

Demolition Package Electrical Specifications

**PART 1 General**

**1.1 GENERAL SPECIFICATIONS**

- .1 The contractors must examine the site and the existing conditions affecting the project. Examine the complete set of contract documents to ensure that the work can be carried out without significant changes to the intent of the documents. No future allowance will be made for changes unless the Contract Administrator has been notified in writing of any discrepancies or interferences, prior to the close of Bid Submissions. No allowance will be made for items, which should have been noted during a pre-Bid Submission site inspection.
- .2 The location, routing and elevations of all new and existing devices, equipment, services and utilities as shown on the drawings are to be considered as approximations only. Verify the exact locations, routes and elevations of all existing devices, equipment and services prior to commencing work, and assume responsibility for laying out all work. The contractor shall retain responsibility for any damage to existing services and utilities.
- .3 All aspects of the demolition must comply with the most stringent of the applicable building codes, local regulations, and by-laws.
- .4 Provide all necessary notices, obtain all required permits, pay all fees required by law, and arrange for all inspections related to the performance of the specified work.
- .5 Provide all materials, labor and equipment required to complete the work as shown and as specified.
- .6 Each Contractor shall coordinate the work with other Contractors in order to avoid conflicts.
- .7 Neatly store all materials, and clean up refuse on a regular basis. Protect and maintain all items to remain.
- .8 Only qualified electricians shall perform the electrical demolition.
- .9 Supervise the work at all times through a responsible and fully competent supervisor.
- .10 Examine architectural, interior design, structural and mechanical drawings and demolition specification including the site, local conditions and all existing apparatus to ensure that the work under this contract can be satisfactorily carried out. Report any discrepancies to the contract administrator prior to bid submission. No extra compensation will be allowed due to failure to make this examination and report.
- .11 The Contractor shall examine the site, local conditions and all existing apparatus if any to be re-used and verify that the condition of this equipment is suitable for its intended use in the new construction.
- .12 Prior to any electrical work, Contractor shall make all provisions to remove asbestos, which had been installed in the existing building's structures.

**1.2 DEMOLITION - SCOPE OF WORK**

- .1 Refer to architectural and mechanical general specifications and other general conditions.

Demolition Package Electrical Specifications

- .2 The Contractor shall provide Fire Safety Plan as specified in National Building Code prior to the commencement of demolition.
- .3 Provide all materials, labor, plant and equipment required for a complete demolition as herein specified and as shown on the drawings.
- .4 The electrical demolition work shall be in accordance with the current edition of the Canadian Electrical Code, National Building Code, provincial and municipal codes and regulations.
- .5 In general, the entire building shall be demolished. All electrical distribution, lighting fixtures, receptacles, fire alarm devices, electrical apparatuses and electrical wirings associated mechanical equipment within the building are to be removed and returned to the City of Winnipeg as required.
- .6 All exterior light fixtures, lamp standards and associated hardware shall be disconnected, removed as indicated on working drawings.
- .7 The Contractor shall identify and tag all live circuits, which are to temporarily remain, for temporary uses (refer to Architectural and Mechanical specification for demolition schedule).

Electrical General Provisions

**PART 1 Electrical General Provisions**

**1.1 GENERAL REQUIREMENTS**

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

**1.2 DEFINITIONS**

- .1 INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
- .2 ELECTRICAL CODE means Local Code in force at Project location.
- .3 INDICATED means as shown on contract drawings or noted in Contract Documents.
- .4 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 working order".
- .5 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).

**1.3 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 Contract Administrator. However, the Contractor and Sub-contractor shall be responsible for determining the final division of work.

**1.4 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

### Electrical General Provisions

consisting of the various sub-systems as described in, but not necessarily limited to, the items in the following Specification Sections and Drawings:

|     |                     |  |
|-----|---------------------|--|
| .1  | Section 26 00 01    | Electrical Demolition                        |
| .2  | Section 26 00 04    | Electrical Contractor info                   |
| .3  | Section 26 05 01    | Basic Electrical Materials and Methods       |
| .4  | Section 26 05 04    | Miscellaneous Apparatus and Appliances       |
| .5  | Section 26 05 21    | Wire and Cables                              |
| .6  | Section 26 05 22    | Connectors and Terminations                  |
| .7  | Section 26 05 28    | Grounding                                    |
| .8  | Section 26 05 29    | Fastenings and Supports                      |
| .9  | Section 26 05 31    | Cabinets, Splitters, Junction and Pull Boxes |
| .10 | Section 26 05 32    | Outlet Boxes and Fittings                    |
| .11 | Section 26 05 34    | Conduit                                      |
| .12 | Section 26 05 36    | Cable Tray                                   |
| .13 | Section 26 05 37    | Wireways                                     |
| .14 | Section 26 05 43    | Underground Conduits and Cables              |
| .15 | Section 26 05 80    | Mechanical Equipment Connections             |
| .16 | Section 26 05 94    | Electric Heating and Cooling Controls        |
| .17 | Section 26 09 24    | Lighting Control Equipment                   |
| .18 | Section 26 09 25    | Lighting Contactor Panel                     |
| .19 | Section 26 22 17    | Dry-Type Distribution Transformers           |
| .20 | Section 26 24 13    | Main Distribution Switchboard                |
| .21 | Section 26 24 13.10 | Load balance Test Report                     |
| .22 | Section 26 24 17    | Panel boards                                 |
| .23 | Section 26 27 26    | Wiring Devices                               |
| .24 | Section 26 28 14    | Fuses  |
| .25 | Section 26 28 21    | Circuit Breakers                             |
| .26 | Section 26 29 01    | Contactors                                   |
| .27 | Section 26 43 13    | Transit Voltage Surge Suppression            |
| .28 | Section 26 50 00    | Lighting                                     |
| .29 | Section 26 52 01    | Unit Equipment for Emergency Lighting        |
| .30 | Section 26 52 01.10 | Emergency Lighting Verification Form         |
| .31 | Section 27 05 13    | Voice Data Communication System              |
| .32 | Section 27 05 14    | Communications System Raceways               |
| .33 | Section 27 51 16    | Public Address System                        |
| .34 | Section 28 16 00    | Intrusion Alarm system                       |
| .35 | Section 28 23 00    | Closed Circuit Television System             |
| .36 | Section 28 31 01    | Fire Alarm System                            |
| .37 | Section 28 31 01.10 | Fire Alarm Verification                      |
| .38 | Drawings            | See drawing list on drawing E-1.1            |

## 1.5 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 demolition as per section 26 00 01, and installation to the satisfaction of the Contract Administrator and City of Winnipeg.
  - .2 All other work as described herein or as shown on the drawings.
  - .3 Provision of complete new power distribution system for new building including transformers, main-distributions, feeders, CDPs and panel boards including provision complete short circuit arc fault studies/analysis.

#### Electrical General Provisions

- .4 Arranging for and coordination the utilities work for underground power and telephone services for the new building. Provide underground conduits, trenching, backfilling as required by Utilities and as shown or indicated on drawings.
- .5 Provision of empty conduit system for telephone and CATV utility. Coordinate required work with utilities. Contact, contacting persons designated on drawings or as otherwise required.
- .6 Provision of complete connection of all services (power, telephone, TV etc.) to the new facility, including appropriate termination equipment where required. Include conduit, wire, backboards, pull strings and service entrance equipment.
- .7 Provision of a complete operational lighting system including conduit, wire, switches, boxes, luminaries, terminations, associated relays and contactors and interface with time clock and photocell control system.
- .8 Provision of complete operational Voice and Data Communication system for the new building.
- .9 Provision of Emergency and Exit lighting systems. Systems shall be complete in every respect.
- .10 Provision of a complete Fire Alarm System including coordination and allowance of all associated equipment connections indicated on mechanical drawings and design build sprinkler drawings.
- .11 Provision of power supply to all mechanical equipment and controls. Provide motor control as indicated.
- .12 Supply and installation of Intrusion Detection system, associated hardware.
- .13 Supply and installation of Public Address system, associated hardware and linkage to the existing system.
- .14 Supply and installation of all necessary junction boxes and conduits for future Sound/video system as indicated.

#### **1.6 CASH ALLOWANCES**

- .1 For information regarding Cash Allowances, refer to the Architectural Specifications.
- .2 For information regarding Cash Allowances, refer to the Specifications set out for the Contractor.
- .3 Cash Allowances are to be carried by the Contractor, not by the Electrical Contractor unless specifically noted otherwise.

#### **1.7 SITE EXAMINATION**

- .1 Visit and inspect the site of the work to verify the location and elevation of existing items and services (such as piping, ductwork, lighting, conduit, ceilings, walls, columns, beams, etc.) which may affect the Bid and Work of this Division, before submission of Bid and proceeding with the Work.

### Electrical General Provisions

- .2 Make allowance to relocate all existing items/services as required, or to provide alternate locations/routings of new items/services as required. Confirm alternate locations/routings with the Contract Administrator prior to submitting Bid in according with B6.
- .3 Claims for extra payments resulting from conditions, which could have reasonably been foreseen during a pre-Bid site examination will not be considered.

#### **1.8 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 Contract Administrator reserves the right to furnish any additional detail drawings, which, in the judgement of the Contract Administrator, 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 Contract Administrator.
- .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 Contract Administrator, 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 Contract Administrator.

#### **1.9 CHANGES TO THE SCOPE OF WORK**

- .1 From time to time during construction, changes to the scope of work may be proposed by the Contract Administrator. These Proposed Changes are to be priced by the contractors in a timely manner. Only after the Contract Administrator 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.

#### **1.10 PHASING**

#### Electrical General Provisions

- .1 This project involves sequential demolition and construction in phases. Refer to the Architectural Drawings and Specifications for exact requirements.
- .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 Architect 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.
- .5 Provide for partial fire alarm verification reports as required to accommodate phasing and occupancy requirements.

#### **1.11 LIABILITY**

- .1 Maintain all necessary insurance coverage to save and indemnify the Contract Administrator.
- .2 Protect and maintain the work until the project has been completed and turned over to the Contract Administrator. Protect the building and contents from damage during the construction period. Repair all damages without additional cost to the Contract Administrator.
- .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 Contract Administrator.

#### **1.12 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 Bid price.
- .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 Contract Administrator s and occupants.
- .3 It shall be the responsibility of the Contractor to schedule the work to meet the Contract Administrator's completion date. The Contractor shall coordinate the sub-trades and adjust the workforce as required to meet the schedule.

#### **1.13 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 Contract Administrator.

#### **1.14 ENGINEERING SITE REVIEW**

- .1 The Sub-Contractor's work will be reviewed periodically by the Contract Administrator, the Contract Administrator, or their representatives, solely for the purpose of determining

#### Electrical General Provisions

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 Contract Administrator, and/or their representatives, any responsibility to supervise or oversee the erection or installation of any work.

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

#### **1.15 PATENTS**

- .1 Pay all royalties and license fees, and defend all suits or claims, for infringement of any patent rights, and save the Contract Administrator 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.

#### **1.16 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.

#### **1.17 UTILITY SERVICES**

- .1 Coordinate, arrange, and pay for all utility relocations, terminations and connections as required and shown on the drawings, complete with all required metering.
- .2 Install all metering equipment in accordance with utility requirements.
- .3 Test all services and provide report(s) as required by the Authorities Having Jurisdiction.

#### **1.18 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, the codes take precedence over the Contract Documents. In no instance reduce the standard or scope of work or intent established by the drawings and specifications by applying any of the codes referred to herein.
- .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 Contract Administrator 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 Contract Administrator. Should the authorities require the information on specific forms fill in these forms by transcribing the information provided by the Contract Administrator.



Electrical General Provisions

- .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 Contract Administrator 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.

**1.19 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 Contract Administrator 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:

#### Electrical General Provisions

- .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 Contract Administrator is for the sole purpose of ascertaining conformance with the general design concept.
  - .3 This review shall not mean that the Contract Administrator 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.

#### 1.20 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.

#### 1.21 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 Contractor if information is required from him.

#### 1.22 RECORD DRAWINGS

#### Electrical General Provisions

- .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 Contract Administrator for review. Make changes as requested by the Contract Administrator and resubmit. This process will continue until the "Record" drawings are deemed complete by the Contract Administrator.
- .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 Contract Administrator .
- .5 For Additional Information, refer to the Architectural General Specifications.
- .6 For Additional Information, refer to the Specifications set out for the Contractor.

#### **1.23 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 Bid price.

#### **1.24 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 Contract Administrator, 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 Contract Administrator 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 Contract Administrator's written consent prior to implementation.

