true to dimension and square in all directions and no door shall be bowed, warped, or out of line in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet.
 - . 2 Flexural stress at the extreme fibre (f) of the main structural members (both vertical and horizontal) shall be less than 186,158.44 KPa.

 - . 3 Door Panel Construction:
 - . 1 Door panel frames shall have both horizontal and vertical structural framing, minimum 100mm thickness, constructed of standard structural steel channels and angles of ample size and strength for loads and stresses imposed under the specified conditions. Minimum steel channel and angles thicknesses of the vertical perimeter members shall not be less than 2mm thick. Interior door panel frame members shall be steel channels and angles not less than 2mm thick and spaced at not more than 600mm centres. The interior members shall run vertically. Pan-style construction or the use of cold/hot formed sheet metal channels, hats, angles or other sheet formed members in the panel construction are not permitted.
 - . 2 Structural frames for the door panels shall be of welded construction with all joints ground smooth wherever exposed and/or where sheeting overlaps the framing members.
 - . 3 Door panels frame members shall be true to dimension and square in all directions.
 - . 4 Door panels shall not be bowed, warped, or out of line by more than 3mm in 6000mm.
 - . 5 Grind smooth exposed welds which interfere with the installation of various parts.
 - . 6 Insulate door sections with 100mm of fibrous glass batt-type insulation, providing minimum R16. Fit the insulation to cover the entire surface of the door panel between the structural members.
 - . 7 Door guide assemblies shall consist of structural shapes and plates arranged as indicated. Guide assemblies shall be fabricated for field bolting or welding to the structural framing are required for a rigid installation. Minimum thickness of the door guide plate material shall be 6mm. Door guide angles shall be minimum 6mm thick.
 - . 8 Provide steel plate sectional counterweight to properly balance door panels for trouble-free operation. Cast iron counterweight is not permitted. Contain counterweight in a steel-plate box, suspended on cables attached to the door operating over cast iron sheaves. Counterweight box shall be guided through the full height of travel by a counterweight enclosure (tower) with internal guides. Counterweight guide tower material shall be minimum 6mm thick; the counterweight tower shall be covered with 2mm thick steel to a minimum height of 2440mm above the finished floor.

 - . 4 Hardware: Provide hardware for a complete installation. Hardware shall be heavy-duty type, including all bolts and fittings for the hardware and as follows:
 - . 1 Guide rollers: Doors shall have a minimum of eight (8) 32mm minimum diameter anti-friction bearing cam followers per panel. Two cam followers at each corner shall engage single angle steel door guides and guide the panels up and down. The cam followers and support bracketry shall be of sufficient size to transmit the wind load from the door panel to the steel door guides. Metal to metal sliding guides are not permitted. Cam followers shall not extend above or below the door panels. The cam rollers shall be
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- . 2 Mechanical Emergency Stop Devices:
 - 1. Provide only the bottom door panel with two (2) mechanical emergency stop devices, one at each side. The devices shall be a cam-action device, which will engage the single angle guide and impede the downward slide of the door panels should a cable break or if there is an attachment failure. The device in the bottom or single panel shall have a three-point contact action. The device shall be reset by hand once the broken cable is replaced or the attachment devices have been repaired or replaced. The emergency stop device shall be factory tested with verification by an independent testing laboratory. Manufacturer shall provide a video of the test for architect's review.
- . 3 Weatherstripping:
 - 1. Provide special pneumatic seals; material shall be adjustable and readily replaceable and provide a substantially weather-tight installation and shall be 3mm thick cloth insert neoprene wrapped around a resilient foam core.

. 5 Finishing:

- . 1 Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- . 2 Door Finish: Manufacturer's standard, factory-applied primer paint.

.2 Hardware: Hardware shall include wire rope to be wirecore, 6x37; steel sheaves with roller bearings. Interior doors with minimal wind load shall have rub blocks. Exterior doors shall have side rollers. Counterweight material shall be steel plate.

