

## 1 ELECTRICAL GENERAL PROVISIONS

### 1.1 GENERAL REQUIREMENTS

- .1 Comply with the requirements set out for the General Contractor.

### 1.2 APPLICATION

- .1 This Section applies to and is part of all Sections of divisions 26.

### 1.3 DEFINITIONS

- .1 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Contractor" is used in divisions 26 Specifications, it means the firm having a contract with the "Departmental Representative" to perform supervise and coordinate all work.
- .2 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Sub-Contractor" is used in divisions 26 Specifications, it means the firm having a contract with the "Contractor" to perform supervise and coordinate all work of that particular Division. This Sub-contractor shall be wholly responsible to the "Contractor" for all work of that Division.
- .3 INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
- .4 ELECTRICAL CODE means Local Code in force at Project location.
- .5 INDICATED means as shown on contract drawings or noted in Contract Documents.
- .6 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Provide" is used in relationship to equipment, piping etc., in this Division, it means "Supply, Install and Connect, test, commission and put into work order".
- .7 Whenever "Drawings and Specifications" are referred to in these documents, it means "the Contract Drawings and Specifications" (including all addenda and post contract revisions) of all Disciplines (Architectural, Structural, Mechanical and Electrical).

### 1.4 TRADE DEFINITIONS

- .1 All work called for in the Contract Documents shall be considered to be within the scope of the Contract, and shall be the responsibility of the Contractor.
- .2 The arrangement of the Drawings and Specifications into Divisions, Sections, and Trades is purely arbitrary, with the sole intention of clarifying the scope and content of the work required to complete the project. The actual division of the work amongst the sub-contractors shall be the responsibility of the Contractor, and the actual division of the work between the sub-sub-contractors shall be the responsibility of the sub-contractors.
- .3 The Contractor, at his option and as per his contracts with the Sub-Contractors, may delegate responsibility to the Sub-contractors for the division of the work.
- .4 The Sub-contractors, at their option and as per their contracts with the sub-sub-contractors, may delegate responsibility to the sub-sub-contractors for the division of the work.

- .5 Sections of the Electrical specifications, and specific but arbitrary responsibility divisions noted in the Electrical Specifications, are not intended to delegate functions nor to delegate work to any specific trade, but may be useful to the Contractor or Sub-contractor when dividing the work amongst the Trades and Sub-trades.
- .6 In the event of a dispute regarding the responsibilities of the various trades and sub-trades, the Contractor and Sub-contractors may request information or a recommendation from the Departmental Representative. However, the Contractor and Sub-contractor shall be responsible for determining the final division of work.

#### 1.5 GENERAL SCOPE OF WORK

- .1 The Electrical work shall include all labour, materials, equipment, and tools required to install, test and place into operation a complete and fully operational Electrical System consisting of the various sub-systems as described in, but not necessarily limited to, the items in the following Specification Sections and Drawings:
  - .1 26 00 05 Electrical General Provision
  - .2 26 05 01 Common Work Results – Electrical
  - .3 26 05 04 Miscellaneous Apparatus and Appliances
  - .4 26 05 20 Wire and Box Connectors 0-1000 V
  - .5 26 05 22 Connectors and Terminations
  - .6 26 05 29 Hangers and Supports for Electrical Systems
  - .7 26 05 31 Splitters, Junction, Pull Boxes and Cabinets
  - .8 26 05 32 Outlet Boxes, Conduit Boxes and Fittings
  - .9 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings
  - .10 26 05 80 Mechanical Equipment Connections
  - .11 26 24 17 Panelboards Breaker Type
  - .12 26 27 26 Wiring Devices
  - .13 Drawing E1.0 Electrical – Existing Basement Floor – Power Layout

#### 1.6 DETAILED SCOPE OF WORK

- .1 The detailed Scope of Work includes, but is not limited to:
  - .1 Provision of all labour, new materials, tools, transportation, services and facilities for a complete electrical installation to the satisfaction of the Departmental Representative.
  - .2 All other work as described herein or as shown on the drawings.
  - .3 Provision of power supply to all mechanical equipment and controls.

