Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 This Contract includes Work, materials and procedures as indicated on the drawings and in the specifications and other documents referenced or related to this project

.2 Work of this Contract comprises the upgrade of the existing electrical distribution of Margaret Grant Pool located at 685 Dalhousie Dr, Winnipeg, MB R3T 3Y2.

.3 City shall apply for Permit but the name on the permit will be changed to the Contractor once the project is awarded. The contractor will be required to coordinate all inspections with the Permit Office. City will pay for required permit fees at time of application. Contractor will not be required to reimburse City for the permit application fees.

.4 Contractor will be Prime Contractor in all areas that the Work for this contract is required, including boiler room 126 and back-up generator room 124.

1.2 CONTRACT METHOD

.1 Construct Work under stipulated price Contract.

1.3 WORK SEQUENCE

.1 Construct Work in stages to accommodate The City's continued use of premises during construction.

.2 Co-ordinate with The City Occupancy during construction.

.3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.4 Maintain fire access/control.

.5 The work shall be completed during the shutdown at Margaret Grant Pool (August 28, 2017 to October 6, 2017).

1.4 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, and or access, to allow:

.1 The City occupancy.
.2 Partial City occupancy.
.3 Public usage.

.2 Co-ordinate use of premises under direction of The City.

.3 Obtain and pay for use of additional storage or Work areas needed for operations under this Contract.

.4 Remove or alter existing Work to prevent injury or damage to portions of existing Work which remain.

.5 Repair or replace portions of existing Work which have been altered during construction operations to match existing or adjoining Work, as directed by The City.

.6 At completion of operations condition of existing Work: equal to or better than that which existed before new Work started.

1.5 THE CITY OCCUPANCY

.1 The city will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with The City in scheduling operations to minimize conflict and to facilitate The City usage.

1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute Work with least possible interference or disturbance to building operations, public and normal use of premises. Arrange with The City to facilitate execution of Work.

1.7 EXISTING SERVICES

.1 Notify, Contract Administrator and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours notice for necessary interruption of mechanical or electrical service throughout course of Work. Minimize duration of interruptions. Carry out Work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic, and tenant operations.

.3 Provide alternative routes for personnel, pedestrian and vehicular traffic.

.4 Establish location and extent of service lines in area of Work before starting Work. Notify Contract Administrator and The City of findings.

.5 Submit schedule to and obtain approval from Contract Administrator for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services when directed by Contract Administrator to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.8 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.10 Record locations of maintained, re-routed and abandoned service lines.

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 Change Orders.
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.
.10 Health and Safety Plan and Other Safety Related Documents. Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00.

1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" Work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

.1 Execute Work with least possible interference or disturbance to normal use of premises. Make arrangements with Contract Administrator to facilitate Work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by Work provide temporary means to maintain security.

.4 The City will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Closures: protect Work temporarily until permanent enclosures are completed.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute Work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Contract Administrator to facilitate execution of Work.

1.5 EXISTING SERVICES

.1 Notify Contract Administrator and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of Work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel, pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays and statutory holidays.

.2 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.3 Keep within limits of Work and avenues of ingress and egress.

.4 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00to 15:00 unless otherwise approved by Contract Administrator.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 The City/Contractor Agreement.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Make applications for payment on account as provided in Agreement as Work progresses.

.2 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.

1.3 SCHEDULE OF VALUES

.1 Provide schedule of values supported by evidence as Contract Administrator may reasonably direct and when accepted by Contract Administrator, be used as basis for applications for payment. Include statement based on schedule of values with each application for payment.

.2 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Contract Administrator may reasonably require to establish value and delivery of products.

1.4 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

.1 After issuance of certificate of Substantial Performance of Work:

.1 Submit application for payment of holdback amount.

.2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which The City might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.

.2 After receipt of application for payment and sworn statement, Contract Administrator will issue certificate for payment of holdback amount.

.3 Where holdback amount has not been placed in a separate holdback account, The City shall, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of The City and Contractor.

.4 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. The City may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of

Work, other third party monetary claims against Contractor which are enforceable against The City.

1.5 FINAL PAYMENT

.1 Submit application for final payment when Work is completed.

.2 Contract Administrator will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Contract Administrator will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.3 Contract Administrator will issue final certificate for payment when application for final payment is found valid.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the Work at the call of Contract Administrator.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Contract Administrator and The City.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in Contract to discuss and resolve administrative procedures and responsibilities.

.2 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.4 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals].

.9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.10 Monthly progress claims, administrative procedures, photographs, hold backs.

.11 Appointment of inspection and testing agencies or firms.

.12 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work, schedule progress meetings bi-weekly.

.2 Contractor, major Subcontractors involved in Work and Contract Administrator and The City are to be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding Work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 26.

1.2 ADMINISTRATIVE

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

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable. Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.5 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.6 Verify field measurements and affected adjacent Work are co-ordinated.

.7 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

.8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

.9 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Manitoba, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which

adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 days for Contract Administrator's review of each submission.

.5 Adjustments made on shop drawings by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent Work.

.9 After Contract Administrator's review, distribute copies.

.10 Submit 1 electronic copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.

.11 Submit 1electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Contract Administrator.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.13 Submit 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Contract Administrator.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project Contract complete with project name.

.14 Submit 1 electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Contract Administrator.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.16 Submit 1 electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.

.17 Delete information not applicable to project.

.18 Supplement standard information to provide details applicable to project.

.19 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 SUBMITTALS

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

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Contract Administrator. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

.3 Address topics at level of detail commensurate with environmental issue and required construction task[s].

.4 Environmental protection plan: include:

.1 Name of person responsible for ensuring adherence to Environmental Protection Plan.

.2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.

.3 Name and qualifications of person responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use

areas including methods for protection of features to be preserved within authorized Work areas.

.9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan: to be included and updated, as required.

1.3 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.4 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site unless approved by Contract Administrator.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.5 NOTIFICATION

.1 Contract Administrator will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan. Contractor: after receipt of such notice, Contract Administrator of proposed corrective action and take such action for approval by Contract Administrator].

.2 Contract Administrator will issue stop order of Work until satisfactory corrective action has been taken.

.3 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Contract Administrator access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Contract Administrator instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Contract Administrator will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such Work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.2 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.3 PROCEDURES

.1 Notify appropriate agency and Contract Administrator in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.4 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Contract Administrator as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's Work damaged by such removals or replacements promptly.

.3 If in opinion of Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, The City will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Contract Administrator.

1.5 REPORTS

.1 Submit 4 copies of inspection and test reports to Contract Administrator.

.2 Provide copies to subcontractor of Work being inspected or tested.

1.6 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

.2 Refer to other Section for definitive requirements.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute Work expeditiously.

.2 Remove from site all such Work after use.

1.3 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

- .1 Facilitate progress of Work. Protect Work and products against dampness and cold.
- .2 Prevent moisture condensation on surfaces.
- .3 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .4 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain normal building temperatures throughout the building where construction is in progress.

.5 Ventilating:

- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful contaminants.

.6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace filters, and ensure operational.

.8 Pay costs for maintaining temporary heat, when using permanent heating system The City will pay utility charges when temporary heat source is existing building equipment.

.9 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.4 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lux.

1.5 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute Work expeditiously.

.5 Remove from site all such Work after use.

1.3 SITE STORAGE/LOADING

.1 Confine Work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.4 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Clean runways and taxi areas where used by Contractor's equipment.

1.5 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from Work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such Work after use.