2.4 ELECTRO-MECHANICAL OPERATOR

- . 1 Vertical lift door shall be operated by an overhead mounted electro-mechanical drive unit. Operator consists of an electric motor, gear reducer and multiple groove drive sheaves mounted on the counterweight tower. Door shall be suspended on wire ropes reeved from leaves over traction sheaves to counterweights. Traction sheaves shall be driven by motor operator mounted at top of tower with auxiliary hand crank override operation to provide manual operation. Pull required on hand crank to open the door shall not exceed 9 kilograms of force. Provide a manual interlock switch to disconnect the motor when the manual operating hand crank is engaged. Emergency operation of door by operating through the motor gearing is not permitted.
- . 2 Electrical motors, controller units, remote push-button stations, relays and other electrical components: to CSA approval with CSA enclosure type as required by manufacturer. Electric power operator shall be complete with electric gear motor, magnetic brake, brackets, pushbutton control, limit switches, magnetic reversing starter and other accessories specified and required. Design power operator such that the gear motor may be removed without disturbing the limit switch setting and without affecting the emergency auxiliary operators. Make provisions for immediate emergency manual operation of the door in the event of an electrical failure. Position the emergency operating mechanism such that it can be placed in and out of operation from the floor and its use shall not affect the timing of the limit switches.
- . 3 Electric gear motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. Motor to be high-starting torque type, with sufficient torque output to move door in either direction from any position and produce a door travel speed of

VAC., 60 Hertz operation and conform to the MEMA standards

- . 1 Power supply: information to be provided by the Canadian Space Agency.
 - . 2 Motor: information to be provided by the Canadian Space Agency. 3-phase, 600V power currently supplied to existing disconnect (to be replaced during construction).
- . 4 Electric Controls:
- . 1 Controls shall be furnished by the door manufacturer, shall be complete and built in accordance with the latest NEMA standards. Enclosures shall be NEMA 4 with disconnect switch.
 - . 2 Control Panel: assembly to be UL labeled and shall house a reversing across-the-line type magnetic motor starter with thermal-overload protection along with control relays, timers, fuses, terminal strips, and other electronic components as required to provide the specified operating sequences. All components to be neatly labeled and pre-wired to numbered terminal strips that correspond to all the door's additional electrical components that are located outside of the electrical control panel enclosure. Provide power circuits in excess of 200 volts with control transformers to reduce the voltage in the control circuit to 120 volts.
 - . 3 Controls shall include variable frequency drive to ramp to door speed up and down during its travel.
- . 5 Pushbuttons:
- . 1 Pushbuttons to be located on the interior of the building as indicated and shall have one three-button pushbutton station with buttons marked "OPEN", "CLOSE" and "STOP". "OPEN" button shall be of the type requiring only momentary pressure by the operator to cause door to go from closed to be fully open position. The "CLOSE" button shall require constant pressure so that removing pressure from the button shall stop the movement of the door. "OPEN" and "STOP" buttons to be momentary contacts. When the door is in motion and the "STOP" button is pressed, the door shall stop instantly and remain in the stopped position; from the stop position, the door may then be operated in either direction by pushing the "OPEN" or "CLOSE" button. Push button enclosure shall be in NEMA 4 enclosure. Pushbuttons shall be NEMA 12/13 rated.
 - . 2 Second interconnected pushbutton station to be located on exterior of building in location of existing locked & keyed cabinet. The two stations shall be interconnected, such that either can operate the door.
- . 6 Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position. They shall be mounted on the side track and actuated by cams on the door. They shall be rotary cam-type switches with NEMA rated microswitches.
- . 7 Photo Eyes: Provide NEMA 4X or IP6 rated thru-beam photo eyes; located on both sides of the opening. These photo eyes will automatically reverse the door if an obstruction is in the door openings during closing.
- . 8 Reversing Device Safety Switch: pneumatic-type reversing edges to be located full length of the door on the leading edges of the two centre sections. Reversing edges will automatically reverse the doors should they come in contact with an obstruction during closing. The reversing switches shall not substitute for limit switches.
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- . 10 Equip Operator with:
 - . 1 Electrical interlock switch to disconnect power to operator when in manual operation.
 - . 2 Built-in chain hoist for manual operation in event of power failure.
 - . 3 Cable fail safe device:
 - i. Able to stop door immediately if cable breaks on door free fall. Braking capacity 500 kg.
 - . 4 New door shall be interlocked with the existing interlock system of two (2) interior doors. The door will be prevented from being opened in the event that any one (1) of the two (2) interior doors is not in the closed position.
- . 11 Wiring: Door manufacturer shall supply controls only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.
- . 12 Door speed: 300 mm per second.