## 1.7 ELECTRICAL DRAWINGS

- .1 The Drawings for the Electrical work are performance drawings, diagrammatic and approximately to scale, intended to convey the scope of work and indicate the general arrangement and approximate location of devices, fixtures, panelboards and conduit / cable runs. These Drawings do not intend to show Architectural and Structural details.
- .2 Do not scale the Drawings. Obtain information involving accurate dimensions from dimensions shown on the Architectural and Structural drawings, and by site measurement.
- .3 Even though some conduit, cables and systems is not completely shown or is shown schematically, and all details are not shown or specified, it is expected that the contractors be familiar enough with their fields of work to complete the project to the standards generally adhered to by the local industry, including good workmanship and common sense. The Departmental Representative reserves the right to furnish any additional detail drawings, which, in the judgement of the Departmental Representative, may be necessary to clarify the work, and such drawings shall form a part of this contract. The work for such Clarifications shall be at no cost to the project.
- .4 Make, at no additional cost, any changes or additions to materials, and/or equipment necessary to accommodate structural conditions, pipes, ducts, beams, columns etc, and to provide complete and adequate service clearance.
- .5 The exact location of the Electrical components may be changed by the contractors to suit site conditions, provided the changes are reviewed with the Departmental Representative, the changes are duly noted on the 'Record' drawings, and the changes do not affect the operation or code-compliance of the system(s). Any such changes shall be at no cost to the project.

## 1.8 CHANGES TO THE SCOPE OF WORK

- .1 From time to time during construction, changes to the scope of work may be proposed by the Departmental Representative. These Proposed Changes are to be priced by the contractors in a timely manner. Only after the Departmental Representative has reviewed and accepted the pricing, will these Proposed Changes be added to the contract.
- .2 Pricing for the Electrical portions of these Proposed Changes shall be submitted by the Sub-contractor to the Contractor complete with price breakdowns as follows:
  - .1 Sub-sub-contractors' prices c/w labor, material and overhead prices broken out.
  - .2 Sub-contractor's price c/w labor, material and overhead prices broken out.
  - .3 Pricing shall be submitted on an item-by-item basis. Each Proposed Change may contain more than one item.

## 1.9 PHASING

- .1 Coordinate phasing with Mechanical / Controls contractor.
- .2 During all phases of the work, certain portions of the facility must be kept fully functional. Re-route existing services and/or provide temporary service connections as required to meet this objective.

- .3 Coordinate with the Departmental Representative and other contractors as required for shut-down of services.
- .4 Provide start-up, testing, verification and certification of the Electrical Systems at the Occupancy Stage of each construction phase.

#### 1.10 LIABILITY

- .1 Maintain all necessary insurance coverage to save and indemnify the Departmental Representative.
- .2 Protect and maintain the work until the project has been completed and turned over to the Departmental Representative. Protect the building and contents from damage during the construction period. Repair all damages without additional cost to the project.
- .3 Special care shall be taken to insure that any existing equipment, structures, components and property are not damaged during the construction period. Repair all damages without additional cost to the project.

#### 1.11 WORK SCHEDULE

- .1 Unless otherwise noted, the work shall be scheduled for normal hours. The contractors shall be aware that off-hour work may be necessary for certain locations or types of work, and shall include the extra costs in the tender price. Weekend will be required for shutdown/changeovers of building power or systems. Coordinate with Departmental Representative
- .2 Where the work requires the contractors to be in occupied areas, or where building services may be disrupted, the contractors shall closely coordinate the hours and areas of work with the Departmental Representative.
- .3 It shall be the responsibility of the Contractor to schedule the work to meet the Departmental Representative's completion date. The Contractor shall coordinate the sub-trades and adjust the workforce as required to meet the schedule.

#### 1.12 SUPERVISION

- .1 Maintain at this job site qualified personnel and supporting staff with proven experience in supervising, installing and commissioning projects of comparable nature and complexity.
- .2 Supervision personnel and their qualifications are subject to the approval of the Departmental Representative.

#### 1.13 ENGINEERING SITE REVIEW

- .1 The Sub-Contractor's work will be reviewed periodically by the Departmental Representative, solely for the purpose of determining the general quality of the work. Guidance will be offered to the contractors in regard to interpretation of plans and specifications, to assist them in carrying out the work. Inspections, and directives given to the contractors, do not relieve the Contractor, and his agents, servants and employees, of his responsibility to provide the work in all of its parts, in a safe and workmanlike manner, and in accordance with the plans and specifications, nor impose

upon the Departmental Representative, any responsibility to supervise or oversee the erection or installation of any work.

- .2 The Departmental Representative will issue inspection reports and deficiency lists from time to time. All deficiencies shall be cleared up to the satisfaction of the Departmental Representative within a reasonably short time.