1.2 HOARDING

.1 Erect temporary site enclosures using construction grade lumber as required.

.2 Apply plywood panels vertically flush and butt jointed.

1.3 DUST TIGHT SCREENS

.1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such Work is complete.

1.4 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.5 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Be responsible for damage incurred due to lack of or improper protection.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 The General Conditions for Construction (Rev. 2006 12 15) are applicable to the Work of the Contract.

.2 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

.4 If there is question as to whether products or systems are in conformance with applicable standards, Contract Administrator reserves right to have such products or systems tested to prove or disprove conformance.

.5 The Cost for such testing will be borne by the Contractor.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of Work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with the Contract Administrator based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Contract Administrator of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Contract Administrator at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Contract Administrator reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.

.9 Touch-up damaged factory finished surfaces to Contract Administrator’s satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator will establish course of action. Where conflicts exist, the more stringent instruction will be enforced.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Contract Administrator to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Contract Administrator reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Contract Administrator, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 REMEDIAL WORK

.1 Perform remedial Work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial Work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

.3 PROTECTION OF WORK IN PROGRESS

.4 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Contract Administrator.

1.10 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of The City or separate Contractor.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of The City or separate Contractor.
- .7 Written permission of affected separate Contractor.
- .8 Date and time Work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering Work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry Work without prior approval.

.9 Restore Work with new products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material.

.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by The City or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Contract Administrator. Do not burn waste materials on site, unless approved by Contract Administrator.

.3 Provide on-site containers for collection of waste materials and debris.

.4 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.5 Dispose of waste materials and debris off site.

.6 Clean interior areas prior to start of finishing Work, and maintain areas free of dust and other contaminants during finishing operations.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Accomplish maximum control of solid construction waste.

.2 Preserve environment and prevent pollution and environment damage.

1.2 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Contract Administrator.

.2 Protect, stockpile, store and catalogue salvaged items.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.4 Protect structural components not removed for demolition from movement or damage.

.5 Protect surface drainage, mechanical and electrical from damage and blockage.

1.3 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

- .1 Number and size of bins.
- .2 Waste type of each bin.
- .3 Total tonnage generated.
- .4 Tonnage reused or recycled.
- .5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.4 USE OF SITE AND FACILITIES

.1 Execute Work with least possible interference or disturbance to normal use of premises.

1.5 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave Work area in clean and orderly condition.

.2 Clean-up Work area as Work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 INSPECTION AND DECLARATION

.1 Notify Contract Administrator in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Contract Administrator's Inspection.

.3 Contract Administrator's Inspection: Contract Administrator and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.4 Completion: submit written certificate that following have been performed:

- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
- .4 Operation of systems have been demonstrated to The City's personnel.
- .5 Work is complete and ready for final inspection.

.5 Final Inspection: when items noted above are completed, request final inspection of Work by The City and Contract Administrator and Contractor. If Work is deemed incomplete by The City and Contract Administrator, complete outstanding items request re-inspection.

.6 Declaration of Total Performance: when The City and Contract Administrator consider deficiencies and defects have been corrected and it appears requirements of Contract have been performed, make application for certificate of Total Performance. Refer to City’s General Conditions for Construction, for specifics to application.

.7 Commencement of Lien and Warranty Periods: date of The City's acceptance of submitted declaration of Total Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.8 Final Payment: when The City and Contract Administrator consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to City’s General Conditions for Construction. If Work is deemed incomplete by The City and Contract Administrator, complete outstanding items and request reinspection.

.9 Payment of Holdback: after issuance of certificate of Total Performance of Work, submit an application for payment of holdback amount in accordance with City’s General Conditions for Construction.

1.2 CLEANING

.1 In accordance with Section 01 74 11 - Cleaning.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.3 Copy will be returned after final inspection, with Contract Administrator's comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four final copies of operating and maintenance manuals in English.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 Furnish evidence, if requested, for type, source and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.2 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide scaled CAD files in dwg format on CD.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project; Date of submission; names.

.1 Addresses and telephone numbers of Contract Administrator and Contractor with name of responsible parties.

.2 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain in addition to requirements in General Conditions, at site Contract Administrator and The City one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples. Field test records.

.6 Inspection certificates.

.7 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Contract Administrator.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Contract Administrator.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.6 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

.15 Additional requirements: as specified in individual specification sections.

1.7 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.8 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.9 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to [site] [location as directed]; place and store.

.4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.10 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store. Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

1.11 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.

1.12 WARRANTIES

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator approval.

.3 Warranty management plan to include required actions and documents to assure that The City receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder and submit upon acceptance of Work. Organize binder as follows:

.1 Separate each warranty with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of Work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties until time specified for submittal.

.7 Except for items put into use with The City's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Contract Administrator.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include electrical systems.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in a timely manner to oral or written notification of required construction warranty repair Work.

.11 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

1.13 PRE-WARRANTY CONFERENCE

.1 Meet with Contract Administrator, to develop understanding of requirements of this section. Schedule meeting prior to Contract completion, and at time designated by Contract Administrator.

.2 Contract Administrator will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty Work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty Work action.

1.14 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.Warranty period.

.5 Inspector's signature.

.6 Construction Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to The City's personnel two weeks prior to date of final inspection.

.2 The City will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 QUALITY CONTROL

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct The City's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Contract Administrator's approval. Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.3 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the designated location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 01.

.2 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

.3 Carefully examine all plans and specifications pertaining to this Contract and become familiar with all details. Visit the site and determine all factors affecting this section of the Work and include all costs for same in Bid Submission.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 American National Standards Institute/ International Electrical Testing Association (ANSI/NETA)

.1 ANSI/NETA Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.

.3 The electrical installation shall comply with the requirements of the Electrical Supply Authority, the latest edition of the Canadian Electrical Code, with all Provincial and Municipal Laws, Rules and Ordinances, and to the satisfaction of those persons having jurisdiction over same.

.4 Notify the Contract Administrator of any discrepancies or conflictions with any regulation in accordance with B4.

.5 In no instance shall the standard established by these specifications and drawings be reduced by any of the codes, rules or ordinances.

.6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

1.3 REQUEST FOR INTERPRETATION PROCESS

.1 General:

.1 Immediately on discovery of the need for interpretation of the Contract Documents, Contractor shall prepare and submit an RFI to the Contract Administrator in the form specified.

.2 Contract Administrator will return RFIs submitted to Contract Administrator by other entities controlled by Contractor with no response. The RFI will then be considered closed.

.3 Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor’s Work or Work of subcontractors.

.4 For RFIs submitted electronically, include project name and RFI number in subject line of email.

.2 Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

.1 Project name (including building number).

.2 Project number.

.3 Date.

.4 Name of Contractor.

.5 Name of Contract Administrator.

.6 RFI number, numbered sequentially. (eg: RFI-001)

.7 RFI subject.

.8 Specification Section number, title and related paragraphs, as appropriate.

.9 Drawing number and detail references, as appropriate.

.10 Field dimensions and conditions, as appropriate.

.11 Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Price, Contractor shall state impact in the RFI.

.12 Contractor's signature.

.13 Attachments: Include sketches, descriptions, measurements, photos, product data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

.1 Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

.3 RFI Forms: Contractor generated form including all content indicated in this Section.

.1 Form and attachments shall be electronic files in Adobe Acrobat PDF format.

.2 RFI's are to be submitted to Contract Administrator.