#### **1.25 TEMPORARY SERVICES**

- .1 Do not use any of the permanent Electrical systems during construction unless specific written approval is obtained from the Contract Administrator.
- .2 The use of permanent facilities for temporary construction service shall not affect, in any way, the commencement date of the warranty period.

Electrical General Provisions

- .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.

**1.26 TEMPORARY AND TRIAL USAGE**

- .1 The Contract Administrator 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 Contract Administrator, 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 Contract Administrator.
- .4 Provide and pay for all testing required on the system components where, in the opinion of the Contract Administrator, Manufacturer's ratings or specified performance is not being achieved.

**1.27 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 Contract Administrator.
  - .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 Contract Administrator reserves the right to inspect the Electrical Systems to determine the effectiveness of the cleaning. Where cleaning is deemed to be

Electrical General Provisions

unacceptable, the cleaning shall be re-done at no extra charge to the Contract Administrator.

**1.28 INSTRUCTIONS TO CONTRACT ADMINISTRATORS**

- .1 Prepare a Suitable List/Sign-off Sheet to indicate the Instructions and Materials provided.
  - .1 List shall Include all Systems.
  - .2 List shall Include all Materials.
  - .3 List shall include spaces for Sign-off Names and Dates for the Contract Administrator's Representative.
- .2 Instruct the Contract Administrator's representatives in all aspects of the operation of the systems and equipment.
- .3 Arrange and pay for the services of Manufacturers' representatives required for the instruction on specialized portions of the installation.
- .4 Assemble three Operation and Maintenance Manuals in three ring binders with index tabs, each containing:
  - .1 this Sub-contractor's and suppliers names and telephone numbers,
  - .2 a complete set of reviewed shop drawings,
  - .3 brochures,
  - .4 data sheets,
  - .5 operating, maintenance, and lubricating instructions,
  - .6 wiring diagrams,
  - .7 controls 'As-Built' shop drawings,
  - .8 commissioning information,
  - .9 warrantee certificates.
- .5 Present all copies of the Operation and Maintenance Manuals to the Contract Administrator for review. The Contract Administrator will review the manuals and return them with comments. The Sub-contractor shall make all requested changes. This process shall continue until the Manuals are deemed complete by the Contract Administrator. The Sub-contractor shall turn over the completed manuals to the Contract Administrator.
- .6 Present all copies of the Final Record Drawings to the Contract Administrator.

**1.29 SPECIAL TOOLS AND SPARE PARTS**

- .1 Prepare a Suitable List/Sign-off Sheet to indicate the Materials provided.
  - .1 List shall Include all Materials.
  - .2 List shall include spaces for Sign-off Names and Dates for the Contract Administrator's Representative.
- .2 Provide spare parts as follows:
  - .1 Circuit breakers and fuses as indicated in panelboard schedules and single line drawings.
  - .2 Motor starters as indicated

Electrical General Provisions

- .3 10 % spare lamps of each type and rating or a minimum of two
- .4 Other systems as indicated
  
- .3 Identify spare parts containers as to contents and replacement parts number.
- .4 Provide one set of all specialized tools required to service equipment as recommended by the Manufacturers.

**1.30 WARRANTIES**

- .1 No certificate issued, payment made, or partial or entire use of the system(s) by the Contract Administrator, 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 Contract Administrator, 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 Contract Administrator. 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 Contract Administrator'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 Total Performance. 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 Contract Administrator.
- .8 The Contract Administrator 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 Contract Administrator 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 Contract Administrator, 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 Contract Administrator for any temporary replacement component or for any labour required to implement the work.

Electrical General Provisions

**1.31 DOCUMENTATION AND SYSTEM(S) ACCEPTANCE**

- .1 The Contractor shall prepare a suitable document to be signed by the Contract Administrator or his representative, confirming:
  - .1 The Contract Administrator 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 Contract Administrator.
  - .3 The "Record" and "As-constructed" drawings have been received and reviewed by the Contract Administrator.
  - .4 Specified spare parts, components, keys, removable handles, tools and the like, have been accepted by the Contract Administrator.

**1.32 COMPLETION**

- .1 The Contractor shall be aware that it is the Contract Administrator'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 Contract Administrator's timetable.
- .3 **SUBSTANTIAL COMPLETION**
  - .1 The project will be ready for a Substantial Completion inspection only when it is ready for the Contract Administrator to occupy and utilize the building for its intended purpose.
  - .2 At Substantial Completion, the Contract Administrator 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 Contract Administrator's Representative have been given.
    - .7 Maintenance Materials and Spare Parts have been provided.

Electrical General Provisions

- .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 Contract Administrator, 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 Contract Administrator 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 Contract Administrator, 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 Contract Administrator 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 02



Electrical General Provisions

Electrical Specifications

**ELECTRICAL SUB-TRADE INFORMATION**

The following document shall be dated, signed and forwarded to Contract Administrator by the Electrical Sub-Trade within two weeks of award of Electrical Contract, and submit the following:

Sub-Trade's company name, address, telephone and facsimile numbers and the name of the project manager and foreman. Indicate total electrical contract value.

|  |
|--|
| Electrical Sub-Trade _____<br>(Company Name) |
| Address: _____                               |
| Phone: _____ Cell: _____ Fax: _____          |
| Signature: _____                             |
| Printed name: _____ Dated: _____             |

|                                     |
|-------------------------------------|
| Project Manager: _____              |
| Phone: _____ Cell: _____ Fax: _____ |
| Site foreman: _____                 |
| Phone: _____ Cell: _____ Fax: _____ |

|   |
|---|
| Total Electrical Contract Value: \$ _____ |
|---|

Basic Electrical Materials And Methods

**PART 1        General**

**1.1            RELATED WORK**

- .1        Bidding & Contract Requirements
- .2        General Requirements
- .3        All Electrical Drawings and electrical specification sections.
- .4        All Mechanical Drawings and specification sections.

**1.2            QUALITY ASSURANCE**

- .1        Do complete installations in accordance with local standard.
- .2        While not identified and specified by number in this Division, comply with CSA Electrical Bulletins in force at time of Bid submission. Comply with the requirements of all Provincial and local laws, rules, ordinances and codes.
- .3        Electrical installation shall be in accordance with the current edition of the Electrical Code, Provincial and other codes, rules and regulations. Supply material and labour required to meet the requirements of these codes, rules and regulations even though the work is not shown on the drawings or mentioned in the specifications. Where the electrical installation calls for better quality materials or construction than the minimum requirements of these codes, rules and regulations, the electrical installation shall be as shown on the drawings and as specified.

**1.3            PERMITS, FEES**

- .1        Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Additional drawings for approval will be provided by the Contract Administrator.
- .2        Obtain all necessary permits required for the electrical installation.
- .3        Pay all fees for permits and inspections as required for the electrical installation.

**1.4            SUBMITTALS**

- .1        Submit shop drawings and product data for review by the Contract Administrator. All drawings must be in English with Imperial dimensions or in metric where indicated. Manufacture of equipment must not commence until shop drawings have been reviewed.
- .2        Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3        Where applicable, include wiring, single line and schematic diagrams.
- .4        Include wiring drawings or diagrams showing interconnection with work of other Sections.

Basic Electrical Materials And Methods

- .5 Submit samples in accordance with General Conditions. Samples shall be forwarded to the Contract Administrator's office. Pay all transportation costs to ship samples to Contract Administrator's office and return. Approved samples will be retained until after Bid closing, then all samples will be returned except for the sample submitted by the manufacturer who has been listed by the successful Contractor in the Bid Documents. This sample will be used for comparison with the actual production run of successful manufacturer.
- .6 Required shop drawing section:
  - .1 26 05 36 Cable Tray
  - .2 26 05 31 Cabinets, Splitters, J.B.'s
  - .3 26 27 26 Wiring Devices
  - .4 26 24 17 Panelboards
  - .5 26 05 04 Miscellaneous Apparatus and Appliances
  - .6 26 09 24 Lighting Control Equipment
  - .7 26 09 25 Lighting Contactor Panel
  - .8 26 29 01 Contactors
  - .9 26 22 17 Dry Type Distribution Transformers
  - .10 26 50 00 Lighting
  - .11 26 52 01 Unit Equipment for Emergency Lighting
  - .12 27 51 16 Public Address System
  - .13 28 16 00 Intrusion Alarm System
  - .14 28 31 01 Fire Alarm System
  - .15 Steelcase's under-floor access box and pathway system

**1.5 OPERATIONS AND MAINTENANCE DATA**

- .1 Provide operation and maintenance data for incorporation into Maintenance Manuals.
- .2 Include details of design elements, construction features, component function and maintenance requirements and schedules to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
- .3 Include technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature are not acceptable.
- .4 Include wiring and schematic diagrams and performance curves.
- .5 Include names and addresses of local suppliers for items included in Maintenance Manuals.
- .6 Submit Maintenance Manuals to the Contract Administrator for review. Manuals that are incomplete shall be returned to the Electrical Subcontractor for completion. Completed manuals must be submitted, to the satisfaction of the Contract Administrator, before final payment may be considered to be due.

**1.6 MAINTENANCE MANUALS**

- .1 Provide maintenance materials and information as specified.
- .2 Turn materials over to Contract Administrator in an orderly fashion upon completion of

Basic Electrical Materials And Methods

installation.

- .3 Maintenance manuals shall contain a copy of the final verification report and certificate, as well as a copy of the electrical inspection certificate.

**1.7 EXAMINATION OF SITE AND CONSTRUCTION DOCUMENTS**

- .1 Attend pre-Bid site meeting as scheduled and request further information or clarifications at that time.
- .2 Prior to submitting a Bid, examine the site and local conditions which will affect the Work. Claims for extra payments, resulting from conditions which could reasonably be foreseen during an examination of the documents and site, will not be recognized.

**1.8 PRICING OF CHANGES AFTER BID SUBMISSION**

- .1 The Contract Administrator reserves the right to review costing using accepted Contractor's Pricing Standards.

**1.9 OTHER TRADES**

- .1 Include in cost all work by sub trades, such as painting, coring, plastering, access doors etc. to restore all finished areas to original finish.
- .2 Schedule execution of electrical work with associated work specified in other Divisions.
- .3 Coordinate electrical work to avoid conflicts with pipes, air ducts or other equipment.

**1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver all materials to site in an orderly fashion and in accordance with schedule.
- .2 Provide additional protection such as tarps, padding, wood skids, etc., where such is required to ensure protection of equipment and as directed by the Contract Administrator.

**1.11 PROJECT RECORD DOCUMENTS**

- .1 The Electrical Contractor shall maintain one set of white prints on site to record all changes to the Contract Drawings, which affect electrical layouts of equipment. Record drawings shall indicate all circuit wiring and all conduit runs, circuit numbers and devices. All relocations of equipment shall be shown. At project completion, the Contractor shall transfer the record information to a clean set of white prints, using recognized drafting standards, and stamp drawings As-Built, including the company name, date and signature of site Supervisor.

**PART 2 Products**

**2.1 MATERIALS AND EQUIPMENT**

- .1 Provide labour, materials, transportation, equipment and facilities, etc., required for the complete electrical installation as indicated or implied on the drawings and specifications.
- .2 Electrical equipment shall be new and of type and quality specified.

Basic Electrical Materials And Methods

- .3 Equipment and material to be CSA certified, and manufactured to standards described. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the appropriate Inspection Departments.

**2.2 VOLTAGE RATINGS**

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

**PART 3 Execution**

**3.1 INSPECTION**

- .1 Furnish a Certificate of Acceptance from the Inspection Authorities on completion of work. Copies of Certificate to be included in Maintenance Manuals.
- .2 Certificate of Inspection and Approval must be submitted before final payment may be considered to be due.
- .3 During the course of the project construction, the Contract Administrator will carry out periodic inspections and prepare a deficiency list for remedial action by the Electrical Subcontractor. When requested, the Electrical Contractor shall respond in writing to the Contract Administrator, stating corrective action and completion date for each item listed as deficient. This response shall be in the hands of the Contract Administrator within three working days of receipt of the Site Observation Report.

**3.2 CARE, OPERATION AND START-UP**

- .1 Instruct the City of Winnipeg's personnel in the operation, care and maintenance of equipment. Arrangement of such instructional sessions to be done at a time convenient to the Contract Administrator.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.
- .3 Provide these services for such a period, and for as many visits as necessary to put equipment into operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

**3.3 FINISHES**

- .1 Clean and touch up surfaces of shop-painted equipment, scratched or marred during shipment or installation, to match original paint.
- .2 Clean, prime and paint exposed hangers, racks, fastenings to prevent rusting.