#### 1.14 PATENTS

- .1 Pay all royalties and license fees, and defend all suits or claims, for infringement of any patent rights, and save the Departmental Representative harmless of loss or annoyance on account of suit, or claims of any kind for violation or infringement of any letters patent or patent rights, by this Contractor or anyone directly or indirectly employed by him, or by reason of the use by him or them of any part, machine, manufacture or composition of matter on the work, in violation or infringement on such letters patent or rights.

#### 1.15 CONSTRUCTION DRAWINGS

- .1 Where requested, prepare drawings in conjunction with all trades concerned, showing sleeves and openings for passage through structures, and all inserts, equipment bases, sumps and pits, supports, etc.

#### 1.16 CODES, PERMITS, FEES AND INSPECTIONS

- .1 Comply with the most stringent requirements of the latest editions of the applicable C.S.A. standards; NFPA70 and the requirements of the Authorities Having Jurisdiction; Federal, Provincial and Municipal Codes; and the applicable standards of the Underwriters' Association. These codes and regulations constitute an integral part of these specifications.
- .2 In case of conflict between code and contract documents notify Departmental Representative.
- .3 Before starting any work, submit the required number of copies of Drawings and Specifications to the Authorities for their approval and comments. Comply with any changes requested as part of the contract, but notify the Departmental Representative immediately of such changes, for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required. Information such as load calculations and other data that may be required can be obtained from the Departmental Representative. Should the authorities require the information on specific forms fill in these forms by transcribing the information provided by the Departmental Representative.
- .4 Apply for, obtain, and pay for all required permits, licenses, inspections, examinations, and fees.
- .5 Arrange for the inspection of all the work by the Authorities Having Jurisdiction over the work. On completion of the work, present to the Departmental Representative the final unconditional certificate of approval of the inspecting authorities. When the Authorities Having Jurisdiction do not normally issue certificates, provide a declaration confirming that the Authorities have inspected and accepted the work.

#### 1.17 SHOP DRAWINGS

- .1 Present a schedule of shop drawings within 2 weeks after the award of the contract, indicating the shop drawing submission and equipment delivery dates.
- .2 Shop Drawings submitted by the Contractor shall contain:
  - .1 Project Information such as Name and Address
  - .2 Contractor Information such as Name, Address, Phone Numbers
  - .3 Supplier Information such as Name, Address, Phone Numbers
  - .4 Equipment Identification using the same System Name and Identification Number as the Contract Documents.
  - .5 All Equipment Information required for the Departmental Representative to assess the suitability such as:
    - .1 Make, Model, Size
      - .1 including schedules where numerous similar items are provided
    - .2 Physical Data such as:
      - .1 Dimensions
      - .2 Materials
      - .3 Weights
      - .4 Installation Requirements
      - .5 Installation Clearances
    - .3 Performance Data such as:
      - .1 Volume
      - .2 Pressure
      - .3 Capacity
      - .4 Performance Curves (with specified performance clearly marked)
    - .4 Motor Data such as:
      - .1 Horse Power
      - .2 Voltage/Phases
      - .3 Efficiency
    - .5 Wiring and Control Diagrams
- .3 Equipment Information may contain standard manufacturer's brochures, catalogue sheets, schematics, diagrams performance charts, illustrations, etc., but must have:
  - .1 Information which is not applicable crossed off
  - .2 Available listed options which are being provided clearly marked
- .4 Shop Drawing Review:
  - .1 In addition to project identification, date, etc., the form of stamp used in shop drawing review shall contain the following format:
    - .1 Drawing:
      - .1 Reviewed
      - .2 Reviewed As Noted
      - .3 Revise and Re-Submit
      - .4 Not Reviewed
  - .2 This review by the Departmental Representative is for the sole purpose of ascertaining conformance with the general design concept.

- .3 This review shall not mean that the Departmental Representative approved the detail design inherent in the shop drawings, the responsibility for which shall remain with the Sub-contractor submitting same, and such review shall not relieve the Sub-contractor of his responsibility for errors or omissions in the shop drawings, or of his responsibility for meeting all the requirements of the contract documents. The contractors are responsible for confirming and correlating dimensions at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all sub-trades, as well as compliance with codes and inspection authorities such as C.S.A., etc.
- .5 Bind one complete set of final shop drawings in each operating and maintenance instruction manual.
- .6 Refer to the Architectural General Specifications for additional information.