.4 Contract Administrator's Action: Contract Administrator will review each RFI, determine action required, and respond. Allow 10 working days for Contract Administrator's response for each RFI. RFIs received by Contract Administrator after 1:00 p.m. will be considered as received the following working day.

.1 The following Contractor-generated RFIs will be returned without action:

.1 Requests for approval of submittals.

.2 Requests for approval of substitutions.

.3 Requests for approval of Contractor's means and methods.

.4 Requests for approval of corrective actions for deficient Work.

.5 Requests for coordination information already indicated in the Contract Documents.

.6 Requests for adjustments in the Contract Time or the Contract Sum.

.7 Requests for interpretation of Contract Administrator's actions on submittals.

.8 Incomplete RFIs or inaccurately prepared RFIs.

.2 Contract Administrator's action may include a request for additional information, in which case Contract Administrator's time for response will date from time of receipt of additional information.

.3 If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Contract Administrator in writing within 10 days of receipt of the RFI response. Failure to notify will result in the Work being included as part of the Contract.

.5 RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with progress meeting minutes. Include the following:

.1 Project name.

.2 Name and address of Contractor.

.3 Name and address of Contract Administrator.

.4 RFI number including RFIs that were returned without action or withdrawn.

.5 RFI description.

.6 Date the RFI was submitted.

.7 Date Contract Administrator's response was received.

.6 On receipt of Contract Administrator action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Contract Administrator within 10 days if Contractor disagrees with response.

1.4 COORDINATION

.1 The Contractor is responsible for installing a complete, fully functional and fully operational system, and is responsible for reviewing all other trades' drawings to ensure all electrical requirements are included in the Bid price. Inform the Contract Administrator of any discrepancies during the Bid Submission process. Any discrepancies not identified, shall be incorporated by the Contractor at no cost during construction.

.2 The Contractor is responsible for coordination with all other trades and Contractors on site.

.3 Through the Contractor, coordination shall include regular meetings, exchange of shop drawings and other technical information. Compile working combined systems drawings, where parts of the installation are complex or require input of several trades. Ensure the Contractor is in attendance and is aware of all coordination. Obtain and exchange schedules with all other trades and Contractors to ensure Work which impacts another trade or Contract is completed in sufficient time.

.4 All Work is to be properly phased to enhance coordination. Where it is evident that Work outside of phase has inhibited the Work of another Contractor, the Contract Administrator shall reserve the right to instruct the Contractor to remove said Work at the cost of the Contractor.

1.5 SUSTAINABLE DESIGN PROCEDURES

.1 The City has established, with the design team, the target for sustainable goals for the project. The Contractor, its Subcontractors and suppliers will be required to participate in the process to realize The City's sustainable goals.

1.6 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

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

1.7 SUBMITTALS

.1 Submit shop drawings, produce detailed data and samples in accordance with previous sections, as specified herein, and to Contract Administrator's satisfaction.

.2 Shop drawings submitted electronically (e.g. by email) shall comply with the following:

.1 Shop drawings larger than 11 x 17 shall include a hard copy delivered separately by messenger the same day as the email copies.

.2 All necessary transmittals shall be included with the email submission.

.3 Emailed shop drawings shall comply in all respects with this section of the specifications.

.3 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.4 Where applicable, include actual wiring, single line and schematic diagrams. Include all technical data and full details of each component.

.5 Include wiring drawings or diagrams showing interconnection with Work of other sections.

.6 Shop drawings must reflect actual equipment being provided. Generic shop drawings are not acceptable and will be returned for re-submittal without Contract Administrator’s review.

.7 Shop drawings of all equipment must be submitted to the Contract Administrator for review in sufficient time to enable him to retain them for at least ten (10) working days.

.8 Each applicable device to be highlighted or identified with an arrow.

.9 Each applicable device to be tagged (e.g. light fixture type, motor tag, etc.).

.10 Bind each system separately eg. P.A., CCTV, Intercom, Fire Alarm, etc. One common binder from one supplier will not be acceptable.

.11 Shop drawing submission shall include a photocopy of all applicable specification sections showing a complete compliance/ non-compliance listing. Refer to spec. detail sheet "Shop Drawing Compliance List Sample" for example. Submittals in electronic format are to be sent to Contract Administrator.

.12 Division 26 shall check all shop drawings and make necessary changes, or cause the supplier to make necessary changes, prior to submission to the Contract Administrator. Division 26 shall stamp shop drawings as evidence of review. Unreviewed shop drawings will be returned, marked revise and re-submit. Division 26 shall ensure the Contractor and other effected sub-trades reviews the shop drawings. Division 26 shall review other trades’ relevant shop drawings and stamp accordingly. Shop drawings will be reviewed by the

Contract Administrator and if re-submission is required, Division 26 shall ensure that the supplier's drawings have been changed to comply before returning them to the Contract Administrator for review again.

.13 Review of the shop drawings by the Contract Administrator shall not relieve the Contractor from responsibility for errors and omissions therein.

.14 Each drawing submission to bear the following signed stamp, and shall include name of project, equipment supplier, and clause number equipment is specified under.

CONTRACTORS CERTIFICATION
This drawing has been reviewed by
(firm name) .

All dimensions have been checked and found compatible with the Contract drawings and all capacities, quantities, sizes, and other data contained in the Contract documents have been listed by the supplier on this drawing and have been checked by the undersigned and found correct.

Date Per:

.15 Clearly show division of responsibility. No item, equipment or description of Work shall be indicated to be supplied or Work to be done "By Others" or "By Purchaser". Any item, equipment or description of Work shown on shop drawings shall form part of Contract, unless specifically noted to the contrary.

.16 Provide field dimensions required by electrical suppliers and sub-subcontractors. In cases where fabrication is required prior to field dimensions being available, check all related drawings and obtain clarification from Contract Administrator if necessary.

.17 Main distribution and utility metering shop drawings must be approved by local utility prior to submission to Contract Administrator.

.18 Incomplete submissions will be returned for updating and re-submittal without Contract Administrator's review.

.19 Quality Control: in accordance with Division 01.

.1 Provide CSA or equivalent certified equipment and material.

.2 Where CSA or equivalent certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of Contract.

.5 Submit, upon completion of Work, load balance report.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work.

.7 Other requirements as listed in specification.

.20 Manufacturer's Field Reports: submit manufacturer's written reports, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in other sections.

1.8 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Division 01.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction and as per the conditions of Provincial or Territorial Act respecting manpower vocational training and qualification.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Contract Administrator with schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01.

1.10 SYSTEM STARTUP

.1 Upon completion of the project, demonstrate the operation, care and maintenance of all system equipment and components in the presence of The City, or his representative, and the Contract Administrator. Obtain signed certification from The City that such equipment was shown to be fully operational and that all necessary operating instructions have been provided.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.11 DRAWINGS

.1 Drawings are intended to communicate the general design intent. They are not to be interpreted as a description of means and methods of construction. The Contractor is responsible for reviewing the drawings and specifications of this and all other trades on the project to ensure that they deliver a fully coordinated, complete and fully operational system. Any component or service not described, but reasonably obvious as required for completion shall be included by the Contractor at no cost.

.2 Carefully examine all drawings and specifications relating to all Work (including, but not limited to, all other disciplines’ drawings and specs), and all electrical Work indicated thereon shall be considered as a part of the Work by this section unless indicated otherwise. Prior to the date of the last addendum report at once to the Contract Administrator, any defect, discrepancy, omission or interference affecting the Work of this section, or the guarantee of same.