**3.4 EQUIPMENT IDENTIFICATION**

#### Basic Electrical Materials And Methods

- .1 Identify electrical equipment with lamacoid nameplates.
- .2 Provide lamacoid nameplates, 1/8" (3 mm) thick plastic engraving sheet, red face, white core, mechanically attached (screwed or riveted) unless specified otherwise. Sizes as follows:

|        |               |               |                                   |
|--------|---------------|---------------|-----------------------------------|
| Size 0 | 3/8" x 1 1/2" | (10 x 38 mm)  | 1 line 1/8" ( 3 mm) high letters  |
| Size 1 | 3/8" x 4"     | (10 x 100 mm) | 1 line 1/8" ( 3 mm) high letters  |
| Size 2 | 1/2" x 3"     | (13 x 75 mm)  | 1 line 3/16" ( 5 mm) high letters |
| Size 3 | 1/2" x 3"     | (13 x 75 mm)  | 2 lines 1/8" ( 3 mm) high letters |
| Size 4 | 3/4" x 3"     | (19 x 75 mm)  | 1 line 3/8" (10 mm) high letters  |
| Size 5 | 3/4" x 4"     | (19 x 100 mm) | 2 lines 3/16"(5 mm) high letters  |
| Size 6 | 1" x 4"       | (25 x 100 mm) | 1 line 1/2" (13 mm) high letters  |
| Size 7 | 1" x 4"       | (25 x 100 mm) | 2 lines 1/4" (6 mm) high letters  |
- .3 Wording on nameplates to be approved prior to manufacture. Submit schedule of nameplates and wording to Contract Administrator where existing systems are modified or added to, and for new construction.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English and French on separate nameplates.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system, circuit, loop numbers.
- .7 Use red nameplates with white lettering for fire alarm equipment and emergency power circuits. Use blue nameplates with white lettering for UPS power circuits.
- .8 Use heat shrink type markers or CAB-3 cable marking system (Pass & Seymour) for all conductors and cables. Mark cables at both ends, see detail 1/E2. Mark fire alarm, card access and LAN cables. Confirm labels with Contract Administrator.

### 3.5 LOCATION OF OUTLETS

- .1 Change location of outlets at no extra cost or credit, providing distance does not exceed 10'-0" (3 m) and information is provided before installation.

### 3.6 MOUNTING

- .1 Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
- .2 Refer to Architectural elevations and details for mounting heights.
- .3 If mounting height of equipment is not indicated, verify with Contract Administrator and before proceeding with installation.
- .4 Install electrical equipment at the following heights unless indicated or directed otherwise (to bottom of outlet).
  - .1 Outlets above counters: 6" (150 mm); backsplash: 4" (100 mm).
  - .2 General receptacles, telephone and television outlets: 16" (400 mm).

#### Basic Electrical Materials And Methods

- .3 Receptacles in mechanical and shop areas: 40" (1 m).
- .4 Switches, dimmers, push buttons, Luxo bracket: 48" (1.2 m).
- .5 Fire alarm pull stations, thermostats: 47" (1.2 m).
- .6 End of line resistors: 64" (1.6 m).
- .7 Fire alarm bells, horns, speakers: 88" (2.2 m).
- .8 Panelboards, annunciator, etc.: 78" (2.0 m) to top.
- .9 Clock outlets: 84" (2.15 m).
- .10 Handicap switches, dimmers, pushbuttons: 35" (0.9 m).
- .11 Handicap receptacles, television, telephone: 24" (600 mm).
- .12 Handicap thermostats: 35" (0.9 m).
- .13 Handicap intercoms: 35" (0.9m).
- .14 As per Architectural elevations.
- .15 Heights as above or at bottom of nearest block or brick course.
- .16 Wall mounted telephone: 60" (1525mm).
- .5 All transformers, motor control centres and floor-mounted distribution panels shall be mounted on 4" (100 mm) concrete housekeeping pads. The Electrical Contractor shall be responsible for provision of these pads. Where ceiling heights will not allow housekeeping pads to be installed below distributions, and where pre-approved by the Contract Administrator, 1 ½" (38 mm) galvanized cantruss shall be provided in place of the pad.

### **3.7 CONDUIT SLEEVES AND HOLES**

- .1 Make necessary arrangements for cutting of chases, coring of holes and other structural work required to install electrical conduits, cables, pullboxes and outlet boxes.
- .2 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .3 The contractor shall satisfy himself by X-Ray or other acceptable means that coring through the floor slab will not disturb existing conduit or cables. The contractor will be responsible for resulting disruptions and required refurbishments.

### **3.8 FIREPROOFING**

- .1 Where cables or conduits pass through floors, block or concrete walls and fire rated walls, provide fire stop to maintain rating.
- .2 Refer to Architectural drawings and specifications, and conform with all requirements



#### Basic Electrical Materials And Methods

therein.

- .3 Acceptable manufacturers (where Architectural specifications do not provide details) are Dow Corning Firestop, A/D Fire Barrier Silicone Sealant, Ener Stop - Ancron Corporation. Install fire stop with strict attention to manufacturers directions. Include directions in maintenance manuals.
- .4 Fireproofing of electrical cables, conduits, trays, etc., passing through fire barriers shall conform to local codes and inspection authorities.

### **3.9 TESTS**

- .1 Conduct and pay for tests including, but not limited to, the following systems:
  - .1 Systems: new electrical distribution system, fire alarm system(s), card access system, low voltage lighting control, parking lot demand controls, mechanical system controls, voice/data infrastructure, emergency lighting system.
  - .2 Furnish Manufacturer's Certificate or letter confirming that entire installation, as it pertains to each system, has been installed to manufacturer's instructions. Include letters in maintenance manuals.
  - .3 Carry out tests in presence of Contract Administrator where directed.
  - .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
  - .5 Submit test results in Maintenance Manuals.

### **3.10 CLEANING**

- .1 Do final cleaning in accordance with Section 01100.

### **3.11 CUTTING AND PATCHING**

- .1 Include the costs of all cutting and patching required for the installation of electrical work.
- .2 Obtain the approval of the Contract Administrator, City of Winnipeg and Contract Administrator before arranging for any cutting. Patching shall restore the affected area to the original condition; materials and methods used for patching shall match existing.

### **3.12 WORKMANSHIP**

- .1 Install equipment, conduit and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Contract Administrator. Install conduit and cable runs parallel and perpendicular to building lines in chases, behind furring or above ceilings, where such concealment is possible. In areas where systems are to be exposed, install neatly and group in a tidy appearance.
- .2 Install equipment and apparatus requiring maintenance, adjustment or eventual replacement, with adequate clearances and accessibility for same.
- .3 Include in the work, all requirements shown on the shop drawings or manufacturer's installation instructions.

Basic Electrical Materials And Methods

- .4 Replace work unsatisfactory to the Contract Administrator without extra cost.

**3.13 ACCESS DOORS**

- .1 Access doors to be a minimum #12 gauge prime coat painted bonderized steel. Each to be complete with a heavy flush frame and anchor, concealed hinges, positive locking screwdriver lock, and mounting and finishing provisions to suit the finish material for which they are supplied. Access doors in fire rated ceilings, walls, partitions, structures, etc. shall be U.L.C. listed and labelled and of a rating to maintain the fire separation integrity.
- .2 Refer to Architectural drawings and specifications for requirements and conform there to.
- .3 Where access doors are located in surfaces where special finishes are required, they shall be of a recessed door type capable of accepting the finish in which they are to be installed so as to maintain the final building surface appearance throughout.
- .4 Supply access doors in inaccessible construction to give access to all concealed junction boxes, pull boxes, conductor joints and other similar electrical work which may need maintenance or repair.

Miscellaneous Apparatus And Appliances

**PART 1 General**

**1.1 RELATED WORK**

- |    |  |                  |
|----|--|------------------|
| .1 | Basic Electrical Materials and Methods | Section 26 05 01 |
| .2 | Conduit                                | Section 26 05 34 |
| .3 | Wire and Cables                        | Section 26 05 21 |
| .4 | Outlet Boxes and Fittings              | Section 26 05 32 |
| .5 | Wiring Devices                         | Section 26 27 26 |

**1.2 SYSTEM DESCRIPTION**

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

**1.3 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.

**2.2 RECEPTACLES**

- .1 Where equipment has line cord and plug, ensure cap is compatible with receptacle. Provide cord sets to equipment where required.

**2.3 BUZZER SYSTEMS**

- .1 Provide a weatherproof 24 volt pushbutton 66" (1.65 m) above floor adjacent to loading or entrance door as indicated.

Miscellaneous Apparatus And Appliances

**2.4 HEAT TRACING CABLES**

- .1 Heating tracing cable for pipes to be self-limiting type rated at 10 watts/foot.
- .2 Voltage and length as indicated.
- .3 Provide cold lead connection kit and locate as indicated.
- .4 Electrical Contractor shall supply and install cables to manufacturer's recommendations.
- .5 Acceptable manufacturer: Raychem.

**PART 3 Execution**

**3.1 EQUIPMENT SUPPLIED BY OTHER TRADES OR CITY OF WINNIPEG**

- .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 City of Winnipeg or General Contractor.

**3.2 TUBS, TUB LIFTS, WHIRLPOOLS, HYDROMASSAGE, ETC.**

- .1 Wire and connect all components and controls. Provide timer-switch for equipment heat lamps.
- .2 Supply and install Ground Fault circuit Interrupters for all power and branch circuits (as required by Canadian Electrical code 68-300 regulations and local authority having jurisdiction).

**3.3 BUZZER SYSTEM**

- .1 Install, wire and connect all components.
- .2 Connect control transformer to nearest receptacle circuit.

Wire And Cables

**PART 1 General**

**1.1 RELATED WORK**

- |    |                              |                  |
|----|------------------------------|------------------|
| .1 | Conduits, Conduit Fastenings | Section 26 05 34 |
| .2 | Connectors and Terminations  | Section 26 05 22 |
| .3 | Communication Systems        | Section 27 05 13 |
| .4 | Data Cable Raceway System    | Section 27 05 14 |

**PART 2 Products**

**2.1 BUILDING WIRES**

- .1 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- .2 All wiring in conduit.
- .3 Minimum wire size #12 AWG, copper.
- .4 Use #10 for runs longer than 45m (15A branch circuits).

**2.2 ALUMINUM SHEATHED CABLE**

- .1 Conductors: copper, size as indicated.
- .2 Insulation: type RA90 rated 600V.
- .3 Sheath: aluminum applied to form continuous corrugated sheath.
- .4 Outer jacket of PVC applied over sheath. Jacket to have LFS/LGE rating FT-4 in accordance with CSA 22.2 No. 0.3-M1985.
- .5 Fastenings for aluminum sheathed cable:
  - .1 One hole aluminum straps to secure surface cables 25 mm and smaller. Two hole aluminum straps for cables larger than 25 mm. Use aluminum straps only with single conductor cable.
  - .2 Channel type supports for two or more cables at 1.5m centers.
  - .3 Nine mm diameter threaded rods to support suspended channels.

Wire And Cables

**PART 3 Execution**

**3.1 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 22.

**3.2 INSTALLATION OF ALUMINUM SHEATHED CABLE**

- .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 22 - Connectors & Terminations.

Connectors And Terminations

**PART 1 General**

**1.1 RELATED WORK**

- .1 Wires and Cables Section 26 05 21
- .2 Grounding Section 26 05 28

**1.2 SHOP DRAWING AND DATA**

- .1 Submit product data in accordance with section 26 05 01.

**1.3 INSPECTION CERTIFICATE**

- .1 Obtain Inspection Certificate of Compliance covering high voltage connections from inspection authority and include in Maintenance manuals.

**PART 2 Products**

**2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper long barrel compression connectors as required, sized for conductors.
- .2 Heat shrink termination kits for connectors.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install terminations in accordance with manufacturer's instructions.
- .2 Bond and ground as required.

Grounding

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Wire and Cable Section 26 05 21

**1.2 REFERENCES**

- .1 Ground equipment to: CSA C22.2 No.41.
- .2 Copper grounding conductors to: CSA G7.1.

**PART 2 Products**

**2.1 EQUIPMENT**

- .1 Grounding conductors system, circuit and equipment, grounding to be bare standard copper, sized in accordance with the Canadian Electrical Code.
- .2 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to;
  - .1 grounding and bonding bushings
  - .2 protective type clamps
  - .3 bolted type conductor connectors
  - .4 thermit welded type conductor connectors
  - .5 bonding jumpers, straps
  - .6 pressure wire connectors.