#### 1.18 COORDINATION

- .1 The Contractor shall be responsible for the complete coordination amongst all trades, including timing, completion, deliveries, interference of building components and sequencing of the trades.
- .2 The Contractor shall coordinate the Mechanical and Electrical sub-contractors to ensure compatibility of the system components.
- .3 The Contractor shall coordinate the Mechanical and Electrical sub-contractors to ensure access to control panels on mechanical equipment for the purpose of completing fire alarm panel connections.
- .4 The Contractor shall coordinate all trades to ensure that access doors and panels are of the same manufacturer and of a style appropriate for the intended use.

#### 1.19 EXPEDITING

- .1 Continuously check and expedite delivery of equipment and materials. If necessary, inspect at the source of manufacture.
- .2 Continuously check and expedite the flow of necessary information to and from all parties involved.
- .3 Immediately inform the General Contractor if information is required from him.

#### 1.20 RECORD DRAWINGS

- .1 Obtain two sets of white prints and, as the job progresses; mark these prints to accurately indicate the installed work. Have the white prints available for inspection at the site at all times, and present for scrutiny at each job meeting.
- .2 At the completion of the work, submit these sets of "Record" drawings to the Departmental Representative for review. Make changes as requested by the Departmental Representative and resubmit. This process will continue until the "Record" drawings are deemed complete by the Departmental Representative.
- .3 Arrange and pay for three copies of the final 'Record' Drawings to be produced and labeled 'As Constructed'.

- .4 Submit the "Record" and "As-constructed" drawings to the Departmental Representative.
- .5 For Additional Information, refer to the Architectural General Specifications.
- .6 For Additional Information, refer to the Specifications set out for the General Contractor.

1.21 CUTTING AND PATCHING

- .1 The cutting of openings not requiring lintels or other structural support will be the responsibility of the trade requiring the opening. The opening size shall be the minimum required. Patching will be the responsibility of the trades normally engaged in working with the finishing materials required to restore the opening to the original or specified conditions.
- .2 Where openings require lintels or other structural support, or roofing work, such openings will be specified under other divisions of this specification.
- .3 Cutting, patching, and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment, piping and/or installation of new equipment in existing buildings is to be included in the tender price.

1.22 WORK IN EXISTING AREAS

- .1 Do the work in existing areas to best suit the available space and not interfere with or obstruct the use of the existing facilities.
- .2 Cut, cap-off, modify, or extend as necessary or as directed by the Departmental Representative, existing material or equipment to be removed, reused or relocated to suit the work under this contract.
- .3 Where disruptions of existing Electrical services are required, coordinate the shut down with the Departmental Representative and do the work at a time and in a manner mutually acceptable. Carefully schedule disruptions to keep "Down Time" to a minimum. Submit a concise written schedule of each disruption at least 72 hours in advance and obtain the Departmental Representative's written consent prior to implementation.

1.23 TEMPORARY SERVICES

- .1 Do not use any of the permanent Electrical systems during construction unless specific written approval is obtained from the Departmental Representative.
- .2 The use of permanent facilities for temporary construction service shall not affect, in any way, the commencement date of the warranty period.
- .3 If the permanent Electrical systems are used during construction, the equipment and systems shall be cleaned and refurbished as required to bring them back to a new/unused condition.

1.24 TEMPORARY AND TRIAL USAGE

- .1 The Departmental Representative has the privilege of trial usage of Electrical systems, or parts thereof, for the purpose of testing and learning the operational procedures.



- .2 Assist in the trial usage over a length of time, as deemed reasonable by the Departmental Representative, at no extra cost, and do not waive any responsibility because of trial usage.
- .3 Trial usage shall not be construed as acceptance by the Departmental Representative.
- .4 Provide and pay for all testing required on the system components where, in the opinion of the Departmental Representative, Manufacturer's ratings or specified performance is not being achieved.

