1 ELECTRICAL GENERAL PROVISIONS

1.1 GENERAL REQUIREMENTS

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

1.2 APPLICATION

.1 This Section applies to and is part of all Sections of divisions 26, 27 and 28.

1.3 DEFINITIONS

.1 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Contractor" is used in divisions 26, 27 and 28 Specifications, it means the firm having a contract with the "City Of Winnipeg" to perform supervise and coordinate all work.

.2 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Subcontractor" is used in divisions 26, 27 and 28 Specifications, it means the firm having a contract with the "Contractor" to perform supervise and coordinate all work of that particular Division. This Subcontractor shall be wholly responsible to the "Contractor" for all work of that Division.

.3 INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.

.4 ELECTRICAL CODE means Local Code in force at Project location.

.5 INDICATED means as shown on contract drawings or noted in Contract Documents.

.6 Notwithstanding any definition elsewhere in the contract documents, wherever the term "Provide" is used in relationship to equipment, piping etc., in this Division, it means "Supply, Install and Connect, test, commission and put into work order".

.7 Whenever "Drawings and Specifications" are referred to in these documents, it means "the Contract Drawings and Specifications" (including all addenda and post contract revisions) of all Disciplines (Contract Administrator, Structural, Mechanical and Electrical).

1.4 TRADE DEFINITIONS

.1 All work called for in the Contract Documents shall be considered to be within the scope of the Contract, and shall be the responsibility of the Contractor.

.2 The arrangement of the Drawings and Specifications into Divisions, Sections, and Trades is purely arbitrary, with the sole intention of clarifying the scope and content of the work required to complete the project. The actual division of the work amongst the Subcontractors shall be the responsibility of the Contractor, and the actual division of the work between the Subcontractors shall be the responsibility of the Subcontractors.

.3 The Contractor, at his option and as per his contracts with the Subcontractors, may delegate responsibility to the Subcontractors for the division of the work.

.4 The Subcontractors, at their option and as per their contracts with the Subcontractors, may delegate responsibility to the Subcontractors 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 Subcontractor 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 Subcontractors may request information or a recommendation from the Contract Administrator. However, the Contractor and Subcontractors shall be responsible for determining the final division of work.

1.5 GENERAL SCOPE OF WORK

.1 The Electrical work shall include all labour, materials, equipment, and tools required to install, test and place into operation a complete and fully operational Electrical System consisting of the various sub-systems as described in, but not necessarily limited to, the items in the following Specification Sections and Drawings:

.1	Section 26 00 05	Electrical General Provisions
.2	Section 26 05 01	Basic Electrical Materials and Methods
.3	Section 26 05 04	Miscellaneous Apparatus and Appliances
.4	Section 26 05 21	Wire and Cables
.5	Section 26 05 22	Connectors and Terminations
.6	Section 26 05 29	Fastenings and Supports
.7	Section 26 05 31	Cabinets, Splitters, Junction and Pull Boxes
.8	Section 26 05 32	Outlet Boxes and Fittings
.9	Section 26 05 34	Conduit
.10	Section 26 05 37	Wireways
.11	Section 26 05 80	Mechanical Equipment Connections
.12	Section 26 05 94	Electric Heating and Cooling Controls

.13	Section 26 08 00	Electrical Commissioning
.14	Section 26 09 25	Lighting Contactor Panel
.15	Section 26 27 26	Wiring Devices
.16	Section 26 28 14	Fuses
.17	Section 26 28 21	Circuit Breakers
.18	Section 26 28 23	Disconnect Switches – Fused and Non-fused
.19	Section 26 29 01	Contactor
.20	Section 26 50 00	Lighting
.21	Section 26 52 01	Unit Equipment for Emergency Lighting
.22	Section 26 52 01.10	Emergency Lighting Verification
.23	Section 27 05 13	Voice Data Communication System
.24	Section 27 05 15	Voice-Data-CATV Pathways
.25	Section 28 31 01	Fire Alarm System
.26	Section 28 31 01.10	Fire Alarm Verification
.27		Existing F/A VI Report

.28 Drawing List: See Drawing E-1.0 for complete drawing list.

1.6 DETAILED SCOPE OF WORK

.1 The detailed Scope of Work includes, but is not limited to:

.1 Provision of all labour, new materials, tools, transportation, services and facilities for a complete electrical installation to the satisfaction of the Contract Administration or City Of Winnipeg.

.2 All other work as described herein or as shown on the drawings.

.3 Provision of all Emergency and Exit lighting system including conduit, wire remote heads, batteries and battery charging system. Systems shall be complete in every respect.

.4 Provision of a complete Fire Alarm System including replacement/upgrading all existing conventional fire alarm panel, fire alarm devices in the existing building to addressable fire alarm system.

.5 Provision of power supply to all mechanical equipment and controls.

.6 Relocate existing receptacle and provide new receptacle as indicated. Provide all related conduits, wires and boxes.

.7 Relocate existing light fixtures and provide new light fixtures as indicated. Provide all related conduits, fixtures, lamps, wire, switches, boxes, termination, associated relays and contactors and interface with time clock and photocell control system.

.8 Devices indicated for demolition shall have the wiring removed up to the nearest junction box, allowing the circuit to be reused for the renovation.

.9 All unused cables to be removed back to source.

.10 Provision of conduit and cables for new voice/data drops.

.11 Provision of a complete CCTV conduit rough in complete with pull strings. Owner to provide CCTV system at a future date. Provide separate price to deduct from contract. Refer to architectural separate price spec.

.12 Electrical Subcontractor shall be responsible to coordinate, submit and facilitate all items related to Manitoba Power Smart program incentives. All rebates to be forwarded to the City Of Winnipeg.

1.7 CASH ALLOWANCES

.1 For information regarding Cash Allowances, refer to the Contract Administrator 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 Subcontractor unless specifically noted otherwise.

1.8 SUPPLEMENTARY FORM

.1 At Bid Opportunity close, before start of Work, submit a copy of the Electrical Supplementary Form showing all requested information.