**PART 3 Execution**

**3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous, system and circuit, grounding systems including electrodes, conductors, connectors and accessories to conform to requirements of local authority having jurisdiction over installation.
- .2 Install connectors to manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections using copper welding by thermit process.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs. Soldered joints not permitted.



## Grounding

- .6 An artificial grounding electrode shall be provided to suit the requirements of the local inspection authorities.
- .7 Install bonding wire for flexible conduit, connected to both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install separate ground conductor, to exterior pole mounted luminaries.
- .9 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .10 Bond single conductor, metallic armored cables to cabinet at supply end, and provide non-metallic entry plate at load end and run separate ground conductor.
- .11 Provide separate ground conductors in PVC conduit, plastic or fibreglass raceways.

### **3.2 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral points of 600V and 208V systems.
- .2 Connect isolated ground buses as indicated to "Y" point of transformer immediately upstream of panel. Connection shall be via insulated green ground wire in conduit. Minimum Size #2/0.

### **3.3 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to: service equipment, transformers, frame of motors, motor control centers, starters, control panels, building steel work, generators, elevators distribution panels, outdoor lighting.

### **3.4 COMMUNICATION SYSTEM**

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
  - .1 provide telephone grounding system in accordance with the utilities requirements
  - .2 Sound, fire alarm, intercommunication systems, as indicated.

### **3.5 TESTS**

- .1 Perform tests in accordance with Section 26 05 01.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the local inspection authority. A report shall be submitted to the City of Winnipeg from the testing agency.
- .3 Perform tests before energizing electrical system.

Grounding

- .4 Disconnect ground fault indicator, if provided, during tests.
- .5 A ground electrode with an unsatisfactory resistance test result shall be altered as necessary until the required resistance reading is achieved.

Fastenings And Supports

**PART 1 General**

**1.1 RELATED WORK**

- |    |                |                  |
|----|----------------|------------------|
| .1 | Conduits       | Section 26 05 34 |
| .2 | Wires & Cables | Section 26 05 21 |

**PART 2 Products**

**2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended as indicated.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Secure equipment to masonry with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 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.
- .5 Support 2 or more cables or conduits on channels supported by 9 mm diameter threaded rod hangers at 1.5m O.C. where direct fastening to building construction is impractical.
- .6 Group conduits on support channels in all corridor ceilings.
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of The Contract Administrator.

Fastenings And Supports

- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

Cabinets, Splitters Junction And Pull Boxes

**PART 1 General**

**1.1 RELATED WORK**

- |    |  |                  |
|----|--|------------------|
| .1 | Basic Electrical Materials and Methods | Section 26 05 01 |
| .2 | Conduits                               | Section 26 05 34 |
| .3 | Fastenings and Supports                | Section 26 05 29 |

**PART 2 Products**

**2.1 LOCATION**

- .1 Locate splitters, junction and pullboxes as indicated or as needed for each system.

**2.2 SPLITTERS**

- .1 Sheet metal enclosure and hinged cover, suitable for locking in closed position.
- .2 Main and branch lugs, to match required size and number of incoming and outgoing conductors, as indicated.
- .3 Provide minimum three spare terminals on each set of lugs in splitters.

**2.3 JUNCTION AND PULLBOXES**

- .1 Sheet steel construction with screw-on flat covers for surface or recessed mounting.
- .2 Covers with 1" (25 mm) minimum extension all around, for flush-mounted pull and junction boxes.
- .3 Cast-type with gasketed covers where exposed to weather.

**2.4 CABINETS**

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface-mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 3/4" (19 mm) GIS fir plywood backboard. Cabinets to be flush or surface-mounted as indicated.
- .3 Provide other systems' cabinets as specified in Electrical Division and located on the electrical drawings.

Cabinets, Splitters Junction And Pull Boxes

**PART 3 Execution**

**3.1 SPLITTER INSTALLATION**

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

**3.2 JUNCTION PULLBOXES AND CABINETS**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 74" (1.9 m) above finish floor.
- .3 Install terminal blocks, as indicated.
- .4 Provide pull boxes in conduit runs as described in Section 26 05 34.
- .5 Boxes and cabinets to be installed plumb and square with building lines.
- .6 Install junction and pull boxes clear of all mechanical ductwork and piping.

**3.3 IDENTIFICATION**

- .1 Identify splitters with Size 5 nameplates.
- .2 Identify junction and pull boxes with Size 1 nameplates.
- .3 Identify cabinet with Size 5 nameplates.

Outlet Boxes And Fittings

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Wiring Devices Section 26 27 26

**1.2 REFERENCE STANDARDS**

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

**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.

**2.2 CONDUIT BOXES**

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

**2.3 FITTINGS GENERAL**

- .1 Bushings 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.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

Outlet Boxes And Fittings

- .3 Provide correct size of openings in boxes for conduit and aluminum sheathed cable connections. Reducing washers are not allowed.



Conduit

**PART 1 General**

**1.1 Related Work**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Fastenings and Supports Section 26 05 29

**1.2 LOCATION OF CONDUIT**

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.
- .2 Electrical Subcontractor to produce layout sketches of conduit runs through mechanical and electrical service areas in order to pre-avoid any conflict with other construction elements and to determine the most efficient route to run conduit.

**PART 2 Products**

**2.1 CONDUITS**

- .1 Electrical metallic tubing (EMT), with couplings: size as indicated. Minimum size 3/4" (19mm).
- .2 Liquid-tight flexible metal conduit: size as indicated, for equipment with vibrational aspects only.

**2.2 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 1 1/4" (32 mm) and smaller. Two hole steel straps for conduits larger than 1 1/4" (32 mm).
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 U-channel type supports for two or more conduits at 60" (1.52 m) intervals (surface-mounted or suspended). 3 – 3/8" (9 mm) diameter threaded rods to support suspended channels. One rod shall be non-ferrous.

**2.3 CONDUIT FITTINGS**

- .1 Fittings manufactured for use with conduit specified.
- .2 Manufactured elbows where 90 degree bends are required for 2" (64 mm) and larger conduits.
- .3 Die cast set screw connectors and couplings. Insulated throat liners on connectors.
- .4 Raintight connector fittings, complete with O-rings, for use on weatherproof or sprinklerproof enclosures. Raintight couplings to be used for surface conduit installations exposed to moisture or sprinkler heads. Raintight connectors shall be used for all top

Conduit

entries to panels, contactors and motor control centres.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use electrical metallic tubing (EMT) except where noted otherwise.
- .4 Wiring home runs to panels and main branch wiring runs in ceiling spaces to be run in conduit. Wiring drops from conduit systems into boxes for wiring devices in steel stud partitions may be wired with AC-90. AC-90 drops to light fixtures shall not run horizontally more than 5' (1.5 m) from conduit system junction boxes in ceiling space. AC-90 drops from conduit system in the ceiling space to feed outlets in steel stud partitions shall not run more than 5' (1.5 m) horizontally from the ceiling outlet box to the point where the AC-90 drops vertically into the partition. Where the total length of AC-90 is greater than 3m in the ceiling, provide conduit to a junction box closer to drop location.
- .5 Use liquid-tight flexible metal conduit for connection to motors, transformers and equipment subject to movement or vibration. Provide a separate insulated grounding conductor within flexible conduit.
- .6 All wiring under computer floors shall be in liquid-tight flexible metal conduit, or teck cable, where indicated.
- .7 Motor connections (use liquid-tight flexible metal conduit only) shall not exceed 6' (1.83m) except where expressly allowed by the Consultant.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Install polypropylene fish cord in empty conduits.
- .10 Install two - 1" (25 mm) spare conduits to tenant ceiling space from each panelboard, cabinet, annunciator, etc. Terminate these conduits in 6" x 6" x 4" (150 x 150 x 100 mm) junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in a flush concrete-type box with extension ring.
- .11 Where conduits become blocked, remove and replace blocked section.
- .12 The length of any conduit run shall not exceed 150' (45 m) and no conduit run shall have more than four 90° bends (or equivalent) before a pull box is installed. Pull boxes shall be installed in accessible ceiling spaces. Conduits shall be supported within 12" (300 mm) of entering any junction box, pull box, cabinet, or panelboard.

## Conduit

- .13 Conduit to be sized as per Canadian Electrical Code or as shown on drawings. Note that the sizes of branch circuit conductors scheduled and/or specified on the drawings are minimum sizes and must be increased as required to suit length of run and voltage drop in accordance with Canadian Electrical Code. Where conductor sizes are increased to suit voltage drop requirements, increase the conduit size to suit at no extra cost.

### 3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not locate conduits within 78" (2 m) of infrared or gas-fired heaters.
- .3 Group conduits wherever possible on suspended or surface channels.
- .4 Do not pass conduits through structural members, except as indicated.
- .5 Do not locate conduits less than 6" (150 mm) to steam or hot water lines.

### 3.3 CONCEALED CONDUITS

- .1 Do not install conduit home runs horizontally in masonry walls.
- .2 Do not install conduits in terrazzo or concrete toppings, unless otherwise indicated.

### 3.4 CONDUIT IDENTIFICATION

- .1 Color code cover plates of junction boxes in conduit systems shall match the city/facility standard or if none exists as per the color code list below.
- .2 Color code by spray painting the cover plate on each junction box in the conduit run.
- .3 In addition to color coding cover plates on junction boxes with power wiring, the circuits being run in the box shall be identified on the inside cover plate with permanent felt marker.
- .4
- |                          |                    |
|--------------------------|--------------------|
| 120/250V Normal Power    | yellow             |
| 120/250V Emergency Power | fluorescent red    |
| 347/600V Normal Power    | orange             |
| 347/600V Emergency Power | fluorescent orange |
| Fire Alarm               | red                |
| Data/Voice               | blue               |
| Security                 | white              |
| Controls                 | brown              |

Provide 50mm wide colour coded tape on all conduits at 3.5m centres.

Cable Tray

**PART 1 General**

**1.1 RELATED WORK**

- |    |  |                  |
|----|--|------------------|
| .1 | Basic Electrical Materials and Methods | Section 26 05 01 |
| .2 | Wire and Cable                         | Section 26 05 21 |
| .3 | Fastenings and Supports                | Section 26 05 29 |
| .4 | Voice Data Communication System        | Section 27 05 13 |

**1.2 SHOP DRAWINGS AND DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.
- .2 Show actual cable tray installation details and suspension system.

**PART 2 Products**

**2.1 CABLE TRAY**

- .1 Aluminum centre hung cable tray.
- .2 18" x 4" x 6" (rung spacing), 450 x 100 x 150 mm, or as specified on the drawings.

**2.2 SUPPORTS**

- .1 In ceiling spaces: cable tray to be suspended 600 mm above ceiling using tray manufacturer's approved system, fastened to steel floor deck above sub-ceiling.
- .2 Provide 45degree risers over or under mechanical equipment.
- .3 Provide Stiffener bars.
- .4 Not all transitions (vertical or horizontal) are indicated on drawings - only general routing. Provide connectors and transitions as required.

**2.3 MANUFACTURERS**

- .1 Acceptable manufacturers: Superior Cabling System Inc. Wire Mold or Mono-Systems Inc., or equals in accordance with B6.

Cable Tray

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install complete cable tray system as indicated.
- .2 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .3 Provide additional offsets, bends, etc. as required to adjust cable tray routing and height to avoid conflict with ducts, pipes, beams, etc. Confirm requirements on site and include costs in Bid price.

**3.2 CABLES IN CABLE TRAY**

- .1 Install cables individually.
- .2 Lay cables into cable tray.
- .3 Secure cables in cable tray at 6' (1.83 m) centres, with category 5 approved clips.
- .4 Identify cables in accordance with Section 27 05 13.
- .5 Install voice cables on one side of tray and data cables on other.

**3.3 FIRE BARRIERS**

- .1 Arrange for opening in fire rated walls, and floors for width and depth of cable tray to pass through.
- .2 Provide fire rating of floors or walls after cables have been installed in accordance with Section 26 05 01.

**3.4 GROUNDING**

- .1 Provide ground wire in cable tray.
- .2 Provide a #6 insulated copper ground wire and bond to tray at 3m intervals using approved clips.
- .3 Include jumpers and compression connections between tray sections and at all transitions.
- .4 Test ground system throughout for continuity.