#### 1.25 CLEANING

- .1 General Clean-up:
  - .1 The worksite shall be maintained in a condition of general cleanliness and tidiness.
  - .2 Provide, erect, maintain and remove temporary protective barriers and shelters. Use drop sheets, temporary walls or other means necessary to limit the spread of construction dirt and debris. Barriers shall be used to minimize the spread of dust, smoke, fumes and noise to other portions of the building.
  - .3 For renovation work, and for phased work where part of the building is occupied, coordinate and cooperate with the occupants throughout the duration of the project to maintain the site in a usable condition.
  - .4 For renovation work, and for phased work where part of the building is occupied, clean the site to the satisfaction of the occupants at the end of each work day, so as to neither inconvenience the occupants nor hinder the use of the facility.
  - .5 For renovation work, at the end of the project, provide cleaning services to leave the site in as clean a condition as existed before the commencement of the work.
- .2 Electrical Systems Clean-up:
  - .1 At the completion of the project, leave all systems in full operation, the exterior of all new and renovated systems clean, and the work areas cleaned to the satisfaction of the Departmental Representative.
  - .2 Clean exposed surfaces of new and renovated electrical equipment, light fixtures, panelboards, control panels, etc.
  - .3 The level of cleaning shall be consistent with the intended use of the building and the electrical systems.
  - .4 The Departmental Representative reserves the right to inspect the Electrical Systems to determine the effectiveness of the cleaning. Where cleaning is deemed to be unacceptable, the cleaning shall be re-done at no extra charge to the project.

#### 1.26 WARRANTIES

- .1 No certificate issued, payment made, or partial or entire use of the system(s) by the Departmental Representative, shall be construed as acceptance of defective work or material.

- .2 Include copies of all warranty and guaranty certificates and declarations in the Operating and Maintenance Manuals, in the appropriate sections.
- .3 Provide a certificate or declaration indicating the warranty and conditions.
- .4 Warranty satisfactory operation of all work and equipment installed under this contract. Repair or replace at no charge to the project, all items which fail or prove to be defective within the Warranty period, provided that the failure is not due to improper usage by the Departmental Representative. Make good all damages incurred as a result of the failure and of the repair of the system(s).
- .5 The warranty shall be for all parts and labour. Do not expect any participation from the Departmental Representative's personnel in the correction of warranty related work.
- .6 For systems, equipment and components which are used continuously throughout the year, the normal warranty period shall be one calendar year from the date of Substantial Completion. For seasonal equipment, components and systems which are not normally used continuously throughout the year, the warranty period shall include at least one full season of satisfactory operation.
- .7 When equipment or systems are put into use subsequent to the acceptance of the building, or a portion of the building, the warranty period for seasonally used equipment and systems shall be deemed to commence from the date of satisfactory operation, not from the date of final acceptance by the Departmental Representative.
- .8 The Departmental Representative retains the right to demand, and to receive, an extension of the original construction warranty for any equipment, component or system which consistently fails to perform, or which requires repeated repair or adjustment.
- .9 Wherever manufacturer's warranties in excess of the Contractor's warranty are provided, furnish the Departmental Representative with copies of the Certificates, dated and acknowledged, and inserted in the O and M Manuals. The Contractors Warranty shall include a list of the Manufacturer's extended warranties.
- .10 Warranty work shall be carried out within a reasonable time period following the reporting of the problem. Should the repair time for any failed component be unreasonably long, as determined by the Departmental Representative, make alternate arrangements to have a temporary replacement component made available until such time that the original component is repaired and re-installed. There shall be no additional cost to the project for any temporary replacement component or for any labour required to implement the work.

#### 1.27 DOCUMENTATION AND SYSTEM(S) ACCEPTANCE

- .1 The Contractor shall prepare a suitable document to be signed by the Departmental Representative or his representative, confirming:
  - .1 The Departmental Representative has received satisfactory instruction in the operation and maintenance of all equipment and systems.
  - .2 The Operation and maintenance manuals have been received and reviewed by the Departmental Representative.
  - .3 The "Record" and "As-constructed" drawings have been received and reviewed by the Departmental Representative.

- .4 Specified spare parts, components, keys, removable handles, tools and the like, have been accepted by the Departmental Representative.