2.5 MATERIALS

- . 1 Galvanized steel sheet: commercial quality with Z275 zinc coating.
- . 2 Steel sheet: commercial quality to ASTM A 1008, unexposed (U), exposed (E), with finish.
- . 3 Primer: to CAN/CGSB-1.213 for steel and aluminum CAN/CGSB 1.181 for galvanized steel surfaces.
 - . 1 VOC limit 250 g/L maximum to GS-11 or SCAQMD Rule 1113.
 - . 1 VOC limit: 100 g/L maximum to CCD-048.
 - . 2 Ensure primer meets minimum recycled content and does not exceed toxicity concentrations to CCD-048.
- . 4 Insulation: to meet design requirements and to CCD-016.

2.6 FINISHING

- . 1 General: thoroughly clean, pre-treat and prime surfaces of door assembly including fixed panels trim, support and closure pieces.
 - . 1 Pre-treatment: as required by primer manufacturer. Primer must be compatible with finish coating.
 - . 2 Finish coat: factory shop painted:
 - . 1 EXT 5.1M - Waterborne light industrial [Semi-gloss] coating (over waterborne primer)
 - . 2 Colour to be selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- . 1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for multi-leaf vertical lift metal doors installation in accordance with manufacturer's written instructions.
 - . 1 Visually inspect substrate in presence of Departmental Representative.
 - . 2 Inform Departmental Representative 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 Departmental Representative.

3.2 INSTALLATION

- . 1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- . 2 Install doors and hardware in accordance with manufacturer's instructions.
- . 3 Touch-up doors with primer where galvanized finish damaged during fabrication.
- . 4 Install electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.
- . 5 Installation includes electric wiring from power supply located near door opening.
- . 6 Lubricate springs and adjust door operating components to ensure smooth opening and closing of doors.
- . 7 Adjust operable parts for correct function.
- . 8 Adjust weatherstripping to form weathertight seal.
- . 9 Adjust doors for smooth operation.

3.3 FIELD QUALITY CONTROL

- . 1 Manufacturer's Field Services:
 - . 1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product within 3 days of review.
 - . 2 Submit 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 Ensure manufacturer's representative is present before and during critical periods of installation construction of field joins and testing.
 - . 4 Schedule site visits to review Work at stages listed:
-

- . 1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
- . 2 Twice during progress of Work at 25% and 60% complete.
- . 3 Upon completion of Work, after cleaning is carried out.

3.4 CLEANING

- . 1 Progress Cleaning: clean in accordance with Section 01 10 10 General Instructions.
 - . 1 Leave Work area clean at end of each day.
- . 2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 10 10 General Instructions.
 - . 1 Remove traces of primer; clean doors and frames.
 - . 2 Clean glass and glazing materials with approved non-abrasive cleaner.
- . 3 Waste Management: separate waste materials for reuse and recycling in accordance with applicable regulations.
 - . 1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- . 1 Protect installed products and components from damage during construction.
- . 2 Repair damage to adjacent materials caused by multi-leaf vertical lift metal door installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- . 1 Section 08 36 19.02 – Multi-Leaf Vertical Lift Metal Doors.

1.2 REFERENCES

- . 1 Provide complete installation in accordance with the latest edition of the Ontario Electrical Safety Code and Electrical Bulletins.
- . 2 Comply with the following additional codes as a minimum:
 - . 1 CSA Standards.
 - . 2 ULC Standards.
 - . 3 Ontario Building Code – Latest Edition.
 - . 4 National Building Code.
 - . 5 Fire Code.
 - . 6 NFPA.

1.3 DEFINITIONS

- . 1 Inspection authorities shall mean Electrical Safety Authority.
- . 2 Supply authority shall mean Hydro Ottawa.
- . 3 Provide shall mean supply, install, test and commission.

1.4 DESIGN REQUIREMENTS

- . 1 Operating voltages to: CAN3-C235-83.
- . 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.

1.5 CARE, OPERATION, AND START-UP

- . 1 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.

1.6 EXISTING SERVICES

- . 1 Existing services required for work may be used by the Contractor with the Departmental Representative's written consent. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
 - . 2 Notify the Departmental Representative a minimum of 72 hours in advance of intended interruption of services; obtain requisite permissions.
-

- . 3 Keep duration of these interruptions to a minimum. Carry out all interruptions during silent hours or as approved by the Departmental Representative in writing.
- . 4 Any unscheduled disruption to services to be immediately reinstated.
- . 5 Existing fire alarm and security systems are to remain fully functional, throughout, provide conduit and wire as required to maintain services during construction.