## WIREWAYS

### **PART 1 General**

#### **1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01

#### **1.2 SUBMITTALS**

- .1 Submit product data in accordance with Section 26 05 01.

### **PART 2 Products**

#### **2.1 WIREWAYS (TELEPHONE DISTRIBUTION)**

- .1 Sheet steel with hinged cover to give uninterrupted access.
- .2 Cross-section dimensions: 2 1/2" x 2 1/2" (64 x 64 mm) or 4" x 4" (100 x 100 mm) or 6" x 6" (150 x 150 mm) as indicated.
- .3 Finish: baked grey enamel.
- .4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.
- .5 Acceptable manufacturers: Pursley, Square D, and Pilgrim.

#### **2.2 WIREWAYS (POWER AND COMMUNICATION)**

- .1 Formed steel with snap-on cover to give uninterrupted access.
- .2 Cross-section dimensions: 1 3/4" x 4 1/4" (45 x 107 mm).
- .3 Finish: standard grey.
- .4 Inside elbows, tees, couplings, clips, device plates and fittings manufactured as accessories to wireway supplied.
- .5 Barrired, as indicated, for power wiring and communication wiring. Non-barrired, as indicated, for power only or communications only.
- .6 Telephone outlets in wireways to have a 1/2" (13 mm) I.D. grommet hole.
- .7 Receptacle outlets in wireways to be one piece with mounting straps tapped for standard devices.
- .8 Acceptable manufacturers: Wiremold.

## WIREWAYS

### **PART 3      Execution**

#### **3.1            INSTALLATION**

- .1      Install wireways in lengths and configurations as indicated.
- .2      Install power and telephone feed-in connections as indicated.
- .3      Install supports, elbows, tees, connectors, fittings.
- .4      Install barriers in the full length of wireways, where required.
- .5      Install devices, wire and make connections.
- .6      Install device plates and snap-on cover.
- .7      Provide wire markers on individual wires in power wireways indicating circuit number. Markers to be installed every 40" (1 m).
- .8      Provide Lamacoid nameplates on all system Wireways.

Underground Conduits And Cables

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Conduits Section 26 05 34
- .3 Wire and Cable Section 26 05 21

**1.2 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 26 05 01.

**PART 2 Products**

**.1 CONDUIT**

- .1 Heavy wall rigid PVC conduits, size as indicated.
- .2 FRE duct, size, as indicated.
- .3 Provide pull boxes as required. Install underground pull box minimum every 200 feet unless otherwise approved. Coordinate location of pull boxes before rough-in.

**2.2 FITTINGS**

- .1 Rigid PVC opaque solvent welded type watertight couplings, bell end fittings, plugs, caps adaptors, as required to make complete installation.
- .2 Expansion joints as required.
- .3 FRE duct couplings, bends, adapters, caps, etc., as required.

**2.3 GROUNDING**

- .1 Provide a separate insulated ground wire in each PVC or FRE conduit run.

**2.4 DIRECT BURIED SINGLE AND MULTI-CONDUCTOR CABLES**

- .1 Single conductor and multi-conductor direct buried cables to Section 26 05 21.

**2.5 WIRE**

- .1 Wire in conduit to Section 26 05 21.



Underground Conduits And Cables

**PART 3 Execution**

**3.1 INSTALLATION OF DIRECT BURIED CABLES AND CONDUITS**

- .1 Conduits and multi-conductor cables to be laid out and spaced appropriately.
- .2 Single conductor cables to be spaced 6" (150 mm) apart.
- .3 Install sand 6" (150 mm) below and 6" (150 mm) above cables and conduits.
- .4 Install conduit with watertight couplings. Make transitions, offsets and changes in direction using 5° bend sections. Do not exceed a total of 20° with conduit offset. Clean conduits before laying. Cap ends of conduits during construction and after installation to prevent entrance of foreign materials. Install pull cords in empty conduits.
- .5 Install continuous overlapping cuprinol-treated planking 6" (150 mm) above cables and conduits before backfilling. Install continuous yellow marker tape 6" (150 mm) above treated planking.

**3.2 INSPECTIONS**

- .1 Advise City of Winnipeg that he may inspect cable and conduit installation prior to backfilling.

**3.3 AS-CONSTRUCTED DRAWINGS**

- .1 Include on As-constructed Drawings, exact dimensioned position and routing of all underground cable feeders, pull boxes, etc.

**3.4 COORDINATION**

- .1 Coordinate underground installations with Utilities (including underground work of other trades) before commencing any work.
- .2 Coordinate underground installations with other trades before commencing any work.

Mechanical Equipment Connections

**PART 1 General**

**1.1 RELATED WORK**

- .1 Mechanical Specifications
- .2 Basic Electrical Materials and Methods                      Section 26 05 01
- .3 Conduits    Section 26 05 34
- .4 Wire and Cable    Section 26 05 21
- .5 Outlet Boxes and Fittings    Section 26 05 32

**1.2 SYSTEM DESCRIPTION**

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

**PART 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 equipment, except for temperature/humidity control systems.
- .3 Unless otherwise noted, motors and control devices shall be supplied by Mechanical Division. Motor horsepower ratings shall be as shown in the Mechanical specifications. Motor voltage and phase ratings shall be as shown on the Electrical 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 Contractor.

**PART 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.

### Mechanical Equipment Connections

- .3 Install main power feeders to starter/control panels furnished by Mechanical Division. 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 the Contract Administrator.

### 3.2 CONTROLS

- .1 Install all electrical controls in accordance with Motor Schedule.
- .2 Install line voltage thermostats.
- .3 Wire and connect float switches, pressure switches, alternators, alarms, etc. for sump pumps, sewage pumps, domestic hot water recirculating pumps, booster pumps, jockey pumps and compressors.
- .4 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.
- .5 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 FIRE PROTECTION (SPRINKLER AND STANDPIPE)

- .1 Wire and connect the flow, pressure and tamper switches, installed on the sprinkler and standpipe systems, to separate zones in the fire alarm control panel. Refer to Fire Protection and Mechanical Drawings for the exact location of these switches.
- .2 Wire and connect fire pump controller supervisory signals to fire alarm control panel.
- .3 Provide an E.O.L.R. for each zone and locate adjacent to monitored device.

### 3.4 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 Division, 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 Division 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.

Mechanical Equipment Connections

- .5 Review both electrical and mechanical drawings and specifications and coordinate all controls with Mechanical Subtrades through Contractor. Report all discrepancies to Contract Administrator before close of Bid. No additional money will be justified for assumptions made on any duplication of information.
  
- .6 Submit to Contractor, as part of the Bid submission, a list of controls and wiring to be provided in the Electrical Contract.

Electric Heating And Cooling Controls

**PART 1 General**

**1.1 SCOPE OF WORK**

- .1 All equipment specified in Section 26 05 94 to be provided, wired and installed by Electrical Div., unless otherwise noted.

**1.2 PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.
- .2 Product data to include:
  - .1 Element replacement data.
  - .2 Mounting methods.
  - .3 Auxiliary controls.
  - .4 Finish.
  - .5 KW ratings, voltage, phase.
  - .6 Cabinet material thicknesses.
  - .7 Controls.

**PART 2 Products**

**2.1 MINIMUM REQUIREMENTS FOR SPACE HEATERS (UNIT AND FORCE FLOW HEATERS)**

- .1 Built-in overheat protection.
- .2 18 gauge steel construction. (16 gauge front cover).
- .3 Heater assembly to be easily removable.
- .4 Finish in beige.
- .5 Wall mounted. (Approx. 7" above finished floor).
- .6 Front inlet and outlet. (Sloped outlet for Dura convector).
- .7 Architectural style, rounded corners.
- .8 Elements: stainless steel, free floating.

Electric Heating And Cooling Controls

- .9 Size as indicated on drawings.
- .10 Baseboard Heaters
- .11 Standard watt density.
- .12 347V, 208V, single phase, as noted on drawings.
- .13 Built in thermostats. Tamperproof in public areas.
- .14 Refer to drawings for quantity and wattage of each unit.
- .15 Equal to Chromalox BN series.

**2.2 ACCEPTABLE MANUFACTURERS**

- .1 Chromalox
- .2 Westcan.
- .3 Stelpro.
- .4 Ouellet.
- .5 Qmark

**2.3 WARRANTY**

- .1 Replace any heater, relay or thermostat which malfunctions within one year from project acceptance by City of Winnipeg.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Mount electric heaters on wall as indicated. Provide additional supports or braces as required to suit application.
- .2 Provide power connection.
- .3 Commission, test and demonstrate operation.

Lighting Contactor Panel

**PART 1 General**

**1.1 RELATED WORK**

- .1 Contactors Section 26 29 01

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.

**PART 2 Products**

**2.1 EQUIPMENT**

- .1 Enclosure constructed with minimum 14 gauge cold rolled steel, pad-lockable, flush mounted, finished with ASA 61 Grey baked enamel inside and outside.
- .2 Inner panel, 12 gauge, baked enamel, white.
- .3 Terminal blocks:
- .1 Design base: Wiedmueller, SAK series.
- .2 Acceptable materials: Wiedmueller, Allen Bradley, Schneider Canada or GE.
- .4 Lighting Contactor:
- .1 20 amp, 4 pole, 600 volt rated (multiple 4 pole as required).
- .2 Control transformer coil: 120 volt and fuse.
- .3 Mount on inner panel.
- .4 Design base: Cutler Hammer CN35 Series.
- .5 Acceptable materials: Cutler Hammer, Allen Bradley, or Schneider Canada ..
- .5 Selector switch mounted inside: HAND-OFF-AUTO:
- .1 Heavy duty Cam type.
- .2 Acceptable materials: Cutler Hammer, Allen Bradley, or Schneider Canada..

Lighting Contactor Panel

**PART 3      Execution**

**3.1            INSTALLATION**

- .1      Terminate all conductors to terminal blocks.
- .2      Mount as indicated near breaker panelboard for control of outdoor building lights.
- .3      Provision for additional supports as required.



Dry Type Distribution Transformers

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01

**1.2 SUBMITTALS**

- .1 Submit product data in accordance with Section 26 05 01.

**PART 2 Products**

**2.1 MATERIALS**

- .1 Dry-type transformers: to CSA C9-02.
- .2 Use distribution transformers of one manufacturer throughout project.

**2.2 TRANSFORMERS - VENTILATED**

- .1 Type: ANN.
- .2 3-phase, 600V Delta, primary 120/208V "Y", secondary 60 Hz.
- .3 KVA capacities as indicated.
- .4 Provide minimum K-4 rated transformers.
- .5 150°C (302°F) temperature rise insulation system.
- .6 Basic Impulse Level (BIL): standard.
- .7 Hi-pot: standard.
- .8 Average sound level: standard.
- .9 Impedance at 170°C (338°F): standard.
- .10 Enclosure: air ventilated sprinklerproof, removable metal front panel. Rear panel to be unremovable.
- .11 Mounting: floor or ceiling suspended as indicated.
- .12 Finish: in accordance with Section 26 05 01.
- .13 Primary taps: two 2 1/2% FCAN and two 2 1/2% FCBN.

**2.3 TRANSFORMERS NON-VENTILATED**

### Dry Type Distribution Transformers

- .1 Epoxy potted.
- .2 3-phase, 600V Delta, primary 120/208V "Y", secondary 60 Hz.
- .3 115°C temperature rise insulation system.
- .4 Basic Impulse Level [BIL]: standard.
- .5 Hi-pot: standard.
- .6 Average sound level: 45 dB.
- .7 Impedance at 170°C [338°F): standard.
- .8 Enclosure: sealed.
- .9 Mounting: floor or wall as indicated.
- .10 Finish: in accordance with Section 26 05 01.

#### **2.4 MANUFACTURERS**

- .1 Acceptable manufacturers: Hammond, REX.

### **PART 3 Execution**

#### **3.1 MOUNTING**

- .1 Mount dry-type transformers on floor with a 4" [100 mm) high concrete housekeeping pad, unless otherwise indicated.
- .2 Suspend dry-type transformers from structure on U-channel and threaded rod support system, as indicated.
- .3 Allow 6" [150 mm) of clearance from walls and 4" [100 mm) from adjacent equipment for ventilation.
- .4 Install transformers in level upright position.
- .5 Remove shipping supports only after transformer is installed and just before putting into service.
- .6 Loosen isolation pad bolts until no compression is visible.
- .7 Mount transformers with vibration isolators.
- .8 Install epoxy potted transformers on wall, unless otherwise indicated.