#### 1.28 COMPLETION

- .1 The Contractor shall be aware that it is the Departmental Representative's intention to withhold recommendations for payment of progress claims totalling more than 92.5% of the electrical contract until the project is declared Substantially Complete.
- .2 The close-out procedure may entail a take-over and occupancy of the building in more than one stage, depending on the specified phasing and the Departmental Representative's timetable.
- .3 SUBSTANTIAL COMPLETION
  - .1 The project will be ready for a Substantial Completion inspection only when it is ready for the Departmental Representative to occupy and utilize the building for its intended purpose.
  - .2 At Substantial Completion, the Departmental Representative will realise that some deficiencies may still exist.
  - .3 In preparation for the inspection to determine Substantial Completion for all or a portion of the project, the Contractor shall ensure and declare in writing that:
    - .1 Except for seasonal deficiencies, the Start-up and Verification of the Commissioning Process has been completed, and all systems are fully functional.
    - .2 All systems and equipment have been cleaned.
    - .3 All systems and equipment have been identified and labelled.
    - .4 The preliminary Record drawings have been submitted for review.
    - .5 One set of preliminary O and M Manuals have been submitted for review.
    - .6 Instructions to the Departmental Representative's Representative have been given.
    - .7 Maintenance Materials and Spare Parts have been provided.
  - .4 When the Contractor is satisfied that the entire project is completed, and after making his own inspection, he shall apply, in writing, to the Departmental Representative for an inspection to determine if the project can be deemed to be Substantially Complete.
  - .5 In the letter of request, a date shall be specified upon which the project can be delivered and be Substantially Complete.
  - .6 During the inspection, a deficiency list will be compiled and a report will be issued. These deficiencies shall be corrected or completed in a satisfactory and timely manner.

- .7 Based on the inspection report, the Departmental Representative will retain a sum of money, sufficient in his estimation to cover the cost of completing the deficiencies.

.4 TOTAL COMPLETION

- .1 When the Contractor has determined that the deficiencies noted during the Substantial Completion inspection have been completed or corrected, he shall apply, in writing, to the Departmental Representative, for a final inspection to determine if the project can be deemed to Totally Complete.
- .2 In the letter of request, a date shall be specified upon which the project can be delivered and be Totally Complete.
- .3 In preparation for the inspection to determine Total Completion for all or a portion of the project, the Contractor shall ensure and declare in writing that:
  - .1 All aspects of the Commissioning Process have been completed.
  - .2 The final Record and As-Constructed drawings have been submitted, reviewed and accepted.
  - .3 The final O and M Manuals have been submitted, reviewed and accepted.
  - .4 The deficiencies noted during the Substantial Completion inspection have been corrected or completed.
- .4 During the inspection, a deficiency list will be compiled and a report will be issued. These deficiencies shall be corrected or completed in a satisfactory and timely manner.
- .5 Based on the inspection report, the Departmental Representative will retain a sum of money, sufficient in his estimation to cover the cost of completing the deficiencies.
- .6 Final Payment will only be made after the project has been determined to be Totally Complete, with all deficiencies satisfactorily corrected.

END OF SECTION 26 00 05

PART 1 GENERAL

1.1 GENERAL

- .1 This Section covers items common to Sections of Division 26.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 VOLTAGE RATINGS

- .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. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 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 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Departmental Representative.

1.6 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .3 Factories assemble control panels and component assemblies.

1.7 REQUEST FOR EQUALS

- .1 Manufactures requesting equal status shall provide a point by point comply non comply statement from the original specification section and in the non comply statements the manufacture shall identify how they intend to comply.

- .2 Provide two copies of all requests for equal documentation and one in PDF format.

## 1.8 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

## 1.9 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 "equipment green" finish to EEMAC Y1-1-1955.
  - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .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.

## 1.10 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
- .2 Nameplates:
  - .1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

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

- .3 Labels:
  - .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .4 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .5 Allow for average of twenty-five (25) letters per nameplate.
- .6 Identification to be English.
- .7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .8 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

- .9 Terminal cabinets and pull boxes: indicate system and voltage.

#### 1.11 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

#### 1.12 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 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	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

#### 1.13 WIRING TERMINATIONS

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

#### 1.14 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible, after equipment is installed.

#### 1.15 WARNING SIGNS

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

#### 1.16 SINGLE LINE ELECTRICAL DIAGRAMS

- .1 Provide single line electrical diagrams under plexiglass as follows:
- .1 Electrical distribution system: locate in main electrical room and sub electrical rooms.
- .2 Electrical power generation and distribution systems: locate in power plant rooms.

- .2 Provide fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.

- .3 Drawings: 600 x 600 mm minimum size.

#### 1.17 LOCATION OF OUTLETS

- .1 Locate outlets as shown on drawings.
- .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. Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

#### 1.18 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.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1200 mm.
  - .2 Wall receptacles:
    - .1 General: 400 mm to bottom.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1200 mm.
  - .3 Panelboards: as required by Code or as indicated.