.2 There will be no substitution of named Subtrades / Manufactures after Bid Opportunity close except as approved by the Contract Administrator.

1.9 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 Opportunity and work of this Division, before submission of Bid Opportunity and proceeding with the work.

.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 City Of Winnipeg/Contract Administrator prior to submitting Bid Opportunity Pricing.

.3 Claims for extra payments resulting from conditions which could have reasonably been foreseen during a pre-Bid Opportunity site examination will not be considered.

1.10 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 Contract Administrator and Structural details.

.2 Do not scale the Drawings. Obtain information involving accurate dimensions from dimensions shown on the Contract Administrator 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 Subcontractors 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 City Of Winnipeg.

.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 Subcontractors 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 City Of Winnipeg.

1.11 CHANGES TO THE SCOPE OF WORK

.1 From time to time during construction, changes to the scope of work may be proposed by the City Of Winnipeg. These Proposed Changes are to be priced by the Subcontractor in a timely manner. Only after the City Of Winnipeg 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 Subcontractor to the Contractor complete with price breakdowns as follows:

.1 Subcontractors' prices c/w labor, material and overhead prices broken out.

.2 Subcontractor'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.

1.12 PHASING

.1 This project involves sequential construction in phases. Refer to the Contract Administrator 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 City Of Winnipeg and other Subcontractors 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.

.6 The Subcontractors shall be responsible for determining the exact requirements for Phasing.

1.13 LIABILITY

.1 Maintain all necessary insurance coverage to save and indemnify the City Of Winnipeg.

.2 Protect and maintain the work until the project has been completed and turned over to the City Of Winnipeg. Protect the building and contents from damage during the construction period. Repair all damages without additional cost to the City Of Winnipeg.

.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 City Of Winnipeg.

1.14 WORK SCHEDULE

.1 Unless otherwise noted, the work shall be scheduled for normal hours. The Subcontractors 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 Opportunity price.

.2 Where the work requires the Subcontractors to be in occupied areas, or where building services may be disrupted, the Subcontractors shall closely coordinate the hours and areas of work with the City Of Winnipeg and occupants.

.3 It shall be the responsibility of the Contractor to schedule the work to meet the City Of Winnipeg's completion date. The Contractor shall coordinate the sub-trades and adjust the workforce as required to meet the schedule.

1.15 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.

1.16 ENGINEERING SITE REVIEW

.1 The Subcontractor's work will be reviewed periodically by the City Of Winnipeg, the Contract Administrator, or their representatives, solely for the purpose of determining the general quality of the work. Guidance will be offered to the Subcontractors in regard to interpretation of plans and specifications, to assist them in carrying out the work. Inspections, and directives given to the Subcontractors, 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 City Of Winnipeg, and/or Contract Administrator 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.

1.17 PATENTS

.1 Pay all royalties and license fees, and defend all suits or claims, for infringement of any patent rights, and save the City Of Winnipeg and 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.

1.18 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.

1.19 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.

1.20 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.

.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.

1.21 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:

.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 Subcontractor submitting same, and such review shall not relieve the Subcontractor 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 Subcontractors 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 Contract Administrator General Specifications for additional

information.

1.22 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 Subcontractors to ensure compatibility of the system components.

.3 The Contractor shall coordinate the mechanical and electrical Subcontractors 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.

1.23 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.

1.24 RECORD DRAWINGS

.1 Obtain two sets of white prints and, as the job progresses; mark these prints to accurately indicate the installed work. Have the white prints available for inspection at the site at all times, and present for scrutiny at each job meeting.

.2 At the completion of the work, submit these sets of "Record" drawings to the 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 City Of Winnipeg.

.5 For Additional Information, refer to the Contract Administrator General Specifications.

.6 For Additional Information, refer to the Specifications set out for the Contractor.

1.25 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 Opportunity price.

1.26 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 City Of Winnipeg 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 City Of Winnipeg's written consent prior to implementation.

1.27 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.

.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.

1.28 TEMPORARY AND TRIAL USAGE

.1 The City Of Winnipeg 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 City Of Winnipeg.

.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.

1.29 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, City Of Winnipeg and Occupants.

.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 City Of Winnipeg reserves the right to inspect the Electrical Systems to determine the effectiveness of the cleaning. Where cleaning is deemed to be unacceptable, the cleaning shall be re-done at no extra charge to the City Of Winnipeg.

1.30 INSTRUCTIONS TO CITY OF WINNIPEG

.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 City Of Winnipeg’s Representative.

.2 Instruct the City Of Winnipeg'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 Subcontractor'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 Subcontractor shall make all requested changes. This process shall continue until the Manuals are deemed complete by the Contract Administrator. The Subcontractor shall turn over the completed manuals to the City Of Winnipeg.

.6 Present all copies of the Final Record Drawings to the City Of Winnipeg.

1.31 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 City Of Winnipeg's Representative.

.2 Provide spare parts as follows:

.1 Circuit breakers and fuse as indicated in panelboard schedules and single line drawings.
.2 Motor starters as indicated
.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.

1.32 WARRANTIES

.1 No certificate issued, payment made, or partial or entire use of the system(s) by the City Of Winnipeg, 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 City Of Winnipeg, 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 City Of Winnipeg. 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 City Of Winnipeg's personnel in the correction of warranty related work.

.6 For systems, equipment and components which are used continuously throughout the year, the normal warranty period shall be one calendar year from the date of Substantial Completion. For seasonal equipment, components and systems which are not normally used continuously throughout the year, the warranty period shall include at least one full season of satisfactory operation.

.7 When equipment or systems are put into use subsequent to the acceptance of the building, or a portion of the building, the warranty period for seasonally used equipment and systems shall be deemed to commence from the date of satisfactory operation, not from the date of final acceptance by the City Of Winnipeg.

.8 The City Of Winnipeg 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 City Of Winnipeg with copies of the Certificates, dated and acknowledged, and inserted in the O and M Manuals. The Subcontractors 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 City Of Winnipeg, 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 City Of Winnipeg for any temporary replacement component or for any labour required to implement the work.