1.7 DEMOLITION

- . 1 Disconnect and make safe all systems to be demolished by other Divisions. Refer to other Divisions for extent.
- . 2 Maintain existing remaining circuits and systems, which pass through construction areas.
- . 3 Reinstated immediately, any existing remaining systems, inadvertently interrupted during construction or demolition.
- . 4 Remove all redundant wiring and conduit (i.e. power.).

1.8 COORDINATION

- . 1 Coordinate the work requirements with all other Divisions, especially Division 08, to ensure systems completeness and compatibility, and to ensure schedules and requirements are maintained.
- . 2 Where perceived interferences occur, prepare detailed sketches indicating proposed solution for review and acceptance by Departmental Representative.
- . 3 The contract documents are intended to describe complete fully functional systems although not all components are indicated. Division 26 shall provide all required conduits, wiring, equipment, etc. to provide fully functional systems which meet the design intent.

1.9 FINAL INSPECTION

- . 1 Do not request final inspection until:
 - . 1 Deficiencies are less than 25 items.
 - . 2 All systems have been tested and are ready for operation.
 - . 3 All balancing of loads has been completed.
 - . 4 The complete operation and maintenance data books have been delivered to the Departmental Representative.
 - . 5 All inspection certificates have been furnished.
 - . 6 All record drawings have been completed and approved.
 - . 7 The cleaning up is finished in all respects.
- . 2 Final inspection shall be subjected to the approval of the Departmental Representative.

1.10 PERMITS, FEES AND INSPECTION

- . 1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
 - . 2 Pay associated fees.
 - . 3 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.
-

- . 4 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Departmental Representative and include in manuals. Final payment will not be made until certificates have been submitted.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

- . 1 Equipment and material to be new CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

2.2 EQUIPMENT IDENTIFICATION

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

Nameplate	Sizes
Size 3	12 x 70 mm 2 lines 3 mm high letters

- . 2 Labels: electronically printed, self-adhesive plastic labels with 6 mm high letters unless specified otherwise.
- . 3 Wording on nameplates and labels:
 - . 1 To indicate volts, phase, amps, HP, etc.
 - . 2 To be submitted to Departmental Representative prior to manufacture for approval.
- . 4 Labels for junction boxes to indicate circuit numbers.
- . 5 Disconnects: indicate equipment being controlled and voltage, Size 3.

2.3 WIRING IDENTIFICATION

- . 1 Identify wiring with permanent wire markers indicating circuit number on both ends of branch circuit wiring. Maintain colour phase sequence (red/black/blue) on all conductors throughout.
- . 2 Maintain phase sequence and colour coding throughout.

2.4 CONDUIT AND CABLE IDENTIFICATION

- . 1 Colour code conduits, boxes and metallic sheathed cables.
- . 2 Code with plastic tape at points where conduit or cable enters wall, ceiling, or floor, and at 6 m intervals.
- . 3 Colours: 25 mm wide prime colour.

	Prime
120/208 V	Blue
347/600 V	Purple
Controls	Orange

2.5 BUILDING WIRES

- . 1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG (including ground wires).
- . 2 Copper conductors: size as required of Division 08:
 - . 1 For applications up to 600 V: with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
 - . 2 For applications up to 250 V: with thermoplastic insulation type T90 Nylon rated at 600 V.

2.6 CONDUITS

- . 1 Electrical metallic tubing EMT, with steel set screw couplings and connectors.
- . 2 Liquid-tight flexible metal conduit.

2.7 CONDUIT FASTENINGS

- . 1 One hole steel straps to secure surface conduits 50 mm and smaller.

2.8 CONDUIT FITTINGS

- . 1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

2.9 OUTLET AND CONDUIT BOXES GENERAL

- . 1 Size boxes in accordance with CSA C22.1HB.
- . 2 102 mm square or larger outlet boxes as required for special devices.
- . 3 Blank cover plates for boxes without wiring devices.

2.10 BOX FITTINGS – GENERAL

- . 1 Bushing and connectors with nylon insulated throats.
- . 2 Knock-out fillers to prevent entry of debris.

2.11 WIRE AND BOX CONNECTORS

- . 1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required. Equal to T&B-PT Series.
- . 2 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - . 1 Connector body and stud clamp for stranded copper conductors.
- . 3 Clamps or connectors for armoured cable as required.
- . 4

2.12 TRADE QUALIFICATIONS

- . 1 The work shall be carried out by licensed electricians with minimum five years experience who hold Ontario Certificates of Qualifications, and current Contractor's license.
-

- . 2 Installation methods and materials to be of strictest quality, and conform to Canadian General Standards Board, Canadian Standards Association, Ontario Building Code and all Local and Provincial Codes and Standards. Discrepancy in Codes to mean strictest rule applies.
- . 3 The ratio of Journeymen to Apprentices shall not exceed the ratio in the Trade Qualifications and Apprenticeship Act of Ontario.