#### 1.19 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 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.

#### 1.20 FIELD QUALITY CONTROL



- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
  - .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
  - .3 Conduct and pay for following tests:
    - .1 Circuits originating from branch distribution panels.
    - .2 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
  - .5 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.
  - .6 Carry out tests in presence of Departmental Representative.
  - .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
  - .8 Submit test results for Departmental Representative's review.
- 1.21 CO-ORDINATION OF PROTECTIVE DEVICES
- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

## **PART 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used

## **PART 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used

END OF SECTION 26 05 01

PART 1. GENERAL

1.1 SYSTEM DESCRIPTION

- .1 Make all required electrical connections to devices, equipment, appliances, etc., furnished by other trades or Departmental Representative, as indicated or implied on the drawings or in the specifications.
- .2 Provide and install miscellaneous electrical components where required.

1.2 COORDINATION

- .1 Verify electrical supply characteristics of all equipment prior to rough-in. Report any discrepancies immediately. Revise wire sizing, device type, connection type, breaker size, etc., as required to accommodate the electrical supply characteristics of the equipment supplied by other trades.

PART 2. PRODUCTS

2.1 GENERAL

- .1 Provide all required electrical devices, components, conduits, fittings, wiring, disconnects, and miscellaneous equipment to make all connections to equipment.
- .2 Be familiar with the apparatus being supplied and carefully coordinate and cooperate with the supplier/installer to ensure a proper and complete installation.

PART 3. EXECUTION

3.1 EQUIPMENT SUPPLIED BY OTHER TRADES OR DEPARTMENTAL REPRESENTATIVE

- .1 Wire and connect all equipment requiring an electrical connection. Install disconnect switches where required.
- .2 Provide a direct connection or receptacle and cord set to suit hook-up requirements of each piece of equipment. Confirm connection method with Departmental Representative or General Contractor.

END OF SECTION 26 05 04

**PART 1 GENERAL**

1.1 SECTION INCLUDES

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

1.2 REFERENCES

- .1 Canadian Standards Association
  - .1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2No.65, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminium Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .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 in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to approved metal recycling facility.

**PART 2 PRODUCTS**

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper alloy, aluminum alloy sized to fit copper and aluminum conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: NEMA to consist of:
  - .1 Connector body and stud clamp for stranded copper conductors.
  - .2 Clamp for stranded copper conductors.
  - .3 Clamp for stranded aluminum conductors.
  - .4 Stud clamp bolts.
  - .5 Bolts for copper conductors.
  - .6 Bolts for aluminum conductors.

- .7        Sized for conductors as indicated.
- .4        Clamps or connectors for armored cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to CAN/CSA-C22.2No.18.

### PART 3    EXECUTION

#### 3.1        INSTALLATION

- .1        Remove insulation carefully from ends of conductors and:
  - .1        Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
  - .2        Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
  - .3        Install fixture type connectors and tighten. Replace insulating cap.
  - .4        Install bushing stud connectors in accordance with NEMA.

END OF SECTION 26 05 20

PART 1 GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .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 and 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.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .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 nuts or 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 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 10 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 10 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 1200mm 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 Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION 26 05 29

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Work plan.
- .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 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

PART 3 EXECUTION

3.1 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 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION 26 05 31

## PART 1 GENERAL

### 1.1 REFERENCES

- .1 CSA C22.1, Canadian Electrical Code, Part 1.

### 1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Work plan.
- .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 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

### 2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel 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 Electro-galvanized steel 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 and tile walls.

### 2.3 CONDUIT BOXES

- .1 Cast FS or FD ferroalloy boxes with factory threaded hubs and mounting feet for surface wiring of switches and receptacle.

### 2.4 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.

2.5 SERVICE FITTINGS

- .1 'High tension' receptacle fitting made of 2 piece stainless steel with housing finish for two duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.
- .2 Pedestal type 'low tension' fitting made of 2 piece stainless steel housing finish to accommodate Amphenol jack connectors.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits, utilize ERICO TSGB24 for mounting boxes and for supporting conduits and cables within stud walls.
- .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.

END OF SECTION 26 05 32

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2, Rigid PVC 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 in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal], and with the Waste Reduction Work plan.
- .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 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Flexible metal conduit: to CSA C22.2 No. 56, aluminum and liquid tight flexible metal.
- .3 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

- .1 One hole steel 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 1200mm oc.
- .4 Threaded rods, 10 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit (steel).
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Watertight connectors entering top of panelboards for EMT. Set-screws are not acceptable.