Dry Type Distribution Transformers

- .9 Use liquid tight flexible conduit for termination.

**3.2 CONNECTIONS**

- .1 Make connections shown on wiring diagram.
- .2 Energize transformers immediately after installation is completed, where practicable.

**3.3 EQUIPMENT IDENTIFICATION**

- .1 Size 7 label in accordance with Section 26 05 01.

Main Distribution Switch Board

**PART 1        General**

**1.1            RELATED WORK**

- |    |  |                  |
|----|--|------------------|
| .1 | Basic Electrical Materials and Methods | Section 26 05 01 |
| .2 | Circuit Breakers                       | Section 26 28 21 |
| .3 | Conduit                                | Section 26 05 34 |
| .4 | Wire and Cable                         | Section 26 05 21 |
| .5 | Grounding                              | Section 26 05 28 |

**1.2            DESCRIPTION OF EQUIPMENT**

- .1 Main distribution board incorporates service entrance cable connection section, main breaker, utility metering transformer compartment, sub-feeder distribution section and customer metering section, factory assembled in one enclosure.

**1.3            SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.
- .2 Indicate:
- .1 Floor anchoring method and foundation template.
  - .2 Dimensioned cable entry and exit locations.
  - .3 Dimensioned position and size of bus.
  - .4 Overall length, height and depth.
  - .5 Dimensioned layout of internal and front panel mounted components.
  - .6 Shipping sections and weights.
- .3 Switchboard manufacturer to provide a coordination, short circuit and Arc Flash study under seal of an engineer licensed to practice in the province of Manitoba and submit to the Contract Administrator with switchboard shop drawings:
- .1 Manufacturer to obtain available fault current (at the customer connection point) from Electric Utility Co.
  - .2 Manufacturer to make all calculations, provide a complete report with separate statement confirming the following:
    - .1 Upstream Utility fusing and Utility fault level;

#### Main Distribution Switch Board

- .2 Interrupting capacity of breakers being supplied;
- .3 Provide device coordination curves for utility transformer and fusing, main breaker, main distribution, largest breaker, smallest breaker and 600:120/208 dry type transformers (75kVA and larger), largest motor.
- .4 Summarize the study with a statement confirming device ratings are compatible with available short circuit and distribution equipment being provided. Confirm equipment is protected by respective breakers and comment on overall coordination.

### **1.4 MAINTENANCE DATA**

- .1 Provide data for incorporation into Maintenance Manual specified in Section 26 05 01.

### **1.5 MAINTENANCE MATERIALS**

- .1 One set spare parts as recommended by manufacturer.
- .2 Fuses:
  - .1 3 fuses for each type above 600A.
  - .2 6 fuses for each type up to and including 600A.

### **1.6 SOURCE QUALITY CONTROL**

- .1 Refer to Section 26 05 01.

## **PART 2 Products**

### **2.1 MATERIALS**

- .1 Service entrance board: to CSA C22.2 No.31.
- .2 Molded case circuit breakers: to CSA C22.2 No.5.
- .3 Fuse holder assemblies: to CSA C22.2 No.39.
- .4 HRC Fuses: to CSA C22.2 No.106.
- .5 Meters: to CSA C17.
- .6 Meter mounting devices: to CSA C22.2 No.115.
- .7 Analogue instruments: to ANSI C39.1.
- .8 Instrument transformers: to CSA C13.

Main Distribution Switch Board

**2.2 POWER SUPPLY**

- .1 Power supply: 3 phase, 4 wire, grounded neutral, 60 Hz, short circuit current rated at 42 KA RMS symmetrical, voltage as indicated on the drawings.

**2.3 SERVICE ENTRANCE SWITCHBOARD**

- .1 Ampere rating: as indicated on the drawings.
- .2 Enclosure:
  - .1 Free-standing, totally enclosed sheet steel, 'sprinklerproof' enclosure with steel frame.
  - .2 Sheet steel barriers to separate adjoining sections.
  - .3 Provision for installation of supply authority metering transformers.
  - .4 Customer metering instruments, transformers and selector switches.
  - .5 Distribution section or sections - see single line include spaces and spares as indicated.
  - .6 Hinged access panels with captive knurled thumb screws. Utility metering section to have provision for utility seals.
  - .7 High conductivity aluminium bus.
  - .8 Bus from load terminals of main breaker via metering section to main lugs of distribution section.
  - .9 Identify phases with color coding.

**2.4 MAIN BREAKER SECTION**

- .1 The main circuit breaker shall be a manually operable, fixed mounted molded case circuit breaker. Breaker shall be equipped with electronic o/c relay to provide the following time/current curve shaping adjustments: (1) long time pick-up setting; (2) long time delay; (3) short time pick-up; (4) short time delay; (5) ground fault pick-up; (6) ground fault time delay. Frame size ampere rating to be as indicated on the drawings.
- .2 The relay shall be provided with three light emitting diodes (L.E.D.'s) to indicate tripping occurred from long time overload, instantaneous or ground fault current. The relay shall be provided with contacts for remote indication. The breaker shall be equipped with in-built current sensors on each phase and neutral. Current sensors ampere tap setting shall be rated to match the frame size of the main breaker. Shunt trip shall be direct acting solenoid-type powered by the sensor/relay energy.

Main Distribution Switch Board

**2.5 GROUNDING**

- .1 Copper ground bus extending full width of cubicles and located at bottom.
- .2 Lugs at each end sized for grounding cable.
- .3 Bond non-current carrying metal parts to ground bus.
- .4 Connect to station ground and building ground bus.

**2.6 HYDRO UTILITY METERING SECTION**

- .1 Separate compartment for exclusive use of utility company metering transformers.
- .2 Provide mounting and wiring for the following:
  - .1 potential transformers
  - .2 current transformers.
  - .3 Hydro utility metering transformers to be supplied by the Hydro utility and factory installed by the switchboard manufacturer.

**2.7 CUSTOMER METERING SECTION**

- .1 Digital metering
  - .1 Standards: ANSI-C6241, IEEE-587.
  - .2 Phase selectable current and voltage (L-L and L-N).
  - .3 Capable of displaying kW, kVA, MWHR, kilowatt demand, current demand, kVA demand, frequency, power factor.
  - .4 LCD or LED display.
  - .5 Resettable minimum and maximum for current, voltage and p.f.
- .2 Potential transformers: if required.
- .3 Potential transformers fused with separate fuse block, equipped with fuse holder and fuses.
- .4 Current transformers: as indicated dry type for indoor use with the following characteristics:
  - .1 nominal voltage class as indicated
  - .2 rated frequency: 60 Hz

Main Distribution Switch Board

- .3 primary circuit rated to match ampere rating of main breaker trip. Secondary current rated at 5 amp.

**2.8 SECONDARY DISTRIBUTION**

- .1 The distribution section shall contain CDP type molded case circuit breakers with electronic trip units. Each breaker shall be manually operated, field adjustable trip for breakers 150A and larger. Fixed trip to 125A ratings as shown on the drawings.
- .2 Breakers shall have a minimum interrupting capacity of 35kA symmetrical. Equal to Culter Hammer FDC for 15-125A and HKD for 150-400A inclusive.
- .3 The distribution section to be provided with sufficient spaces for breakers and spare spaces as indicated on drawings.

**2.9 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 01:
  - .1 service entrance switchboard finish to be exterior grey
  - .2 supply 2 spray cans of touch-up enamel
  - .3 treated to inhibit rusting.

**2.10 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 01.
- .2 Nameplates:
  - .1 black plate, white letters, size 7, to indicate voltage, amp rating and designation
  - .2 complete switchboard: labelled as above main disconnect: labelled "Main Breaker"
  - .3 sub-breakers: labelled to indicate panel or equipment fed.

**2.11 SHOP FABRICATION**

- .1 Assemble and wire complete service entrance board.
- .2 Energize switchboard.
- .3 Check meters and phase selector switches.
- .4 Prepare switchboard for shipment to site.



Main Distribution Switch Board

**2.12 MANUFACTURERS**

- .1 Acceptable manufacturers: Cutler-Hammer or equals in accordance with B6.

**2.13 FUTURE ENERGY MANAGEMENT**

- .1 Provide terminal board and wiring from separate customer CT's and PT's to facilitate the future installation of thermal demand, watt hour energy management equipment, recorders, etc.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Locate service entrance switchboard as indicated.
- .2 Connect main secondary service entrance cables to line terminals of switchboard.
- .3 Connect load terminals of distribution breakers to outgoing feeders, as indicated.
- .4 Check factory-made connections for mechanical security and electrical continuity.
- .5 Run two #3/0, bare copper, grounding conductor in 1" (25 mm) conduit from ground bus to the main building ground.
- .6 Adjust relay settings to those indicated in shop drawings to ensure proper working and protection of components.
- .7 Manufacturer to provide test equipment and field test overload, magnetic and ground fault tripping. Include test report in Maintenance Manuals.
- .8 Perform 3 phase load testing under normal building load after project is deemed substantially complete. Measure voltage, current and power factor for 4 hours, sampling every 5 minutes and recording peak load. Customer metering device may be used for sampling. Recording instrument to be supplied by distribution manufacturer or third party - cost to be included.
- .9 Arrange for main distribution switchboard to be mounted on 4" (100 mm) housekeeping pad.





Panelboards

**PART 1 General**

**1.1 RELATED WORK**

- .1 Panelboards shall be provided as indicated and required for the systems served and supplied under Electrical Division.
- .2 Circuit breakers, switches and accessories shall be provided as indicated and required for a complete installation.

**1.2 SUBMITTALS**

- .1 Shop drawings shall be submitted for approval for all panelboards.
- .2 Voltage and amperage test results shall be submitted to the Contract Administrator, prior to the final site observation.

**PART 2 Products**

**2.1 ACCEPTABLE MANUFACTURERS**

- .1 Panelboards shall be as manufactured by Cutler Hammer or or equals in accordance with B6.
- .2 Panelboards and all of the related components shall be supplied by only one of the indicated manufacturers. Partial or split packages of equipment are not acceptable.

**2.2 GENERAL**

- .1 Panel ratings, sizes, mounting, and components shall be as indicated on the drawings.
- .2 Multiple circuit breakers shall be common trip type.
- .3 All bussing shall be full height at the panelboard rated capacity.
- .4 Provide lockable covers for all CDP's, panels, including suite panelboards.
- .5 Covers shall be hinged, locking type with concealed trim clamps.
- .6
- .7 Main circuit breakers and disconnect switches shall not be branch-mounted unless explicitly indicated.
- .8 Branch circuit breakers shall have a minimum interrupting capacity of 10,000 amps at 120/208 volts and 14,000 amps at 347/600 volts. Refer to single line drawing.
- .9 Provide CDP type panels where indicated.
- .10 All CDP's shall be sprinkler proof and CSA enclosure 3. Panels shall be sprinkler proof.

Panelboards

- .11 Provide 3 spare 15 amp 1 Pole breakers for each panelboard and 1 spare 15 amp 3 Pole for each CDP or as indicated.
- .12 Provide GFCI and AFCI breakers as indicated.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Wall mounted panels shall be mounted with tops at 6'-0" and mounted to 3/4" plywood equipment mounting panels which are painted with a gray fire-retardant.
- .2 Floor mounted panels shall be provided with a 4" concrete housekeeping pad.
- .3 Typed circuit directories shall be provided for all circuit breaker panelboards. Include supply disconnect location and size of feeder.
- .4 Laminated (black/white) plastic nameplates with 3/16" letters shall be provided for each panelboard and for each device in the distribution panelboard(s).
- .5 Loads shall be evenly balanced on all phases.

**3.2 TESTING**

- .1 Voltage and amperage readings shall be taken on the incoming line side of each panelboard with the maximum possible number of systems operating to simulate peak operating conditions.