1.33 DOCUMENTATION AND SYSTEM(S) ACCEPTANCE

.1 The Contractor shall prepare a suitable document to be signed by the City Of Winnipeg or his representative, confirming:

.1 The City Of Winnipeg 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 City Of Winnipeg.

.3 The "Record" and "As-constructed" drawings have been received and reviewed by the City Of Winnipeg.

.4 Specified spare parts, components, keys, removable handles, tools and the like, have been accepted by the City Of Winnipeg.

1.34 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 City Of Winnipeg's timetable.

.3 SUBSTANTIAL COMPLETION

.1 The project will be ready for a Substantial Completion inspection only when it is ready for the City Of Winnipeg to occupy and utilize the building for its intended purpose.

.2 At Substantial Completion, the City Of Winnipeg 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 City Of Winnipeg's Representative have been given.

.7 Maintenance Materials and Spare Parts have been provided.

.4 When the Contractor is satisfied that the entire project is completed, and after making his own inspection, he shall apply, in writing, to the City Of Winnipeg and/or 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 City Of Winnipeg 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 City Of Winnipeg and/or 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 City Of Winnipeg 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

1 GENERAL

1.1 RELATED WORK

.1 Bidding & Contract Requirements

.2 General Requirements Division 1

.3 All Electrical Drawings and Division 26, 27 and 28 specification sections.

.4 All Mechanical Drawings and Mechanical 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 Opportunity 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.

.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 Opportunity 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 Opportunity Documents. This sample will be used for comparison with the actual production run of successful manufacturer.

.6 Required shop drawing section:

.1	26 05 04	Miscellaneous Apparatus and Appliances
.2	26 05 21	Wire and Cables
.3	26 05 22	Connectors and Terminations
.4	26 05 29	Fastenings and supports
.5	26 05 31	Cabinets, Splitters, J.B.’s
.6	26 05 32	Outlet Boxes and Fittings
.7	26 05 34	Conduits
.8	26 05 37	Wireways
.9	26 05 80	Mechanical Equipment Connections
.10	26 05 94	Electric Heating Equipment
.11	26 08 00	Electrical Commissioning Specification
.12	26 09 25	Lighting Contactor Panel
.13	26 24 17	Panelboards
.14	26 27 26	Wiring Devices
.15	26 28 14	Fuses
.16	26 28 21	Circuit Breaker
.17	26 28 23	Disconnect Switches
.18	26 29 01	Contactors
.19	26 50 00	Lighting
.20	26 52 01	Unit Equipment for emergency Lighting
.21	26 52 01.10	Emergency Lighting Verification
.22	26 53 00	Exit Signs
.23	27 05 13	Voice Data Communication System
.24	27 05 15	Voice-Data-CATV-Pathways

.25	28 31 01	Fire Alarm System
.26	28 31 01.10	Fire Alarm Verification

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 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 City Of Winnipeg in an orderly fashion upon completion of 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 Opportunity site meeting as scheduled and request further information or clarifications at that time.

.2 Prior to submitting a Bid Opportunity, 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 OPPORTUNITY

.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 subtrades, 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.

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.

.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.

.4 All motors (including motors used for mechanical equipment) shall comply with the relevant appliance or equipment efficiency act or CAN/CSA-C390, article 4-10.

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.

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 Building Manager's personnel in the operation, care and maintenance of equipment. Arrangement of such instructional sessions to be done at a time convenient to the City Of Winnipeg.

.2 Arrange and pay for services of manufacturer's factory service Contract Administrator 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

.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 rivetted) unless specified otherwise. Sizes as follows:

Size 0	3/8" x 1 ½"	(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	½" x 3"	(13 x 75 mm) 1 line 3/16"(5 mm) high letters
Size 3	½" 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 ½" (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 City Of Winnipeg (where existing systems are modified or added to) and to the Contract Administrator 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 Contract Administrator elevations and details for mounting heights.

.3 If mounting height of equipment is not indicated, verify with Contract Administrator 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); splashbacks: 4" (100 mm).

.2 General receptacles, telephone and television outlets: 16" (400 mm).

.3 Receptacles in mechanical and shop areas: 40" (1 m).

.4 Switches, dimmers, push buttons, Luxo bracket: 47" (1.2 m) above the finished floor level measured from the centre of the device box.

.5 Fire alarm pullstations, intercoms, thermostats: 47" (1.2m) above the finished floor level measured from the centre of the device box.

.6 Audible signal silencing means/devices (separately installed or incorporated in the audible signal device) in Suites of residential occupancy: 47” (1.2m) above finished floor level measured from the centre of the silencing means.

.7 End of line resistors: 64" (1.6 m).

.8 Fire alarm bells, horns, speakers: 90" (2.3 m).

.9 Panelboards, annunciators, etc.: 78" (2.0 m) to top.

.10 Clock outlets: 84" (2.15 m).

.11 Handicap suite switches, dimmers, pushbuttons: 40" (1 m).

.12 Handicap suite receptacles, television, telephone: 24" (600 mm).

.13 Handicap suite thermostats: 40" (1.0 m).

.14 Power door operator for person using wheel chair to be located and operated with two heights: one with its centre located 35 1/2" (900mm) from the finished floor level; and the other with its centre located 9" (225mm) from the finished floor level.

.15 As per Contract Administrator elevations.

.16 Heights as above or at bottom of nearest block or brick course.

.17 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 FIREFPROOFING

.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 Contract Administrator drawings and specifications, and conform with all requirements therein.

.3 Acceptable manufacturers (where Contract Administrators 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, Building Manager and City Of Winnipeg 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.

.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 Contract Administrator 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, pullboxes, conductor joints and other similar electrical work which may need maintenance or repair.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1	Basic Electrical Materials and Methods	Section 26 05 01
.2	Wire and Cables	Section 26 05 21
.3	Outlet Boxes and Fittings	Section 26 05 32
.4	Conduit	Section 26 05 34
.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.

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 cordsets 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.