.3 Install all equipment as shown or as specified and in accordance with manufacturer's approved shop drawings.

.4 The drawings accompanying these specifications are intended to show the general arrangement and extent of the Work to be carried out, but the exact location and arrangement of all parts shall be determined as the Work progresses. The location of equipment, outlets, etc., as given on the drawings are approximately correct, but it shall be understood that they are subject to such modifications as may be found necessary or desirable at the time of installation to meet any structural or architectural requirements. Such changes shall be implemented as directed by the Contract Administrator, without additional charge.

.5 Electrical drawings do not show all structural and other details. Architectural and structural conditions shall govern, and this Section shall make without charge, changes or additions to accommodate these conditions. Check all architectural plans, elevations and details for location of electrical devices, equipment and equipment to be connected.

.6 Where drawings indicate the general location and route to be followed by conduit, cable, etc., these locations must be governed by job conditions. Where the required conduit, cable, and boxes are not shown on drawings or only shown diagrammatically, they shall be installed to conserve maximum head room and interfere as little as possible with free use of space through which they pass. Maximum clearance above floor shall be maintained under all suspended conduit and equipment, unless otherwise shown on the drawings, or approved by the Contract Administrator.

.7 Submit a complete set of drawings for the proposed installation to the Inspection Department having jurisdiction and receive written approval before installation or fabrication of any equipment. No extra compensation will be allowed for any changes or rearrangement of any electrical apparatus or materials necessary due to failure to receive this approval.

1.12 COORDINATION OF EQUIPMENT AND SERVICES IN ABOVE-CEILING SPACES AND SERVICE ROOMS

.1 Coordinate installation of equipment and services in above-ceiling spaces and service rooms with other trades.

.2 Install equipment and services in such way to utilize spaces efficiently and to maximize accessibility for installations and maintenance of equipment and services of all trades. Review requirements of other trades. Consider required clearances for maintenance and repairs of equipment provided by other trades.

.3 Examine Contract documents for ceiling space. Examine structural, architectural and mechanical obstructions. Examine manufacturer’s requirements for maintenance.

.4 Where equipment or services are installed in existing above-ceiling spaces, service rooms, riser rooms and riser shafts, visit these spaces to obtain details.

.5 Assign space priorities and lay out equipment and route services so they can be installed efficiently in these spaces and provide code-compliant access to equipment and services for maintenance.

.6 The location of equipment in ceiling spaces shall be such that it can be accessed for maintenance from a location immediately below the equipment, by two hands at a time, by removal of a ceiling tile or an access panel.

.7 All above-ceiling installed equipment shall be located such that there is no interference with furniture and equipment in spaces below ceiling or above-ceiling mechanical and electrical systems.

.8 Where access to equipment or service is required for maintenance, removal or relocation of another equipment or service shall not be required.

1.13 PENETRATIONS IN STRUCTURAL MEMBERS

.1 Penetrations in existing structural members.

.1 Provide electrical services through structural members as shown on drawings.

.2 Installations that deviate from structural are not acceptable.

.3 Submit proposals for deviations to Contract Administrator for review.

1.14 AS-BUILT DRAWINGS INDICATING CONDUIT/CABLE RUNS & EQUIPMENT LOCATIONS

.1 Record the horizontal and vertical routing of all electrical cables and conduits installed under this Contract. This includes the entire electrical distribution, all Div. 26, electrical systems, and lighting.

.2 Contract Administrator will provide the required number of 'white' prints of the contract drawings, as requested by Div. 26.

.3 Record drawing information shall be organized and presented as follows. Each of the following groups of systems shall be recorded on separate record drawing sets. Do not 'crowd' drawings with as-built record information. Use additional drawing prints as required. In addition to the plan record drawings, provide supplemental riser schematics for clarity.

.1 Normal Power: Power and receptacles for all cable/wiring 120 Volts or greater excluding lighting.

.2 Normal Power: Distribution Equipment Feeders.

.4 Record the location of the following: All power distribution equipment, cable splices, pull boxes, junction boxes, access fittings, power supplies and system control equipment, terminal cabinets, etc.

.5 As Work progresses, record on one (1) set of Contract drawings, installed conduit layout as well as any approved changes and deviations from the original Contract and/or working drawings, including outlets, equipment and panel locations. Have these drawings available for reference and observation at all times. At completion of Work, submit to the Contract Administrator, at the Contractor’s Costs, AutoCAD Record Drawings and one hardcopy set of Record Drawings. The Contract shall not be considered complete and no final

payment shall be made until these drawings are accepted by the Contract Administrator. Provide separate drawings for each system in order not to "crowd" drawings.

1.15 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into operation and maintenance manuals specified.

.2 Provide one copy of Operation and Maintenance manuals to Contract Administrator for review. Operation and Maintenance manuals will be reviewed by the Contract Administrator and if re-submission is required, ensure that the manuals have been changed to comply before returning them to the Contract Administrator for review again.

.3 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of the electrical installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature alone is not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers.

.5 Copy of reviewed shop drawings.

.4 Provide four (4) complete, hard-backed, D-ring loose leaf Maintenance Manuals. These shall consist of typewritten or printed instructions for operating and maintaining all systems and equipment provided under this section of the specification. Manuals shall also contain shop drawings, wiring diagrams, test results, check lists, programming details and manufacturer's brochures on all equipment, together with typed index tab sheets. Manuals shall also contain a DVD with PDF files of the contents of the manuals.

1.16 TEMPORARY LIGHTING AND POWER

.1 All temporary and construction lighting and power Work and costs for same are not included as part of the scope of the Work of this section. Refer to such clauses in other sections of the specification.

1.17 EXAMINATION OF DOCUMENTS AND SITE

.1 Carefully examine all plans and specifications pertaining to this Contract and become familiar with all details. Visit the site and determine all factors affecting this section of the Work; include all costs for same in Bid Submission.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Division 01.

2.2 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Div. 01.

.2 Equipment and material to be CSA certified or certified by an equivalent recognized certifying agency to meet Canadian Standards. Electrical equipment consisting of individual certified components must also have a CSA or equivalent certification for the entire assembly. Where there is no alternative to supplying equipment which is certified, obtain special approval from local Electrical Inspection Department or authority having jurisdiction.

.3 Factory assemble control panels and component assemblies.

.4 Submit for Contract Administrator's approval, a duplicate list of makes and types of all equipment and materials for this project, prior to placing of orders for same. This shall be done within fourteen (14) days of the award of the project Contract to the Contractor in order to avoid delays in delivery and completion.

.5 Any material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved material or equipment without a change in the Contract price.

2.3 EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to equipment and controls, as indicated.

.2 Supplier and installer responsibility is indicated on electrical drawings, or in this specification.

.3 Refer to other Sections of this specification and to drawings for responsibilities for control wiring and conduit.

.4 Coordinate with other trades. Identify any discrepancies during Bid Submission.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Contract Administrator.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for type of conductors used.

2.6 EQUIPMENT IDENTIFICATION LABELS, SIGNS AND MARKINGS

.1 Equipment identification labels, nameplates, signs and markings: in accordance with requirements of authority having jurisdiction and Contract Administrator.

.2 To match existing where applicable.

.3 Confirm with authority having jurisdiction and Contract Administrator prior to manufacture.