Wiring Devices

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Outlet Boxes and Fittings Section 26 05 32

**1.2 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.

**PART 2 Products**

**2.1 SWITCHES**

- .1 Toggle-operated general purpose AC switches 15A and 20A, 120V AC and 347V AC, single pole, double pole, three-way and four-way switches as indicated, with the following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea molding.
  - .4 Suitable for back and side wiring.
  - .5 Brown or white toggle as directed by The Contract Administrator.
  - .6 Fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .2 Switches of one manufacturer throughout project.
- .3 Switches to be premium specification grade.
- .4 Acceptable manufacturers:

| <u>Manufacturer</u> | <u>120 Volt</u> | <u>347 Volt</u> |
|---------------------|-----------------|-----------------|
| Hubbell             | 1200 Series     | 18200 Series    |
| Bryant              | 4800 Series     | 6800 Series     |
| Leviton             | 1200 Series     | 54500 Series    |

Wiring Devices

|                |              |              |
|----------------|--------------|--------------|
| Pass & Seymour | 15AC1 Series | 3715 Series  |
| Arrow Hart     | 1891 Series  | 18201 Series |
| Woodhead       | 1890 Series  |              |

**2.2 RECEPTACLES**

- .1 Duplex receptacles, NEMA No. 5-15R, 125V AC, 15A, U-ground, with the following features:
  - .1 Nylon face, red for emergency power or computer power. Other receptacles: color to be determined by The Contract Administrator.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Double wipe contacts and riveted grounding contacts.
- .2 Single receptacles NEMA No. 5-15R, 125V AC, 15A, U-ground, with the following features:
  - .1 Nylon face, color as indicated above.
  - .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Receptacles to be orange face isolated ground type where indicated. Provide a separate insulated ground wire for each isolated ground circuit.
- .4 Receptacles to be of one manufacturer throughout project.
- .5 Acceptable manufacturers: Hubbell, Arrow Hart, Bryant, Woodhead, Pass & Seymour. Catalogue No. 5252 (or equivalent) for all manufacturers.

**2.3 SPECIAL WIRING DEVICES**

- .1 Special wiring devices: as indicated on drawings.
- .2 Pushbutton stations to be flush or surface-mounted as required. Units to be complete with up/down or start/stop buttons, as required, and green pilot light.
- .3 Range outlets to be NEMA #14-50, 125/250V, 50A, black, complete with cord set.
- .4 Dryer outlets to be NEMA #14-30, 125/250V, 30A, black, complete with cord set.
- .5 Power poles to be Emergi-lite #STD/9'6"/W/LC/VP102/RD/AF, complete with telephone and power sections, two duplex receptacles, 10' (3 m) cord and adjustable foot. Color to

#### Wiring Devices

be white. Provide a receptacle in the ceiling space for unit to plug into.

- .6 Floor mounted, pedestal-type receptacle to consist of a 5" (127 mm) square low profile, 2-piece fitting with steel frame with black plastic housing and 2 duplex receptacles. Bottom plate to be complete with knockout for centred installation.
- .7 Floor mounted, pedestal-type combination telephone/receptacle to consist of a 5" x 10" (127 mm x 250 mm), low profile, 2-piece fitting with steel barriered frame with black plastic housing with 2 duplex receptacles and space for two Amphenol jack connectors. Bottom plate to be complete with knockouts in power section and slot for conduit entry in telephone section
- .8 Floor mounted, flush-type receptacle to consist of a Hubbell #B-2529 round formed steel shallow concrete pour box, #S-3925 round cover (brass) and duplex receptacle.

#### **2.4 INCANDESCENT LIGHTING DIMMER CONTROLS**

- .1 Dimmer control devices to have a calibrated linear slide control lever from 0% to 100%. A separate ON/OFF switch, the bottom position of slider to have a positive OFF switch, to turn off current flow to lamps.
- .2 Dimmers shall be Lutron Nova 'NT' Series rated at 1500, 1000 or 600 watts, as indicated on drawings. Dimmers for low voltage lamp circuits to be rated for low voltage applications.
- .3 Color or dimmer snap-on cover to be as selected by the The Contract Administrator, or as indicated on the drawings.
- .4 Provide a separate neutral wire for each dimmer circuit.

#### **2.5 TRANSIENT VOLTAGE SURGE PROTECTION RECEPTACLES**

- .1 Transient voltage surge protection (TVSS) receptacles, NEMA No. S-15R, 125V AC, 15A, U-ground with the following features:
  - .1 Thermo-plastic face, duplex, ivory, hospital grade construction.
  - .2 Back and side wiring.
  - .3 80 joules of energy absorption in each of the three modes: line-to-neutral; line-to-ground; neutral-to-ground.
  - .4 6000 volts protection in each of the three modes.
  - .5 Two filtering capacitors for 7:1 RFI and EMI noise reduction.



#### Wiring Devices

- .6 Varistor clamping voltage 150V RMS.
- .7 Response time of less than 1 nanosecond.
- .8 Built-in LED for surge protection indication.
- .9 Electronic components potted for electrical, mechanical and thermal stability.
- .2 TVSS receptacles to be orange face, isolated ground-type. Provide a separate insulated ground wire for each isolated ground circuit.
- .3 Acceptable manufacturers: Pass & Seymour 6262-SP Series, or equivalent product by Hubbel or Leviton.

### **2.6 COVERPLATES**

- .1 Cover plates from one manufacturer throughout project.
- .2 Stainless steel cover plates for wiring devices mounted in flush-mounted outlet boxes. Where indicated by The Contract Administrator, in-suite outlets may have nylon cover plates in white, off-white or brown. Confirm with shop drawings.
- .3 Sheet steel utility box cover for wiring devices installed in surface mounted utility boxes.
- .4 Cast gasketed cover plates for wiring devices mounted in surface mounted FS or FD.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof cover plates, complete with gaskets for single receptacles or switches as indicated.

## **PART 3 Execution**

### **3.1 INSTALLATION - SWITCHES**

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang-type outlet box when more than one switch is required in one location.
- .3 Mount toggle switches at height specified in Section 26 05 01 or as indicated.

### **3.2 INSTALLATION - RECEPTACLES**

#### Wiring Devices

- .1 Install receptacles in gang-type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles horizontally at height specified in Section 26 05 01, or as indicated.
- .3 Install cord sets on ranges and dryers.

### **3.3 INSTALLATION - COVERPLATES**

- .1 Install suitable common cover plates where wiring devices are ganged.
- .2 Do not use cover plates intended for flush outlet boxes on surface mounted boxes.
- .3 Provide a cover plate on each outlet. Stainless steel, unless otherwise directed.

### **3.4 IDENTIFICATION**

- .1 Identify receptacles with size  $\theta$  nameplate indicating panel and circuit number. Nameplates to be pre-glued with peel-off paper backing.
- .2 Where directed by The Contract Administrator, do not provide name plates on outlets in independent living suites (only).

Fuses

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01

**1.2 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.  
.2 Submit fuse melting and clearing time-current characteristics for each fuse type and size above 400A.

**1.3 MAINTENANCE MANUALS**

- .1 Provide maintenance materials in accordance with Section 26 05 01.  
.2 Three spare fuses of each type and size.

**1.4 DELIVERY AND STORAGE**

- .1 Ship fuses in original containers.  
.2 Do not ship fuses installed in switchboards or disconnects.  
.3 Store spare fuses in storage cabinet.

**PART 2 Products**

**2.1 FUSES - GENERAL**

- .1 Plug and cartridge fuses: to CSA C22.2 No.59.  
.2 HRC fuses: to CSA C22.2 No.106 (R1967) to have interrupting capability of 200,000 amps symmetrical.  
.3 Fuses: product of one manufacturer.

**2.2 FUSE TYPES**

- .1 Form I, HRC fuses, Class L:  
.1 Type L1, time delay, capable of carrying 500% rated current for 4s minimum.  
.2 Type L2, fast-acting.

## Fuses

- .2 Form I, HRC fuses, Class J:
  - .1 Type J1, time delay, capable of carrying 500% rated current for 10s minimum.
  - .2 Type J2, fast-acting.
- .3 Form I, HRC fuses, Class R:
  - .1 Type R1, time delay, capable of carrying 500% rated maximum let-through limits.
  - .2 Type R2, time delay, capable of carrying 500% rated current for 10s minimum, to meet UL Class K5 maximum let-through limits.
  - .3 Type R3, fast-acting Class R, to meet UL Class K1 maximum let-through limits.
- .4 Form II, HRC fuses, Class C:
  - .1 Type C, current limiting.

### **2.3 MANUFACTURERS**

- .1 Acceptable manufacturer's products: FuseTek, Buss, English Electric, Gould.

## **PART 3 Execution**

### **3.1 INSTALLATION**

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

Circuit Breakers

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Panelboards Section 26 24 17

**1.2 SUBMITTALS**

- .1 Submit product data in accordance with Section 26 05 01.
- .2 Include with requests for equal time-current characteristic curves for breakers with Ampacities of 800A and over, or with interrupting capacity of 25,000A symmetrical RMS and over at system voltage.

**PART 2 Products**

**2.1 BREAKERS - GENERAL**

- .1 Bolt-on molded case circuit breaker, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C (104°F) ambient.
- .2 Common-trip breakers with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.

**2.2 THERMAL MAGNETIC BREAKERS**

- .1 Molded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping under overload conditions and instantaneous magnetic tripping for short circuit protection.

**2.3 GROUND FAULT CIRCUIT INTERRUPTERS**

- .1 Molded case circuit breakers as above with integral Class A Group 1 ground fault interrupter.

**2.4 ARC FAULT CIRCUIT INTERRUPTERS**

- .1 Molded case circuit breakers as above with integral Arc Fault Circuit Interrupter to CSA-C22.2 No. 5.1.
- .2 Series, parallel and ground protection.

Circuit Breakers

**2.5 MANUFACTURERS**

- .1 Acceptable manufacturers: Cutler Hammer or equals in accordance with B6.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

Contractors

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Lighting Contactor Panel Section 26 09 25

**PART 2 Products**

**2.1 CONTACTORS**

- .1 Contactors to EEMAC No. ICS-1970.
- .2 Mechanically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Fused switch combination contactor as indicated.
- .4 Complete with two normally open and two normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in CSA enclosure Type 3, or specific control panel, unless indicated otherwise.
- .6 Include the following options in cover:
  - .1 Red indicating lamp.
  - .2 Hand-Off-Auto selector switch.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 01 - Electrical General Requirements.
- .2 Size 4 nameplate indicating name of load controlled as indicated.

**2.3 MANUFACTURER**

- .1 Acceptable manufacturers: Allen Bradley, or Cutler Hammer

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install contactors and connect auxiliary control devices.

Transient Voltage Surge Suppression

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01

**1.2 SCOPE OF WORK**

- .1 The Transient Voltage Surge Suppression System shall utilize multiple bi-directional devices designed to suppress and divert transient voltages and surge currents. The system shall be designed to provide protection for sensitive electronic devices against the harmful effects of surges, transients and electrical line noise.
- .2 The device shall be integral in the main distribution and or panelboard as shortest leads as possible.

**1.3 STANDARDS**

- .1 The transient voltage surge suppression system shall be designed and manufactured to the following standards:
- .1 Underwriters Laboratory - UL 1449 & 1283
  - .2 Canadian Electrical Code.
  - .3 ANSI/IEEEC62.41, Categories A, B, and C
  - .4 ANSI/IEEE62.45

**1.4 SUBMITTALS**

- .1 Submit shop drawings and product data for review by the Contract Administrator as directed in Section 26 05 01. All drawings must be in English with Imperial dimensions or in metric where indicated. Manufacture of equipment must not commence until shop drawings have been reviewed.

**PART 2 Products**

**2.1 OPERATING ENVIRONMENT**

- .1 The system shall be designed for operation in the following conditions:
- .1 Operating Temperature -40C - 60C
  - .2 Relative Humidity 0 - 95%
  - .3 Operating Altitude 0 - 12,000 Feet



Transient Voltage Surge Suppression

**2.2 ELECTRICAL REQUIREMENTS**

- .1 The transient voltage surge suppression System shall have unlimited nominal current handling when installed in a parallel configuration.
- .2 The system voltage shall be as indicated, 3 Phase, 4 Wire plus ground at 60 Hertz.
- .3 The transient voltage surge suppression System shall be a single stage device capable of suppressing 200kA amperes.
- .4 The system's mode of operation shall protect against surges and transients as follows:

| <u>System Configuration</u>     | <u>Protection Mode</u> | <u>Surge Current</u> |
|---------------------------------|------------------------|----------------------|
| Three Phase, 4 Wire (Wye) + Gr. | L-N & N-G              | 200kA                |

**2.3 OPERATING PARAMETERS**

- .1 The maximum response time shall not exceed 1 nanosecond.
- .2 The system shall be provided with a Noise Filtering System capable of managing noise levels produced by electro-magnetic interference and radio frequency interference. The Noise Filtering System shall reject a minimum of 40db.
- .3 The system shall operate over a frequency range of 45 hertz to 450 hertz.
- .4 The system's filtering mode shall provide sinewave tracking to within +/- 20%
- .5 The Clamping Voltage values of the system shall be no greater than specified in UL 1449.