.2 Provide flush-mounted 24 volt buzzer with stainless steel coverplate in shipping office or as indicated. Buzzer to provide a 65 dB sound level at a 10'-0" (3m) distance.

.3 Provide 120/24V AC transformer in common backbox with the first buzzer. VA rating of transformer to be sized for the buzzer(s) load plus 25%.

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.

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.

END OF SECTION

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	Voice Data CATV Pathways	Section 27 05 15

2 PRODUCTS

2.1 BUILDING WIRES

.1 Copper conductors: size as indicated, with 300V or 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 strap only with single conductor cable.

.2 Channel type supports for two or more cables at 1.5 mm centers.

.3 Nine mm diam threaded rods to support suspended channels.

3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

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

.2 Only cables/wires in totally enclosed noncombustible raceways are permitted to penetrate an fire rated/fire-resistance assembly.

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.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1 Wires and Cables Section 26 05 21

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.

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.

3 EXECUTION

3.1 INSTALLATION

.1 Install terminations in accordance with manufacturer's instructions.

.2 Bond and ground as required

END OF SECTION

1 GENERAL

1.1 RELATED WORK

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

2 PRODUCTS

2.1 SUPPORT CHANNELS

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

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 dia. threaded rod hangers at 1.5m OC 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 Contract Administrator.

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

END OF SECTION

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

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 gasketted 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 Divisions 26, 27 and 28 and

located on the electrical drawings.

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 pullboxes 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 pullboxes 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 pullboxes clear of all mechanical ductwork and piping.

3.3 IDENTIFICATION

.1 Identify splitters with Size 5 nameplates.

.2 Identify junction and pullboxes with Size 1 nameplates.

.3 Identify cabinet with Size 5 nameplates.

END OF SECTION

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 C22.1-1994 Canadian Electrical Code, Part 1.

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 feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.3 FITTINGS GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pullboxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

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

END OF SECTION

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.

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). 4 1/4" (6 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 Manufacturer elbows where 90E bends are required for 2 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 entries to panels, contactors and motor control centres.

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 Contract Administrator.

.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^{o} bends (or equivalent) before a pullbox is installed. Pullboxes shall be installed in accessible ceiling spaces. Conduits shall be supported within 12" (300 mm) of entering any junction box, pullbox, cabinet, or panelboard.

.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.

.14 Provide separate bonding conductor for EMTs if installed/located in concrete or masony slabs in contact with the earth or in any location where material having a deteriorating effect may come in contact with the EMT.

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 coverplates of junction boxes in conduit systems shall match owner/facility standard or if none exists as per the color code list below.

.2 Color code by spray painting the coverplate on each junction box in the conduit run.

.3 In addition to color coding coverplates on junction boxes with power wiring, the circuits being run in the box shall be identified on the inside coverplate 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.

END OF SECTION

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.

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 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 Barriered, as indicated, for power wiring and communication wiring. Non-barriered, 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 taped for standard devices.

.8 Acceptable manufacturers: Wiremold.

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.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

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

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.

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 and pool 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/ Sub-Contractor. Motor horsepower ratings shall be as shown in the Mechanical Division specifications. Motor voltage and phase ratings shall be as shown on the Electrical Division drawings.

.4 Provide the Mechanical Sub-Contractor with a copy of the Motor Schedule and ensure conformance with voltage shown. Additional prints of Motor Schedule will be made available by the General Contractor.

3 EXECUTION

3.1 POWER WIRING

.1 Install branch circuit wiring for mechanical system control panels, time clocks, and control transformers.

.2 Install main power feeders to starter/control panels furnished by mechanical Divisions. Install branch wiring from starter/control panels to controlled equipment such as motors, electric coils, etc.

.3 Flexible connections to motors shall not exceed 6 feet (1.83 m), unless approved by Contract Administrator.

3.2 CONTROLS

.1 Install all electrical controls in accordance with Motor Schedule Equipment list.

.2 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.

.3 Wire and connect line voltage remote thermostats and P/E switches for furnaces, condensing units, force flows, gas-fired unit heaters, electric heaters and rooftop units.

.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 Divisions, regarding wiring controls, overload heaters, equipment ratings and over-current protection. Notify the Mechanical Subcontractor, at once, if any information provided is incorrect or unsatisfactory.

.3 Coordinate control wiring requirements with Mechanical Divisions and provide all control wiring and connections as required to make the control systems operate as specified.

.4 Refer to Mechanical Division specifications for any further electrical requirements.

.5 Review both electrical and mechanical drawings and specifications and coordinate all controls with Mechanical Subtrades through General Contractor. Report all discrepancies to both Mechanical and Electrical Contract Administrators before close of tender. No additional money will be justified for assumptions made on any duplication of information.

.6 Submit to General Contractor, as part of the tender submission, a list of controls and wiring to be provided in the Electrical Contract.

END OF SECTION

1 GENERAL

1.1 SCOPE OF WORK

.1 All equipment specified in Section 26 05 94 to be provided, wired and installed by Electrical Contractor, 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 rating, voltage, phase.

.6 Cabinet material thicknesses.

.7 Controls.

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.

.9 347 volt, 208 volt, single phase, as noted on drawings.

.10 Size as indicated on drawings.

2.2 BASEBOARD HEATERS

.1 Standard watt density.

.2 347V, 208V, single phase, as noted on drawings.

.3 Built in thermostats. Tamperproof in public areas.

.4 Refer to drawings for quantity and wattage of each unit.

.5 Equal to Chromalox BN series.

2.3 ACCEPTABLE MANUFACTURERS

.1 Chromalox

.2 Westcan.

.3 Stelpro.

.4 Ouellet.

.5 Qmark

2.4 WARRANTY

.1 Replace any heater, relay or thermostat which malfunctions within one year from project acceptance by Owner.

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.

END OF SECTION

1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 General requirements for commissioning of electrical equipment systems.

.2 Related Sections:

.1 Section 019113 General Commissioning

1.2 INTENT

.1 Provide commissioning of electrical equipment and systems in accordance with this, Section 019113 and related sections.