.4 References:

.1 ANSI Z535.1 – Safety Colors

.2 ANSI Z535.2 – Environmental Facility and Safety Signs

.3 ANSI Z535.3 – Criteria for Safety Symbols

.4 ANSI Z535.4 – Product Safety Signs and Labels

.5 Equipment Identification

.1 Identify equipment with nameplates and labels as follows, and as indicated in other specification sections:

.1 Nameplates: lamicoid 3mm thick plastic engraving sheet, black face with white core (black with white letters) lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

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

.3 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.

.4 Wording on nameplates and labels to be approved by Contract Administrator prior to manufacture.

.5 Allow for minimum of twenty-five (25) letters per nameplate and label.

.6 Nameplates for terminal cabinets, pullboxes and junction boxes to indicate system and/or voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Room names and numbers used shall be actual room names and numbers that will be used on the project. Co-ordinate and confirm with trades involved.

.9 Nameplates for control devices: indicate equipment controlled.

.10 Adjacent to each breaker in CDP type panelboards, provide and mount lamacoid nameplates identifying the respective load and location.

.6 Identification of equipment fed from multiple power sources

.1 Provide adhesive-backed vinyl on equipment, 3.5 mil thick, minimum size 76mm x 127mm , yellow background with black letters, with wording: "CAUTION – THIS EQUIPMENT IS SUPPLIED BY MORE THAN ONE POWER SOURCE. ENSURE ALL SOURCES ARE ISOLATED BEFORE WORKING ON EQUIPMENT."

.7 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders (coloured plastic tapes) and branch circuit wiring (numbered wire markers). Conductor marker identification shall correspond with panel or terminal board directory information.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system. Colour coding used shall be documented by individual systems in Maintenance Manuals.

.5 Insulated grounding conductors shall have a green finish and shall be used only as a grounding conductor.

.8 Conduit And Cable Identification

.1 Colour code conduits, boxes and metallic sheathed cable.

.2 Colour coding to match existing where applicable.

.3 Confirm colour coding with The City and Contract Administrator prior to start of Work.

.4 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

.5 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
Up to 250V (normal power)	yellow	
Up to 600V (normal power)	yellow green	
Up to 250V (emergency power)	yellow & red	
Up to 600V (emergency power)	yellow & red	green
Voice/Data	green	
Other communication systems	green	blue
Fire alarm	red	
Emergency voice	red	blue
DC Emergency Lighting	yellow & red	blue
Other security systems	red	yellow
Control	blue	
Fibre optic	orange	

.6 Other conduit systems as directed on site; all conduit systems shall be identified.

.7 Colour outlet box covers to colour designated and show circuit numbers in black felt marker on inside of covers.

2.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor distribution enclosures light gray.

2.8 WORKMANSHIP AND MATERIALS

.1 The installation shall consist of material and equipment specified unless as provided herein. Electrical equipment provided under this Contract shall be built in accordance with EEMAC standards and shall be C.S.A. certified (or certified by an equivalent recognized certifying agency to meet Canadian Standards) and/or locally approved. All equipment

supplied under this Contract shall be new and the best of its respective kind and of uniform pattern throughout.

.2 Any material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved material or equipment without a change to the Contract.

.3 Replace inferior Work if so ordered by Contract Administrator without a change to the Contract.

.4 Retain same foreman or superintendent on the job until completed, unless otherwise directed by the Contract Administrator.

.5 All tradesmen shall carry all tools on their person at all times. Any tool not in use shall be under lock and key in an area authorized by the building supervisor.

2.9 REQUEST FOR EQUAL

.1 Applications for approval of equal or alternate materials or methods as substitutions to those specified or shown shall be submitted in accordance with B7.

2.10 WIRING TERMINATIONS

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

2.11 SPARE PARTS

.1 The Contractor shall submit 15 days after bid a list of spare parts that the Contractor considers essential/important/useful to the operation of the systems described herein. This list shall be in addition to any spares/consumables called for in the Contract Documents and those which are required up to practical completion and hand over.

.2 Each spare part listed shall include the manufacturer's/ supplier's price including all mark-ups, delivery and packaging. The prices shall remain valid for 12 months following handover of the project.

.3 These spare parts may or may not be ordered during the Contract period. The Contractor shall only include these items in the Contract sum if specifically instructed to do so.

.4 Any spare parts listed shall be completely interchangeable with those specified in the Contract Documents and included in the Works.

.5 Any spares ordered shall be delivered to the specified client's representative complete with all documents/instructions.

Part 3 Execution

3.1 INSTALLATION

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

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION - GENERAL

.1 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.2 Arrange for holes through exterior wall and roof to be flashed and made weatherproof.

.3 All conduits to be hidden in all locations except mechanical and electrical rooms.

.4 Redundant, unused or empty conduits, raceways, cable trays, supports, junction and pull boxes and other equipment, including associated cables and wiring, that was installed under this project but was not used shall be removed from the site unless otherwise noted. Where conduits, raceways, cable trays, supports, junction and pull boxes and other equipment, including associated cables and wiring, were required to be installed to facilitate construction Work, such as temporary feeds these shall be removed from the site unless otherwise noted.

3.4 CONDUIT AND CABLE INSTALLATIONS ON ROOFS AND ROOF PENETRATIONS

.1 When conductors/cables are installed in conduits on roofs, EMT conduit to be provided c/w liquid tight couplings.

.2 Teck cables, AC90, ACWU and aluminum sheathed cables on roofs to be installed on cable tray, hot-dip galvanized steel.

.3 Cable trays and EMT conduits to be installed on roof top rubber supports. Unistrut channels to be provided as required.

.4 Roof penetrations to be provided with roof flashings specifically made for electrical cable and conduit penetrations.

.5 Roof flashings to be installed by a roofing Contractor.

.6 Approved manufacturers:

.1 Rubber supports: Eaton – Dura-Block or approved equivalent in accordance with B7.

.2 Electrical roof flashings: Thaler or approved equivalent in accordance with B7.

.7 Provide shop drawings for review in accordance with specification section 26 05 00 Common Work Results – For Electrical.

.8 Install per manufacturer recommendations.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centre line of equipment unless specified or indicated otherwise.

.2 Install electrical equipment on wall at following heights unless indicated otherwise.

- .1 Local switches, dimmers, timers, occupancy sensors with manual over-ride: 1200mm.
- .2 Panelboards, annunciators etc.: 2000mm to top.
- .3 Speed controls: 1200mm.
- .4 Manual starters: 1200mm.
- .5 Emergency power off buttons: 1200mm.
- .6 Heights as above or at bottom of nearest block or brick course except where required to comply with Manitoba Building Code, other applicable codes, authorities having jurisdiction, etc.
- .7 Heights and orientation to match existing where applicable except where required to comply with Manitoba Building Code, other applicable codes, authorities having jurisdiction, etc.
- .8 Where multiple existing devices are present and are installed at different heights or orientations, confirm mounting height and orientation of new devices with Contract Administrator prior to rough in.
- .9 Notify Contract Administrator for any discrepancies related to mounting heights and orientations.

3.6 FIELD QUALITY CONTROL

.1 General

- .1 This Section specifies general requirements common to all starting and testing of electrical equipment and systems. Read this Section in conjunction with related Sections which specify specific portions of electrical starting and testing Work.
- .2 Except where otherwise specified, arrange and pay for the testing and related requirements specified in this and related Sections.
- .3 If test results do not conform with applicable requirements, repair, replace, or adjust or balance equipment and systems. Repeat testing as necessary until acceptable results are achieved.
  - .1 Prior to testing ensure all electrical equipment is cleaned and free of dust.
  - .2 After testing, protect equipment subject to dust from construction activities.
  - .3 Do not conceal or cover equipment until observed and approved by Contract Administrator.
  - .4 Assume all liabilities associated with starting, testing and balancing procedures.
  - .5 Assume all costs associated with starting, testing, adjusting and balancing, including supply of testing equipment and witnessing.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Coordinate starting of electrical equipment and systems with other Divisions.