2.13 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 "equipment green" finish to EEMAC Y1-1.
 - . 2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.
- . 2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- . 3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

2.14 WIRING TERMINATIONS

- . 1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

2.15 MANUFACTURERS AND CSA LABELS

- . 1 Visible and legible after equipment is installed.

2.16 WARNING SIGNS

- . 1 As specified and to meet requirements of Electrical Inspection Department and Departmental Representative.
- . 2 Porcelain enamel signs, minimum size 175 x 250 mm.

3. Execution

3.1 MOUNTING HEIGHTS

- . 1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- . 2 Panelboards, disconnects, splitters: as required by Code or as indicated.

3.2 CONDUIT AND CABLE INSTALLATION

- . 1 Conduit Systems:
 - . 1 Install conduits to cause minimum interference in spaces through which they pass.
 - . 2 Use electrical metallic tubing EMT except in where specified elsewhere.
 - . 3 Use liquid tight flexible metal conduit for connection to motors which may vibrate or must be moved for servicing.

- . 4 Minimum conduit size: 21 mm.
- . 5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- . 6 Run parallel or perpendicular to building lines.
- . 7 Group conduits wherever possible on channels.
- . 8 Ream raceways to remove burrs.
- . 2 Wiring:
 - . 1 Install T-90 Nylon and RW-90 conductors in raceways except as otherwise indicated.
 - . 2 Leave minimum 200 mm length of conductor at junction and outlet boxes.
 - . 3 Splices shall not be pulled into conduits.
 - . 4 Provide approved wire pulling lubricants for cable installations in conduits.
- . 3 Outlet boxes:
 - . 1 Support boxes independently of connecting conduits.
 - . 2 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
 - . 3 Provide circuit number identification on all junction boxes with electronically printed labels.
 - . 4 Identify systems for outlet boxes as required.
- . 4 Wire and Box Connections:
 - . 1 Remove insulation carefully from ends of conductors and:
 - . 2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA C22.2 No. 65.
 - . 3 Install bushing stud connectors in accordance with EEMAC 1Y-2.
- . 5 Fastenings and Supports:
 - . 1 Secure equipment to hollow masonry, tile and plaster surfaces with lead anchors or nylon shields.
 - . 2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
 - . 3 Fasten exposed conduit or cables to building construction or support system using straps.
 - . 4 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
 - . 5 Do not use wire lashing or perforated strap to support or secure raceways or cables.
 - . 6 Do not use support or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
 - . 7 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 DISCONNECT SWITCHES

- . 1 Heavy duty fusible and non-fusible, disconnect switch in CSA Enclosure I, size as indicated. Arc quencher and visible blade copper terminals.
- . 2 Provision for padlocking in on-off switch position.
- . 3 Mechanically interlocked door to prevent opening when handle in ON position.

- . 4 Fuses: size coordinated with motor requirements, unless indicated otherwise.
- . 5 Quick make, quick break type.

3.4 CURRENT LIMITING THERMAL MAGNETIC MOLDED CASE BREAKERS

- . 1 Thermal magnetic breakers with current limiters.
 - . 1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.
 - . 2 Coordination results in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

3.5 COORDINATION OF PROTECTIVE DEVICES

- . 1 Ensure circuit protective devices such as overcurrent relays, relays and fuses are installed to values and settings, and coordinated with related equipment and Division 08.

3.6 FIELD QUALITY CONTROL

- . 1 Load Balance:
 - . 1 Measure phase current to panelboards with normal loads operating. Do tests after space is fully occupied and operational. 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, after space is fully occupied and operational.
 - . 3 Submit, at completion of work, report listing phase and neutral currents on panel boards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- . 2 Conduct and pay for following tests:
 - . 1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - . 2 Motors and associated control equipment including sequenced operation of systems where applicable.
- . 3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- . 4 Insulation resistance testing.
 - . 1 Check resistance to ground before energizing.
 - . 2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - . 3 Submit test results for Departmental Representative's review.

3.7 CLEANING

- . 1 Leave Work area clean at end of each day.

END OF SECTION