1.3 MANUFACTURER'S SERVICE ON SITE

.1 Arrange and pay for qualified Manufacturer's representatives to supervise starting and testing of following electrical equipment and systems:

.1 Telephone Equipment System
.2 Fire Alarm System and associated devices
.3 Sound and PA Control system

.2 Use manufacturers factory trained personnel where required to maintain manufacturer's warranty.

.3 Maintain documentation of all equipment start-up and commissioning and provide to Commissioning Agent.

1.4 REFERENCE DOCUMENTS

.1 Perform tests in accordance with:

.1 These Contract Documents.
.2 Requirements of authorities having jurisdiction.
.3 Manufacturer's published instructions.
.4 Applicable CSA, IEEE, IPCEA, EEMAC, NEMA and ASTM standards.

1.5 CONTRACTOR AND MANUFACTURER REPORTS

.1 Arrange for Manufacturer to submit copies of all production test records for production tests required by EEMAC and CSA standards for manufactured electrical equipment to the Contract Administrator prior to shipping.

1.6 TESTING QUALIFICATIONS

.1 Arrange and pay for services of testing agent(s) to perform tests and verifications specified in this Section that are not within the capabilities of the Contractor.

.2 Required Testing Qualifications:

.1 Minimum of five years experience in the maintenance and testing of electrical equipment and systems at all voltage levels up to and including 25 kV class.

.2 Personnel involved in power system testing shall have proven experience in the use of the following test equipment:

.1 Insulation Resistance Testers (Meggers) at 250 V, 1000 V and 2500 V.

.2 DC hipot test equipment up to 100 kV DC.

.3 Capacitance bridges.

.4 Transformer ratio test equipment.

.5 Contact resistance testers (ductor). Protective relay test equipment of current injection type for testing and calibration of induction disc and solid state protective devices.

.3 The Contractor will be responsible for appointing a verification agent to direct verification of fire alarm system in accordance with:

.1 CAN/ULC-S537, "Standard for Verification of Fire Alarm System Installations"

.2 Requirements of authority having jurisdiction.

2 PRODUCTS

.1 None

3 EXECUTION

3.1 GENERAL

.1 Commission all equipment and systems installed as part of this contract. Typical required information or actions are listed below for each equipment or system.

.2 Provide check sheets for equipment not listed in this section.

.3 Document the commissioning process by completing the Component Verification Forms, System Tests and Integrated System Tests.

3.2 MAIN DISTRIBUTION SWITCHGEAR

.1 Enclosure:

- .1 Visually inspect.
- .2 Torque all bus connections to Manufacturers requirements and seal with red lacquer.
- .3 Megger test main bus at 1000 V.
- .4 Check phasing and continuity of horizontal and vertical bus. This includes phasing and phase rotation of two incoming services or supplies.

.2 Wiring Checks:

- .1 Check all control, relaying and instrumentation wiring against vendor wiring schematics, three line diagrams, and project specifications.
- .2 Test each circuit for continuity using a buzzer or similar device.
- .3 All current circuits shall be injected, all voltage circuits shall be powered at 120 Volts, all devices functioned and checked against control schematic diagram.
- .4 Check polarity and verify phase relationships on all three phase metering circuits.
- .5 Where errors are discovered and changes are required, mark up and note required corrective action on vendor prints.

.3 Instrumentation:

- .1 Test and calibrate all meters in accordance with Manufacturers bulletins.
- .2 Check calibration on all ammeters using 5 Amp secondary injection test.
- .3 Perform wiring checks as listed above.

.4 Breakers - Industrial Air Circuit Breakers:

- .1 Visually inspect.
- .2 Clean and lubricate.
- .3 Contact resistance (ductor) test and adjust contacts.
- .4 Insulation resistance (Megger) test.
- .5 Mechanical function test.
- .6 Electrical function test.
- .7 Test and calibrate, to settings provided, all elements of solid state trip unit as follows:
  - .1 Inspect and test in accordance with Manufacturer's most recent installation and maintenance brochure.
  - .2 Perform tests using Manufacturer's relay test unit as applicable, with corresponding test instruction.
  - .3 If the Manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.

.5 Check C/T and P/T ratios.

.5 Fused Disconnect Switches:

.1 Visually inspect and clean.

.2 Ductor test across switch blade contact surfaces.

.3 Megger test.

.4 Mechanical function test.

3.3 DISTRIBUTION PANELS

.1 Enclosure:

.1 Visually inspect.

.2 Torque all bus connections.

.2 .2 Breakers:

.1 Visually inspect.

.2 Ductor test.

.3 Megger test.

.4 Mechanical function test.

.5 Set all units with adjustable magnetic trip units.

.6 Where solid state protection is provided with large breakers, test units as follows:

.1 Inspect and test in accordance with Manufacturer's most recent installation and maintenance brochure.

.2 Perform tests using Manufacturer's relay test unit as applicable, with corresponding test instruction.

.3 If Manufacturer's tester is not available, use an approved relay tester unit with the proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.

.5 Check C/T and P/T ratios.

3.4 ELECTRICAL START-UP AND TESTING

.1 Energizing Main Electrical System:

.1 Prior to energizing main electrical system:

.1 Verify supply authority voltage and phase rotation.

.2 Ensure all testing as specified in Section 16972 has been completed and deficiencies have been corrected.

.3 Megger test all feeders and record results on approved test report forms.

.2 Testing of Wiring and Wiring Devices:

.1 Test conductors at distribution centres and panelboards for insulation resistance to ground (megger test).

.2 Test service grounding conductors for ground resistance.

.3 Test all wiring devices for correct operation and circuitry.

.3 Ground Resistance Testing:

.1 Measure ground resistance of ground grids with earth test megger to verify compliance with CSA C22.2 No. 0.4-1982 and Canadian Electrical Code.

.4 Load Balance Testing:

.1 Perform load tests with as many building loads on as possible prior to Interim Acceptance.

.2 Test load balance on all feeders at distribution centres, motor control centres and lighting panelboards.