.6 Notify Contract Administrator when starting and testing of all systems has been completed.

.7 Upon completion of the Work and adjustments of all equipment, all systems shall be operated in the presence of the Contract Administrator and The City to demonstrate that all equipment furnished and installed or connected as part of this section of the Contract shall function in the required manner as determined by the Contract Administrator. The City or Contract Administrator may elect to not attend demonstration.

.2 Reference Documents

.1 Perform tests in accordance with:

.1 These Contract Documents

.2 Requirements of authorities having jurisdiction

.3 Manufacturer's published instructions

.4 CSA Z32 - Electrical Safety and Essential Electrical Systems in Health Care Facilities

.5 CAN/ULC S537 - Verification of Fire Alarm Systems

.6 NETA Standard For Acceptance Testing Specifications for Electrical Power Equipment and Systems

.7 Other applicable standards

.2 If requirements of any of the foregoing are in conflict, notify Contract Administrator before proceeding with tests and obtain clarification.

.3 Witnessing of starting and testing on site

.1 Where any equipment or systems requires testing prior to starting, ensure that such Work has been completed prior to starting of electrical equipment and systems.

.2 Prior to starting and testing of electrical equipment or systems, prepare a start-up and testing schedule of all tests specified.

.3 Review schedules with Contract Administrator and The City. Provide a complete schedule to the Contract Administrator and The City a minimum 2 weeks prior to commencement of testing.

.4 Advise Contract Administrator and The City of dates and times for all testing with sufficient advance notice (minimum three days) to allow Contract Administrator to make arrangements to attend.

.5 Contract Administrator or The City may witness all or any portion of testing and starting procedures performed by Contractor or Contractor's Testing Agent.

.6 Contractor shall be present for all tests specified, even where test is being performed by a supplier or sub-contractor.

.4 Manufacturer's Starting Recommendations

.1 Prior to starting equipment or systems, obtain and review manufacturer's installation, operation and starting instructions.

.2 Use manufacturer's and supplier's starting personnel where required to maintain validity of manufacturer's warranty. Confirm with manufacturer that all testing specified in this Section will not void any warranties.

.3 Compare installation to manufacturer's published data and record discrepancies. Modify procedures detrimental to equipment performance prior to starting equipment.

.5 Contractor's Testing Agent(s)

.1 Arrange and pay for services of testing agent(s) to perform tests and verifications, except for megger testing of wiring and equipment operating at 600V and below, which are acceptable to be meggered by the Contractor.

.2 Contractor's Testing Agent(s) Qualifications:

.1 Registered testing firm whose normal day to day business is electrical testing.

.2 Testing agent shall be independent of any Supplier, Contractor or Subcontractor and shall not have any financial or other interests in or with the Contractor.

.3 Employ at least one electrician holding a current journeyman's certificate in the Province of Manitoba.

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

.1 Contact resistance testers (ductor).

.3 Contractor's Testing Agent(s) Report:

.1 Arrange for Contractor's Testing Agent(s) to submit PDF files of all test results, together with deficiency lists, and summary of tests, and include recommendations for any corrective action required directly to the Contract Administrator.

.6 Manufacturer's Field Services

.1 Arrange and pay for qualified manufacturer's representatives to supervise starting and testing of equipment and systems when in the opinion of the manufacturer such representatives are necessary for the supervision of the starting and the testing.

.2 Manufacturer's personnel shall be experienced in design and operation of equipment and systems being started and have ability to interpret results of readings, and tests and report results in a logical fashion.

.3 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in SUBMITTALS.

.4 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for observation of product installation in accordance with manufacturer's instructions.

.7 Contractor’s and Manufacturer’s Reports

.1 Submit for Contract Administrator’s review completed test report forms in PDF file format immediately after each test is completed.

.2 After a test has been successfully completed, each test report shall contain a summary which clearly states that all results were satisfactory.

.3 Record all data gathered on site on test report forms.

.4 Obtain test report forms from equipment manufacturers. When test report forms are not available of specific tests are requested in this specification create your

own test report forms based on those requirements. Where applicable, create test report forms based on samples provided in this specification.

.5 Provide testing personnel names and signatures and date and time of testing.

.6 Note any damage, missing parts or incomplete Work on test form.

.7 Record date of corrected deficiencies on form.

.8 Maintain one copy on site of all data taken during starting and testing period.

.9 Maintain one copy of all final starting, testing, balancing and adjusting reports on site up to interim acceptance of the Work for reference purposes.

.10 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.

.11 Arrange for manufacturer to submit certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.12 Insert final test results, check lists, programming details and certifications in Maintenance Manuals.

.13 Provide calibration certificates for each test equipment.

.8 Test Equipment

.1 Provide all required test equipment.

.2 Test equipment must be calibrated within one year of testing.

.9 Contract Administrator's/The City’s Performance Testing Agent(s)

.1 The Contract Administrator or The City, at his option, may arrange for services of a performance testing agent to separately test or re-test electrical equipment or systems.

.2 Performance testing agent may witness any or all tests or start-ups which are the responsibility of the Contractor.

.3 Performance testing of any system by the Contract Administrator or the The City does not reduce the Contractors obligations for complete testing and start-up of systems as specified.

.10 Starting Motors

.1 Prior To Starting Motors:

.1 Confirm motor nameplate data with motor starter heater overloads, setting of MCP's 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.

.11 Correction Of Deficiencies

.1 Correct all Contract deficiencies found during electrical starting and testing of equipment and systems and Contract Administrator's performance verification.

.12 Basic Testing

.1 Perform the following testing:

.2 Bolted Conductor Terminations Testing

.1 Bolted conductor terminations shall be tightened to manufacturer's published torque values using torque tools.

.2 Torque tools shall be calibrated not more than one year before the date of use.

.3 Obtain torque values from equipment manufacturer.

.4 In absence of manufacturer's published torque values, use recommended tightening torque values from Canadian Electrical Code.

.5 For equipment rated 400A and above record torque values and provide report to Contract Administrator for review.

.6 Report to include following:

.1 Project name _____

.2 Project # _____

.3 Provide completed form as sample below.

.4 After all terminations have been completed, provide summary in the report to clearly state that all terminations are completed per manufacturer's (or Code) recommendations.

.5 Provide details if torque values deviate from manufacturer's or Code recommended values.

.6 Submit tool calibration certificate with report.

.7 Table 1. Sample form

Equipment name and rating	Phase	Busbar	Terminal Block	Conductor Lug	Bolt Size	Torque Value	Date	Technician Name
CDP-1B 1200A/600V/3ph/3W	A			X	½" x 2"	50ft/lbs	Nov 2/14	John Smith
	B			X	½" x 2"	50ft/lbs	Nov 2/14	
	C			X	½" x 2"	50ft/lbs	Nov 2/14	
All terminations are completed per manufacturer's recommendations.								John Smith

.3 Load Balance and Adjusting

.1 Test load balance on all feeders for distribution centres (CDP's), motor control centres and panelboards.

.2 Perform load tests with as many loads on as possible and make necessary reconnection of single phase loads from one leg or phase to another to balance the load on legs or phases as nearly as possible.