**2.4 PROTECTION AND FILTERING ELEMENTS**

- .1 The transient voltage surge suppression system shall consist of a number of circuits designed to suppress and divert transient voltages and surge currents. The system shall be rated to suppress a minimum of 40,000 amperes of surge current. Each device shall be designed to withstand over 1000 surges of Category C (IEEE/ANSI C62.41) currents rated at 3000 amperes.
- .2 The system shall contain a green light and red light for easy viewing. The normal operation of the system shall provide positive indication utilizing the green light. Failure of the system shall provide negative indication utilizing the red light.
- .3 The protection components shall be mounted via printed circuit board designed to reduce potential impedances which could inhibit the Surge Suppression process. Multiple modules shall be connected to their "Motherboard" printed circuit board to additionally reduce unwanted impedances.
- .4 Each protection pathway shall contain filtering elements capable of providing 40db of

### Transient Voltage Surge Suppression

noise attenuation.

- .5 The use of Gas Discharge Devices is expressly forbidden.

## **2.5 CABINET CONSTRUCTION**

- .1 The cabinet enclosure shall be designed for wall mounting. The cabinet shall be factory pre-finished and require no painting.
- .2 The cabinet enclosure shall be CSA Enclosure 4X rated for either indoor or outdoor applications.

## **2.6 STANDARD MONITORING FEATURES**

- .1 The surge suppression system shall provide complete visual status indication as to the proper operation of the system. The system shall include three (3) illuminated indicator lights: one green illuminated light to indicate that the system is fully operational; one amber illuminated light to indicate a phase loss and one red indicator for any system fault condition.
- .2 A summary contact is provided so that remote monitoring of the system is possible. The "Form C" dry contacts can be connected in either the normally open or normally closed position. Any TVSS protection circuit failure, phase loss, or abnormal low voltage condition shall change the state of the summary alarm contact for remote alarm purposes.

## **2.7 SYSTEM WARRANTY**

- .1 The Transient Voltage Surge Suppression System manufacturer shall warranty the entire system against defective materials and workmanship for a period of three years following acceptance by the Contract Administrator.
- .2 The manufacturer is required to have a nationwide network of factory trained technicians dedicated to repair and service of this product.

## **2.8 ACCEPTABLE MANUFACTURERS**

- .1 TVSS Projects must be approved by and supplied with the electrical distribution system by the switchboard manufacturer.
- .2 Acceptable manufacturers are: Cutler Hammer or equals in accordance with B6.
- .3 Other manufacturers must provide the Contract Administrator the following information at least five days prior to the bid date for review purposes:
  - .1 Complete product literature.
  - .2 Complete copy of a UL 1449 file including clamping voltage ratings.
  - .3 Independent test laboratory reports indicating compliance with ANSI/IEEE C62.41 "C" and C62.45.

Transient Voltage Surge Suppression

- .4 Warranty certificate in compliance with specification section 2.7.
- .5 Contact and number of local field service support center applicable to this project.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 TVSS device shall be factory assembled and integral with main distribution and or panelboard.
- .2 Provide maintenance instructions and maintenance materials for inclusion in maintenance manuals.

Lighting

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Fastenings and Supports Section 26 05 29
- .3 Outlet boxes Section 26 05 32

**1.2 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 26 05 01.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified for approval by City of Winnipeg.
- .3 Submit list of replacement lamp data for each luminaires. Include lamp type, voltage, wattage, base type and order code. Include list in maintenance manual.

**1.3 GUARANTEE**

- .1 Replace:
  - .1 Incandescent and tungsten halogen lamps burnt out within 3 months of takeover.
  - .2 Fluorescent and HID lamps burning out within 12 months of takeover.
  - .3 Ballasts that fail or exceed their labelled noise level rating or THD within 12 months of takeover.

**1.4 COORDINATION**

- .1 Coordinate luminaire locations with work of other trades.
- .2 Coordinate luminaire types with ceiling finishes to ensure compatibility.

**PART 2 Products**

**2.1 GENERAL**

- .1 Luminaires shall carry the CSA label.
- .2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.
- .3 Provide lenses or diffusers of glass or acrylic material as indicated. Acrylic lenses used with fluorescent luminaires shall be a minimum of .125" (3 mm) thick, and shall be mounted in a hinged frame.

## Lighting

- .4 Include finishes to Section 26 05 01 and as indicated.
- .5 Where soffits or ceilings have thermal insulation, provide fixtures which are CSA approved for such use.

### **2.2 LAMPS**

- .1 Provide lamps as indicated.
- .2 Incandescent lamps to be extended service type rated 5000 hours, 130 volts, inside frosted, unless indicated otherwise.
- .3 Fluorescent lamps shall be T-5,T-8 rapid start, 3100 lumens, rated 20,000 hours, 3500K, CRI 85 (or greater).
- .4 Fluorescent "PL" lamps shall be 13W (or as indicated on drawings) and match T5 or T8 lamps for color temperature.

### **2.3 BALLASTS AND ACCESSORIES**

- .1 Provide ballasts and accessories as indicated.
- .2 Provide ballasts with non-PCB type capacitors with pressure sensitive devices to prevent rupturing.
- .3 Provide discreet electronic instant start fluorescent ballasts of 120 and 347V design, automatic reset thermal protected, 90% power factor, group A noise rating. Ballasts to have 4 watt/lamp or less loss. Only Manitoba Hydro Power Smart approved ballasts will be accepted.

### **2.4 EXIT LIGHTS**

- .1 Provide exit lights as indicated, complete with directional arrows, as shown on the drawings.
- .2 Units to be provided with full panel LED's, bilingual, meeting CSA-C860-01.
- .3 Arrange exit lights as required, to allow exits to be visible from access to egress locations.

## **PART 3 Execution**

### **3.1 INSTALLATION (LUMINAIRES)**

- .1 Install luminaires at locations indicated, complete with all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.
- .2 Install luminaires and lens materials in architectural details, as indicated.

## Lighting

- .3 Install luminaires parallel with building lines. Wall-mounted luminaires to be installed plumb.
- .4 Review all ceiling types, construction details and mounting arrangements before placing luminaire orders and ensure that all mounting assemblies, frames, rings and similar features are included for and match the required installation.
- .5 All luminaires and assemblies shall be properly secured and supported. Support luminaires independent of the ceiling construction, complete with all fasteners, framing and hangers, as may be required. Do not secure luminaires to mechanical ductwork or other vibration producing apparatus.
- .6 Where a luminaire is suspended from the ceiling using a self-aligning box cover, an additional ground wire from the outlet box to the luminaire shall be provided.
- .7 Coordinate the installation of luminaires with the work of other trades, ensuring that the necessary depths and mounting spaces are provided. Luminaires which cannot be installed due to a conflict with structural members, pipes or ductwork shall be relocated to a more suitable location, as directed by the City of Winnipeg and/or Contract Administrator.
- .8 Do not handle specular lenses with bare hands. Use plastic gloves as recommended by supplier.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits as indicated.
- .2 Circuit breakers for exit light and night light circuits shall be provided with lock-on devices.
- .3 Provide a separate neutral conductor for each circuit.
- .4 Wiring for exit and night light circuits shall be installed in a separate conduit system.
- .5 Connect luminaires to contactor controlled circuits where indicated. In general corridor, alternating fixtures on separate contactors.

### **3.3 TESTS**

- .1 Perform tests in accordance with Section 26 05 01.
- .2 Check luminaires and replace defective lamps, ballasts, lenses and accessories.
- .3 Provide 100 hour burn in at start up.

### **3.4 CLEANING**

- .1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a

Lighting

damp cloth to remove dust, smudges and fingerprints.

- .2 Do not handle specular lenses with bare hands. Use plastic gloves as recommended by supplier.

Unit Equipment For Emergency Lighting

**PART 1 General**

**1.1 RELATED WORK**

- .1 Basic Electrical Materials and Methods Section 26 05 01
- .2 Conduit Section 26 05 34
- .3 Wiring Devices Section 26 27 26
- .4 Outlet Boxes and Fittings Section 26 05 32

**1.2 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 26 05 01.
- .2 Data to indicate system components, mounting method, source of power and special attachments.
- .3 Battery bank sizing criteria.

**1.3 OPERATION AND MAINTENANCE DATA**

- .1 Provide data for incorporation into Maintenance Manual specified in Section 26 05 01.
- .2 Operation and Maintenance Manual to include:
  - .1 Operation and maintenance instructions for complete battery system to permit effective operation and maintenance.
  - .2 Technical data - illustrated parts lists with parts catalogue numbers.
  - .3 Copy of approved shop drawings.

**1.4 MAINTENANCE MANUALS**

- .1 Provide maintenance manuals in accordance with Section 26 05 01.

**1.5 WARRANTY**

- .1 Provide a written guarantee, stating that the battery for emergency lighting is guaranteed against defects in material and workmanship for a period of ten years, with a no-charge replacement during the first five years and a pro-rate charge on the second five years from the date of the Final Acceptance from the City of Winnipeg.

**1.6 SYSTEM DESCRIPTION**

- .1 The system to include battery unit(s) remote heads, wire and conduit, etc., to provide backup emergency lighting in the event of a loss of AC power to the normal lighting



Unit Equipment For Emergency Lighting

- system.
- .2 Unit equipment certified to CSA Standard C22.2 No. 141.

**PART 2 Products**

**2.1 BATTERY BANK**

- .1 Supply voltage: 120 or 347 volt.
- .2 Output voltage: 24DC.
- .3 Battery: long life sealed lead, maintenance-free.
- .4 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected, modular constructed.
- .5 Solid state transfer.
- .6 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .7 Signal lights: solid state, life expectancy 100,000 h minimum, for "AC Power ON" and "High Charge".
- .8 Lamp heads: integral on unit and remote as indicated. Adjustable mounting, swivel type, complete with quartz halogen lamp. Minimum twin heads required per location.
- .9 Cabinet: suitable for shelf mounting to wall and complete with knockouts for conduit.
- .10 Auxiliary equipment:
  - .1 test switch
  - .2 battery disconnect device
  - .3 AC input and DC output terminal blocks inside cabinet
  - .4 shelf
  - .5 cord and plug connection for AC
  - .6 RFI suppressors
  - .7 Auto Test
  - .8 Time Delay

**2.2 REMOTE HEADS**

- .1 Double adjustable heads, as indicated.

Unit Equipment For Emergency Lighting

**2.3 MANUFACTURERS**

- .1 Acceptable Manufacturers: Lumacell, Energi Lite and ReadyLite.

**PART 3 Execution**

**3.1 INSTALLATION**

- .1 Install unit equipment for emergency lighting in accordance with CSA C22.1.
- .2 Install conduit and wiring as indicated.
- .3 Install unit equipment and remote mounted fixtures as indicated.
- .4 Cut and re-cap cord to remove surplus.
- .5 Direct heads as indicated.
- .6 Mount double remote heads on outlet box such that two heads will be horizontal with the building lines.
- .7 Provide “dark test” at the end of the project to direct heads as indicated and required to provide adequate egress lighting. Confirm test complete before requesting substantial performance and/or final on-site review by the Contract Administrator.
- .8 Charge the batteries and test the system for proper operation (minimum of 35 minutes discharge time).

Electrical Specifications

**EMERGENCY LIGHTING VERIFICATION**

The following document shall be dated and signed by Contractor. upon final completion, witnessing and verification of installed, fully operational emergency lighting systems (including installation and testing of all exit lights and emergency lights) as outlined in drawings and electrical specifications.

This **Emergency Lighting Verification** document must be submitted to City of Winnipeg **PRIOR** to submitting request for 'Substantial Completion'.

|   |                  |
|---|------------------|
| Company Name: _____<br>(Electrical Sub-Trade)   | Date: _____      |
| Printed Name: _____   | Signature: _____ |
| I hereby verify that all emergency lighting systems as noted above are complete and have been commissioned on above noted date. |                  |

|   |                  |
|---|------------------|
| Company Name: _____<br>(Contractor)   | Date: _____      |
| Printed Name: _____   | Signature: _____ |
| I hereby verify that all emergency lighting systems as noted above are complete and have been commissioned on above noted date. |                  |

|   |                  |
|---|------------------|
| Witness (circle one):   |                  |
| Contract Administrator's representative -   | Date: _____      |
| Printed Name: _____   | Signature: _____ |
| I hereby verify that all emergency lighting systems as noted above are complete and have been commissioned on above noted date. |                  |

The above does not constitute a waiver of any of the contract document requirements.