#### 2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm 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 and in unfinished areas.
- .3 Use electrical metallic tubing EMT except in cast concrete below grade.
- .4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures and work in movable metal partitions.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .6 Use explosion proof flexible connection for connection to explosion proof motors.
- .7 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .8 Minimum conduit size for lighting and power circuits 21 mm.
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm dia.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .14 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.

END OF SECTION 26 05 34

1 GENERAL

1.1 SYSTEM DESCRIPTION

- .1 Provide complete electrical power and control connections for mechanical equipment, except as noted herein, or as noted on the drawings.

2 PRODUCTS

2.1 MATERIALS

- .1 Include motor starters, disconnects, conduit, wire, fittings, interlocks, outlet boxes, junction boxes, and all associated equipment required to provide power wiring for mechanical equipment, unless otherwise indicated.
- .2 Include pushbutton stations, motor protective switches, interlocks, conduit, wire, devices, and fittings required to provide control wiring for mechanical, line voltage temperature/humidity control systems.
- .3 Unless otherwise noted, motors and control devices shall be supplied by Mechanical Division/Contractor. Motor horsepower ratings shall be as shown in the Mechanical Division specifications. Motor voltage and phase ratings shall be as shown on the Electrical Division drawings.
- .4 Provide the Mechanical Contractor with a copy of the Motor Schedule and ensure conformance with voltage shown. Additional prints of Motor Schedule will be made available by the General Contractor.

3 EXECUTION

3.1 POWER WIRING

- .1 Install power feeders, starters, disconnects, and associated equipment and make connections to all mechanical equipment.
- .2 Install branch circuit wiring for mechanical system control panels, time clocks, and control transformers.
- .3 Install main power feeders to starter/control panels furnished by mechanical Divisions. Install branch wiring from starter/control panels to controlled equipment such as motors, electric coils, etc.
- .4 Flexible connections to motors shall not exceed 6 feet (1.83 m), unless approved by Departmental Representative.

3.2 CONTROLS

- .1 Wire and connect line voltage remote thermostats and P/E switches for gas-fired unit heaters.
- .2 In general conduit, wire, devices and fittings required to wire and connect low voltage controls which are an integral part of the trade supplying the packaged unit, unless otherwise indicated. Control wiring shall be installed in conduit.

In general: conduit, wire, devices and fittings required to wire and connect low voltage temperature control systems, shall be supplied and installed by the trade supplying the temperature control system. Control wiring shall be installed in conduit.

### 3.3 COORDINATION

- .1 Refer to Mechanical Drawings for the exact location of motor control devices, and mechanical equipment requiring an electrical connection.
- .2 Obtain full information from Mechanical Divisions, regarding wiring controls, overload heaters, equipment ratings and over-current protection. Notify the Mechanical Subcontractor, at once, if any information provided is incorrect or unsatisfactory.
- .3 Coordinate control wiring requirements with Mechanical Divisions and provide all control wiring and connections as required to make the control systems operate as specified.
- .4 Refer to Mechanical Division specifications for any further electrical requirements.
- .5 Submit to General Contractor, as part of the tender submission, a list of controls and wiring to be provided in the Electrical Contract.

END OF SECTION 26 05 80

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

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

### 1.2 REFERENCES

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

### 1.3 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, fault rating and enclosure dimension.

### 1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

## PART 2 PRODUCTS

### 2.1 BREAKERS

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .3 Lock-on devices for 5% of 15 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.
- .4 Lock-on devices for fire alarm, exit and night light circuits.

### 2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results.
- .2 Nameplate for each circuit in distribution panelboards (CDP) size 2 engraved.
- .3 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.3 APPROVED MANUFACTURERS

- .1 Eaton, Schneider, Siemens

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Connect loads to circuits.
- .2 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION 26 24 17



PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 REFERENCES

- .1 Canadian Standards Association
  - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices.
  - .3 CSA-C22.2 No.55, Special Use Switches.
  - .4 CSA-C22.2 No.111, General Use Snap Switches.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .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 and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

PART 2 PRODUCTS

2.1 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground ( 5252 ), to: CSA-C22.2 No.42 with following features:
  - .1 Ivory urea moulded housing.
  - .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 rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground( 5252 ) with following features:

- .1 Ivory urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.
- .5 Acceptable materials: Leviton, Arrow Hart, Hubbel, Pass and Seymour.

## 2.2 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 Cast 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 receptacles or switches.

## PART 3 EXECUTION

- .1 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 01 - Common Work Results - Electrical.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .2 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.

END OF SECTION 26 27 26