.3 Revise equipment directories and wiring identification accordingly.

.4 Record all changes on Record Drawings.

.5 Submit, at completion of Work, report listing phase and neutral currents on CDP's, panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.4 Voltage Testing and Adjusting

.1 Test and record voltage at CDP's, panelboards, operating under normal load.

.2 Record all changes on Record Drawings.

.3 Submit, at completion of Work, report listing phase and neutral voltages at each location tested. State hour and date on which each load was measured, and voltage at time of test.

.5 Insulation resistance testing:

.1 Branch circuits and feeders rated 1000V and less:

.1 Rated up to 350V with a 500V instrument.

.6 Test all circuits and wires for continuity and high impedance grounds.

.7 Those circuits which test non-continuous, with an insulation resistance less than minimum recommended resistance or with high impedance grounds shall be replaced.

.8 All circuits shall be tested to ensure that the circuit numbers are correct and that the proper neutral conductors have been provided and installed.

3.7 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of Work.

.2 Pay all associated fees for inspection of the Work by authorities having jurisdiction.

.3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

.4 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to Contract Administrator. Copies to be included in Maintenance Manuals.

3.8 RESPONSIBILITY

.1 Be responsible for any damage caused The City's, or their Contractors due to improperly carrying out this Work.

.2 Install all components of this Work promptly and where applicable, in advance of concrete pouring, or similar construction. Provide and set in the proper sequence of construction, all sleeves, hangers, inserts, etc. and arrange for all necessary openings, where required to accommodate the electrical installation.

.3 Work shall be arranged in co-operation with other divisions of this specification in such a manner that it doesn't interfere with the progress of the project. In areas where ducts or pipes must be installed along with conduit or cable, co-operate with other divisions so that the finished job will represent the most efficient use of the space.

.4 In no case proceed with any Work in uncertainty. Obtain, from the Contract Administrator, any clarification necessary and thoroughly understand all portions of the Work to be performed.

3.9 CLEANLINESS AND CLEANING

.1 This division shall maintain a clean tidy job site. All boxes, crates, and construction debris due to this portion of the Work shall be neatly piled outside the construction area and shall be removed at least weekly during the construction period. All construction areas shall be kept clear of debris.

.2 Before the project will be accepted by The City, all lighting fixtures, lamps, lens, panelboards, switches, receptacles, cover plates, and other electrical equipment shall be clean and free of dust, plaster, paint, etc. Any equipment which is scratched or damaged shall be refinished or replaced if so designated by the Contract Administrator.

3.10 MODIFICATIONS

.1 Locations of all light fixtures, convenience receptacles, outlets, switches, voice/data or similar outlets, fire alarm stations, bells, etc. are subject to modification by the Contract Administrator, who reserves the right to move these up to 3000 mm from the position shown, without change to the Contract price, provided notice is given before the related Work has commenced.

3.11 ENGINEERING OBSERVATIONS

.1 Guidance will be offered to Contractor in interpretation of plans and specifications to assist Contractor to carry out Work. Observation and directives given to Contractor does not relieve Contractor and his agents, servants and employees of their responsibility to erect and install Work in all its parts in a safe and Workmanlike manner, and in accordance with all relevant Codes, Standards, plans and specifications, nor does it impose upon The City, and/or Contract Administrator or their representatives, any responsibility to supervise or oversee erection or installation of any Work.

.2 Contractor shall notify Contract Administrator of completion of Work at various stages. Notification shall be made as a minimum as noted below (provide minimum 5 working day’s notice), whereupon the Contract Administrator may visit site to periodically observe the Work:

.1 After distribution equipment is installed into final location, but before energization. All distribution equipment shall be left with covers removed to allow for an internal review of distribution.

.2 After main feeders and grounding and bonding conductors are installed and terminated.

.3 Before closing walls and ceilings,

.4 At first energization of equipment,

.5 At final completion of project,

.3 The Contract Administrator is not responsible for inspection of the Contractor’s Work. The Contract Administrator maintains the right to observe the Work at its sole discretion. In addition to the above, Contractor's Work may be observed periodically by The City, and/or Contract Administrator or their representatives, without notice or without request from Contractor, solely for purpose of determining general quality of Work, and not for any other purpose. None of the above relieves the Contractor of their responsibility to adhere to the requirements of relevant Codes and Standards and the Contract Documents.

.4 Where observation reports are submitted, the Contractor is responsible for rectifying issues noted in the Observation Reports in a timely manner and before covering up the Work or affecting access to it.

3.12 GUARANTEE

.1 Guarantee the satisfactory operation of all Work and equipment supplied and installed as a part of this section of the specifications.

.2 Replace forthwith, at no additional material or labour cost, any part which may fail, or prove defective within a period of twelve (12) calendar months after the final acceptance of the complete installation, provided that such failure is not due to improper usage, or ordinary wear and tear.

.3 No certificate given, payment made, partial or entire use of the equipment by the The City or his representative shall be construed as acceptance of defective workmanship or materials.

.4 This general guarantee shall not act as a waiver of any specified guarantee or special equipment guarantees covering a greater length of time.

3.13 CUTTING AND PATCHING

.1 Cutting, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping in existing building(s) to be included by Contractor in bid price. Contractor to employ and pay appropriate sub-trade whose Work is involved, for carrying out Work described above.

.2 Contractor shall mark all openings required for conduits, cables, ducts, and the like.

3.14 FIREPROOFING

.1 Where cables or conduits pass through floors, block or concrete walls and fire rated walls, seal openings with 3 M Brand Fire Barrier Products or equivalent, to maintain fire rating.

.2 Seal all holes resulting from removal of cables, conduits and equipment.

.3 Fireproofing of electrical cables, conduits, trays, etc. passing through fire barriers shall conform to local codes and inspection authorities.

.4 Refer to following table for 3M brand products.

Pentrating Item	3M Brand Fire Barrier Product Options	Range of Applications			Concrete Walls and Assemblies		Gypsum Wall Assemblies	
		Penetrating Items	Annular Space	Maximum Opening Size	F Ratings (Hrs)	T Ratings (Hrs)	F Ratings (Hrs)	T Ratings (Hrs)
1. Plastic Pipe/ Conduit & Cast-in Coupling	FS-195+ Wrap Strip, CP 25WB+ Caulk or MP Moldable Putty+	PVC: 8 in. Nominal Diameter 4 Wraps/Application	0.2 in.	9 in. Diameter	2	2	2	1-1/2
		PVC: 4 in. Nominal Diameter 3 Wraps/Application	0.75 in.	6 in. Diameter	3	2	2	2
		ABS: 4 in. Nominal Diameter 3 Wraps/Application	0.75 in.	6 in. Diameter	2	2	1-1/2	1-1/2