.3 If load unbalance exceeds 15%, reconnect circuits to balance loads. Revise panelboard directories and wiring identification accordingly.

.5 Power Factor Testing:

.1 Record power factor readings at 15 minute intervals for full 72 hour period during a normal work week, once during summer with chiller operating and once during winter.

.2 Take readings at the following locations on power distribution system:

.1 Main Breaker.

.2 All motor control centres.

.3 Feeder breakers which control large motor loads (e.g. chillers).

.4 Emergency generator.

.6 Voltage Testing and Adjusting:

.1 Test voltage at service entry point, motor control centres and secondary of transformers above 45 kVA. Record voltages at Interim Acceptance for a period of ten hours (07:00 to 17:00) during a normal work day.

.2 Adjust transformer tap settings to compensate for under-voltage or over-voltage conditions, if directed to do so by the Owner.

.7 Starting Motors:

.1 Prior to starting motors:

.1 Confirm motor nameplate data with motor starter heater overloads, setting of MCPs and sizing of fuses.

.2 Verify rotation.

.3 Ensure disconnects are installed.

.4 Confirm labelling of motors, disconnects and starters.

.2 Measure and record operating load amp readings for all three phase motors.

3.5 HARMONIC DISTORTION TESTING (where required)

.1 Perform harmonic distortion testing at following locations:

.1 Main incoming service.

.2 All 600 volt distribution centres.

.3 All 208 volt distribution centres, except car park distribution and unused tenant distribution.

.2 Harmonic tests to include phase and neutral currents and voltages for each order of harmonic up to 50th order.

.3 Allow for four hours of sampling at each location.

.4 Ensure all sources of harmonic distortion such as adjustable speed drives, uninterruptible power supplies, computer and microelectronics equipment are energized before performing tests.

.5 Perform tests prior to interim acceptance.

.6 Certified test results sealed by professional engineer are to include harmonic distortion of each harmonic from 1 to 50 in graphic or tabular form. Results for main incoming service shall include harmonics coming in from utility and outgoing harmonics generated on facility power system.

.7 Recommended limits of distortion are to be based on ANSI/IEEE 519-1981 IEEE Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

3.6 LIGHTING

.1 Function test all light switches, luminaries, dimmers and lighting control equipment.

.2 Record all photocell and time-clock settings.

.3 Prior to energizing HID dimming system, ensure Manufacturer has checked all equipment and wiring for proper installation and termination. Manufacturer to check that all pre-set levels are set and operate as specified.

.4 Check operation of all emergency lighting units, exit lights and connection of exit lights to emergency power as specified.

.5 Verify that correct lamps and ballasts have been used.

.6 Record lighting levels for typical rooms and specialized areas.

.7 Confirm operation of battery operated emergency lighting units including battery size and operating time.

.8 Confirm operation of exit lights and connections of exit lights to emergency lighting panels.

.9 Check all terminations and label all lighting circuits.

3.7 LIGHTING CONTROL SYSTEM

.1 Inspect system to ensure that the low voltage lighting system is correctly installed, connected and fully operational in accordance with requirements of the Contract Documents and Manufacturers recommendations.

.2 Test each lighting sequence and document on the lighting flowchart.

.3 Demonstrate the operation of each timed, occupancy control or daylight control function to the Owner.

.4 Ensure the program interface provides an easy means for the building operator to make changes to the sequences.

3.8 WIRING AND WIRING DEVICES

.1 Test all receptacles for proper polarity.

.2 Verify panelboard directories and branch circuit designations as indicated on record drawings, directories and lamicoid labelling.

3.9 ISOLATED GROUND SYSTEMS

.1 Measure isolation transformer leakage

.2 Measure circuit conductor leakage.

.3 Measure ground circuit impedance.

.4 Verify equalized ground circuit impedance.

.5 Measure internal leakage of monitoring equipment including test equipment.

.6 Record results.

3.10 SURGE SUPPRESSION

.1 Test and verify operation in accordance with Manufacturers recommendations.

.1 Terminated prior to testing.

3.11 VOICE AND DATA CABLE TESTING

.1 Test all runs upon completion of permanent terminations, using instrumentation acceptable to the Owner. Before commencing testing, submit sample test data sheet(s) and information with respect to test instrumentation to be used.

.2 Copper Media:

.1 Test for the following:

.1 Continuity.

.2 Pair placement and polarity.

.3 DC resistance.

.4 Characteristics at highest contemplated frequency Hz:

.1 Attenuation - data cable.

.2 Mutual Capacitance - data cable.

.3 Near-end crosstalk (NEXT) - data cable.

.4 Run length.

.2 Before recording results, compare readings to predicted values based on cable specification and run length, using connector and patch cord losses as part of the predicted value. Retest runs with:

.1 Resistance and capacitance readings more than [10% above [or below] predicted values.

.2 NEXT values [5 dB] higher than predicted values.

.3 Attenuation values [2 dB] higher than predicted values.

.3 Reconnect or re-install and retest as necessary to correct excessive variations.

.4 Check installation of all equipment.

.5 Ensure all cables are properly identified at each end and correctly terminated prior to testing.

3.12 FIRE SAFETY SYSTEMS

.1 Prior to requesting verification of Fire Alarm system by Contractor, Verification Agent, and Fire Safety system Manufacturer's technical staff shall:

.1 Inspect system in conjunction with the Manufacturer to ensure that Fire Alarm system is correctly installed, connected and fully operational in accordance with requirements of the Contract Documents and Manufacturers recommendations. This includes all auxiliary equipment

connected to fire alarm system such as elevators, central station tie-in, fan shut-down, sprinklers, door hold-open devices, etc.

.2 Ensure that any subsequent work remaining to be performed on the above noted items will not invalidate examinations and test performed during verification procedure.

.3 Ensure that operation and maintenance data has been submitted.

.4 Ensure that spare parts and maintenance materials have been delivered.

.2 Certify to the Owner in writing that above prerequisites have been fulfilled and specifying known exceptions in the form of a list of items to be completed or corrected, prior to proceeding with verification.

.3 The Owner will proceed with verification, or advise Contractor that prerequisites are not adequately fulfilled.

.4 Fire Alarm Verification:

.1 Assist and co-operate with the Owner in verification procedure.

.1 Provide following equipment:

.1 Velometer.

.2 Artificial Smoke.

.3 Rate of Rise Heat Detector Tester.

.2 Do not proceed with verification unless the following parties are present at all times during verification procedure:

.1 Electrical Contractor.

.2 Fire Alarm System Manufacturer's Representative.

.3 Owner's verification representative.

.3 Disassemble and reassemble system components.

.4 Disconnect and reconnect wiring.

.5 Perform required field adjustments.

.6 Repair defective work and replace defective components.

.7 Perform all other work on system required by verification procedure.

3.13 SECURITY SYSTEM

.1 Prior to function testing of system, perform following in conjunction with Manufacturer:

.1 Ensure all equipment is properly installed and all terminations completed.

.2 Verify wiring of all magnetic locks, door contacts and card readers.

.3 Ensure all programming is complete and software is performing correctly.

.4 Confirm operation of each door. Check door contacts, proper latching of magnetic locks, card operation and exit pushbuttons.

.5 Confirm correct labelling of doors on annunciators, CRT monitor and in programming.

.6 Confirm system programming and printer operation.

.7 Check remote alarming via automatic diallers.

.2 Manufacturer shall function test system in presence of the Owner as follows:

.1 Door Supervision System:

.1 Check installation and operation of all door contacts and control panels, including automatic dialler, if specified.

.2 Confirm proper door labelling on all annunciators and main control.

.3 Confirm operation of each door. Check door contacts, proper latching of magnetic locks, card operation and exit pushbuttons.

.2 Card Access System:

.1 Check installation of all equipment.

.2 Confirm operation of each card reader.

.3 Check all interconnections with other systems.

.3 Confirm correct labelling of all door security and access control equipment on annunciators, CRT monitor and in programming.

.4 Confirm system programming and printer operation.

.5 Check remote alarming via automatic diallers.

.6 Record results on approved test report forms.

3.14 ELECTRICAL EQUIPMENT AND SYSTEMS DEMONSTRATION AND INSTRUCTION

.1 Provide operation and maintenance instruction and demonstrations in accordance with Section 019113.

END OF SECTION

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.

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.

.4 Lighting Contactor:

.1 20 Amp, 4 pole, 120/240 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: Klockner Moeller, Allen Bradley, or Schneider Canada.

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.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1 Panelboards shall be provided as indicated and required for the systems served and supplied under electrical Divisions.

.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.

2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 Panelboards shall be as manufactured by Schneider Canada, Cutler Hammer, or Siemens.

.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. Covers will not be required for distribution type panelboards.

.6 Main circuit breakers and disconnect switches shall not be branch-mounted unless explicitly indicated.

.7 Branch circuit breakers shall have a minimum interrupting capacity of 35,000 amps at 120/240 volts. Refer to single line drawing.

.8 Provide CDP type panels where indicated.

.9 All CDP's shall be sprinkler proof and CSA enclosure 3. Panels shall be sprinkler proof.

.10 Provide 3 spare 15 amp 1 Pole breakers for each panelboard and 1 spare 15 amp 2 Pole for each CDP.

.11 Provide GFCI and AFCI breakers as indicated.

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.

.6 Every breaker feeding receptacles in suite bedrooms shall be AFCI type (arc fault circuit interrupter) with series and parallel protection, and meeting C.E.C. rule 26-722. Install in strict conformance with manufacturers instructions do not connect smoke alarms to AFCI protected circuits.

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.

END OF SECTION

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.

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 Architect.

.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:

Manufacturer	120 Volt	347 Volt
Hubbell	1200 Series	18200 Series
Bryant	4800 Series	6800 Series
Leviton	1200 Series	54500 Series
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 Architect.

.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 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 and AC-90 connector 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 AC-90 connector 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 Novs 'NT' Series or Prescolite 'HT' 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 Architect, 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.

.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 Coverplates from one manufacturer throughout project.

.2 Stainless steel coverplates for wiring devices mounted in flush-mounted outlet boxes. Where indicated by Architect, 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 gazetted coverplates for wiring devices mounted in surface mounted FS or FD.

.5 Weatherproof double lift spring-loaded cast aluminum coverplates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof coverplates, complete with gaskets for single receptacles or switches as indicated.

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

.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 coverplates where wiring devices are ganged.

.2 Do not use coverplates intended for flush outlet boxes on surface mounted boxes.

.3 Provide a coverplate on each outlet. Stainless steel, unless otherwise directed.

3.4 IDENTIFICATION

.1 Identify receptacles with size θ nameplate indicating panel and circuit number. Nameplates to be pre-glued with peel-off paper backing.

.2 Where directed by Architect, do not provide name plates on outlets in independent living suites (only).

END OF SECTION

1 GENERAL

1.1 Related Work

.1	Basic Electrical Materials and Methods	Section 26 05 01
.2	Disconnect Switches	Section 26 28 23

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.

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.

.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.

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.

END OF SECTION

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 ampacity of 800A and over, or with interrupting capacity of 25,000A symmetrical RMS and over at system voltage.

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 STATIC TRIP (LSI) BREAKERS

.1 All upstream breakers to protect transformers shall be equipped with LSI fully adjustable type breaker. Instantaneous setting of the breakers shall be greater than transformer inrush current (12x primary rated current).

.2 All LSI breakers as indicated in the drawings shall be fully adjustable. Fixed setting is not accepted.

2.3 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.

2.4 GROUND FAULT CIRCUIT INTERRUPTERS

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

2.5 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.

2.5 MANUFACTURERS

.1 Acceptable manufacturers: Cutler Hammer, Schneider Canada, Seimens or General Electric.

3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

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	Mechanical Equipment Connections	Section 26 05 80

1.2 Submittals

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

2 PRODUCTS

2.1 Disconnect Switches

.1 Fusible and non-fusible disconnect switches in EEMAC Type 3R and 4X, size as indicated.

.2 Process areas, Cooler, Cutting, and Packaging Areas: Fusible and non-fusible disconnect switches shall be EEMAC Type 4X, size as indicated.

.3 Provision for padlocking in "ON-OFF" position with 3 padlocks. Mechanically interlocked door to prevent opening when handle in "ON" position.

.4 Mechanically interlocked door to prevent opening when handle in “ON” position.

.5 Fuse holders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 "ON-OFF" switch position indication on switch enclosure cover.

.8 Fuses as indicated in accordance with Section 26 28 14.

.9 Fuse holders in each switch suitable without adaptors, for type of fuse, as indicated.

.10 Single-phase motor disconnect switches shall be one or two-pole toggle-type, 20 amp, 120/227V AC, brown handle with side and back wiring complete with pilot light.

.11 Three-phase motor disconnect switches for motors up to 5HP at 208V and 10HP at 600V shall be 3-pole, toggle-operated with surface-mounting enclosure and pilot light, as indicated.

.12 Three-phase motor disconnect switches for motors above 5HP at 208V or 10HP at 600V shall be 600V non-fusible safety switches, sized as required. Switch shall be non-teasing, quick-make, quick-break type with visible blades, line terminal shield and enclosure, as indicated, with cover interlock and lockable handle.

.13 Fusible and non-fusible disconnect switches in sprinkler proof enclosure for interior applications, and EEMAC Type 3 enclosure for exterior applications, unless otherwise indicated.

3 EXECUTION

3.1 Installation

.1 Install motor disconnect switches (complete with current limiting fuses) where indicated or where the short circuit fault level is greater than 10KA.

.2 Install fused circuit disconnect switches (complete with current limiting fuses) where indicated or where required by the inspection authorities,or where and/or for equipment supplied by other trades.

3.2 Identification

.1 Indicate name of load controlled on Size 4 nameplate to Section 26 05 01.

3.3 Manufacturers

.1 Acceptable manufacturers: Cutler Hammer, SquareD or approved equal.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

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

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: Schneider Canada, Allen Bradley, or Cutler Hammer

3 EXECUTION

3.1 INSTALLATION

.1 Install contactors and connect auxiliary control devices.

END OF SECTION

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 Contract Administrator.

.3 Submit list of replacement lamp data for each luminaire. 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.

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.

.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.

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.

.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 Contract Administrator and/or Architect.

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

.9 Coordinate the installation of luminaires with the work of pool supplier, ensuring that the installation to be complied with Canadian Electrical code (C22.1-09) rule 68-066.

3.2 WIRING

.1 Connect luminaires to lighting circuits as indicated.

.2 Circuit breakers for exit light circuits shall be provided with lock-on devices.

.3 Wiring for exit and night light circuits shall be installed in a separate conduit system.

.4 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.

3.4 CLEANING

.1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a damp cloth to remove dust, smudges and fingerprints.

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

END OF SECTION

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	Outlet Boxes and Fittings	Section 26 05 32
.4	Conduit	Section 26 05 34

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 Owner.

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 system.

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

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

2.2 REMOTE HEADS

.1 Double adjustable heads, as indicated.

2.3 MANUFACTURERS

.1 Acceptable Manufacturers: Lumacell, Energi Lite , Readylite and Beghelli.

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 Contract Administrator.

.8 Charge the batteries and test the system for proper operation (minimum of 35 minutes discharge time).

END OF SECTION

EMERGENCY LIGHTING VERIFICATION

The following document shall be dated and signed by E.C. and G.C. 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 Tower Engineering **PRIOR** to submitting request for 'Substantial Completion'.

Company Name: _____ Date: _____
(Electrical Contractor)

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: _____ Date: _____
(General Contractor)

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):

Engineer - Tower 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.

PART 1 GENERAL

1.1 REFERENCES

.1 Atomic Energy Control Board Regulations

.2 Canadian Code for Preferred Packaging

.3 Canadian Standards Association (CSA)

.1 CSA C22.2 No.141 , Unit Equipment for Emergency Lighting.

.2 CSA C860, Performance of Internally-Lighted Exit Signs.

.4 National Fire Protection Association (NFPA) requirements

1.2 SUBMITTALS

.1 Submit product data in accordance with Section 013300 - Submittals .

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 026133 - Hazardous Materials. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.

.4 Manufacturer’s Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures .

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 017419 - Construction/Demolition Waste Management and Disposal, and with Waste Reduction Work plan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing: cold rolled steel minimum 1.0 mm thick .

.3 Face and back plates: die formed cold rolled steel .

.4 Lamps: LED-5W, 100,000 hours.

.5 “Running Man” Pictogram

.6 Downlight: white glass in bottom of unit.

.7 Face plate to remain captive for relamping.

2.2 SELF-POWERED UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing: cold rolled steel minimum 1.0 mm thick .

.3 Face and back plates: die formed cold rolled steel .

.4 Lamps: LED-5W, 100,000 hours.

.5 “Running Man” Pictogram

.6 Downlight: white glass in bottom of unit.

.7 Face plate to remain captive for relamping.

.8 Supply voltage: 120 or 347 V, ac.

.9 Output voltage: 12 or 24 V dc.

.10 Operating time: 30 min.

.11 Recharge time: 24 hours

.12 Battery: sealed, maintenance free.

.13 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.

.14 Solid state transfer circuit.

.15 Signal lights: solid state, for 'AC Power ON' and 'High Charge' condition.

.16 Lamp heads: integral on unit, 345° horizontal and 180° vertical adjustment. Lamp 12 W MR-16.

.17 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.18 Cabinet: finish: white .

.19 Auxiliary equipment:

.1 Test switch.

.2 AC/DC output terminal blocks inside cabinet.

.3 RFI suppressor.

2.3 MANUFACTURER

.1 Acceptable manufacturer ; Lumacell, Beghelli or approved equal

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install exit lights.

.2 Connect fixtures to night / exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Ensure that exit light circuit breaker is locked in on position.

END OF SECTION 265300