	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	PVC: 4 in. Nominal Diameter	3.0 in.	10 in. Diameter	3	1/2	- -	- -
		ABS: 4 in. Nominal Diameter	3.0 in.	10 in. Diameter	3 (in wall) 1 (in floor)	3 (in wall) 0 (in floor)	- -	- -
		PB: 2 in. Nominal Diameter	3.0 in.	8 in. Diameter	1/2	- -	- -	- -
2. Metal Pipe and Conduit	CP 25WB+ Caulk	1 in. Depth of Caulk: 20 in. Diameter	2.5 in.	22.5 in. Diameter	3	0	2	0
	FS-195+ Wrap Strip, CP 25WB+ Caulk or MP Moldable Putty+	4 in. Nominal Metal Pipe	1.75 in.	8 in. Diameter	2	0	2	2
	CS-195+ Composite Sheet with FS-195+ Wrap Strip and CP 25WB+ Caulk or MP Moldable Putty+	4 in. Nominal Metal Pipe (Multiple Pipes)	45.0 in.*	30 x 50 in.	4 (both sides) 3 (one side)	3/4 0	- -	- -
	PSS 7902 Penetration Sealing System CP 25 WB+ Caulk or MP Moldable Putty+	10 in. Nominal Diameter Pipe and 8x16 in Rectangular Cover Plate if fill is less than 10%	9.0 in.	10 x 20 in.	3	0	- -	- -
	CP 25WB+ Caulk	1/2 in. Diameter Depth of CP-25WB 12 in. Nominal Diameter Pipe	1.2 in.	14 in. Diameter	3	0	- -	- -
	FD 150 FireDam Caulk	2 in. Depth of FireDam 150 Chaulk 6 in. Nominal Diameter Pipe	2.0 in.	8-1/4 in. Diameter	3	0	- -	- -
	MP Moldable Putty+	1 in. Depth of Putty: 10 in. Nominal Diameter Pipe	0.75 in.*	12-1/4 in. Diameter	2 (1/2 in. Depth) 3 (1 in. Depth)	0	- -	- -
3. Insulated Electrical and Communications Cable	CP 25WB+ Caulk	1 in. Depth of Caulk; 43% of Area Filled, 350 MCM Cable and 100 Pair Telephone Cable	0.75 in.	6 in. Diameter	3	0	2	1-1/2
		1 in. Depth of Caulk; 37% of Area Filled, 3/0 350MCM Cable and 100 Pair Telephone Cable	0.75 in.					
		2-12 in. Depth of Caulk; 59% of Area Filled, 7C/12 AWG Cable, 100 Pair Telephone Cable	0.75 in.					
	FS-195+ Wrap Strip with CP 25WB+ Caulk or MP Moldable Putty+	4 in. Depth of Caulk with FS-195 Wrap; 59% Area Filled, 350 MCM Cable	0.75 in.	6 in. Diameter	2	0	- -	- -
	CS-195+ Composite Sheet with FS-195+ Wrap Strip and CP 25WB+ Caulk or MP Moldable Putty+	Multiconductor 12 AWG Cable, 100 Pair PVC Telephone Cable, Cable Bundle 3 in. Diameter	47.0 in.*	30 x 50 in.	4	1	- -	- -
	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	350 MCM Cable; 30% of Area Filled. Cover Plate required if Fill is less than 10%	11.0 in.	8 x 16 in.	3	1/2	- -	- -
	MP Moldable Putty+	Telephone Cable; 100 Pair, 40% or Area Filled	0.75 in.	6-1/4 in. Diameter	2	0	- -	- -
4. Cable Tray	CS-195+ Composite Sheet with CP 25WB+ Caulk	Nominal Size Cable Tray 4 x 24 in.; 39% Area Filled in Tray; Cable Size: 300 MCM 4 in. Depth of Chaulk	14.64 in.	12 x 24 in.	3	0	- -	- -
	PSS 7904-R Penetration Sealing System with CP 25 WB+ Caulk	Nominal Size Cable Tray 4 x 18 in.; 52% Area Filled in Tray; 25 Pair No. 22 AWG Telephone Cable	9.0 in.	10 x 20 in.	3	3/4	- -	- -
5. Blank Openings and Construction Joints and Expansion Trenches	CP 25WB+ Caulk	1/2 to 1 in. Depth	- -	Joint Width	3	3	- -	- -
		2 in. Depth Cover Plate required when joint width exceeds 2 in.	- -	4 in. Diameter Opening 4 in. Joint Width	3	2	- -	- -
	MP Moldable Putty+	1 in. Depth	- -	1 in. Joint Width	2	2	- -	- -
	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	4 in. Depth of Kit. Cover Plate Required.	- -	8 x 16 in.	3	1	- -	- -

* Distance Measured from the outer edge of the pentrant to the furthest edge of the opening

3.15 SCHEDULING OF WORK

.1 Existing buildings will remain in use during construction. Arrange Work so that interruption of services is kept to a minimum. Obtain permission from The City prior to cutting into electrical services. Where deemed necessary by Contract Administrator, temporary electrical shall be installed and/or Work shall be carried out at night and on weekends.

.2 Contractor to maintain continuous and adequate all existing electrical systems and other services during entire time of this Contract. Provide temporary conduit, wire, equipment, etc. where necessary to meet this requirement.

3.16 DEMOLITION OF EXISTING ELECTRICAL

.1 Remove all unnecessary existing electrical equipment, wiring, fixtures, in those portions of the existing building which are being remodelled or demolished. All devices/fixtures, etc. are not necessarily shown on the plans. The The City shall select from the materials and/or equipment remaining that which he wishes to retain, and the remainder shall be removed from the site. Any electrical equipment in remodelled sections or in structures removed or altered, adjacent to new Work, necessary for the operation of existing building, shall be relocated as necessary. All existing equipment re-used shall be made good and guaranteed. Power interruptions to be kept to a minimum and shall be at a time suitable to the building occupant.

.2 Drawings do not show all electrical requiring removal to accommodate renovations such as receptacles, switches, lights, starters, motors, nurse call systems, components, heaters, etc. Division 26 shall visit site, electrical drawings and include all costs for demolition.

.3 Refer to Specification Section 26 05 05 - Work in Existing Building.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 05 21 - Wires and Cables.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association (CSA)

.1 CSA C22.2No.0.4, Bonding and Grounding of Electrical Equipment.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.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.

1.4 COORDINATION

.1 The building shall remain open and in normal operation during the construction period.

.2 Where existing services such as electrical power, fire alarm system, sound system, etc. are required to be disrupted and/or shut down, coordinate the shut-downs with The City and carry out the Work at a time and in a manner acceptable to them. Carefully schedule all disruption and/or shut-downs and ensure that the duration of same is kept to the absolute minimum. Submit for approval a written, concise schedule of each disruption at least 120 hours in advance of performing Work and obtain The City's written consent prior to implementing.

.3 Should any temporary connections be required to maintain services during Work in the existing building, supply and install all necessary material and equipment and provide all labour at no extra cost. Should any existing system be damaged, make full repairs without extra cost, and to the satisfaction of The City and Contract Administrator.

.4 If existing equipment shown on drawings is defective it shall be brought to the Contract Administrator and The City's attention prior to Work completion.

.5 Refer to General Conditions for phasing and staging of Work and adhere to that schedule. Comply with instructions regarding working hours necessary to maintain the building in operation.

.6 Coordinate complete installation of relocated utility services, if required, with Utilities to ensure minimum interruption of service. Coordinate the transfer of the existing hydro service point to the new service point with the Hydro utility in order to keep power interruptions to a minimum.

1.5 EXISTING DEVICES IN NEW CONSTRUCTION

.1 Where existing devices (receptacles, switches, etc.) presently mounted on a wall which will be covered with a new finish, provide an extension ring, coverplate, etc. or relocate as required to mount the device to the new wall.

.2 Where existing conduits pass vertically through a floor area, relocate those conduits to be installed concealed in a new wall or surface mounted in a service area. Extend conduit, wiring, etc. as required.

.3 Existing junction boxes in walls and ceiling spaces required to maintain existing circuits shall remain accessible.

.4 Where services are concealed within walls, floors or ceilings and cannot be visually identified, Contractor shall provide electronic scanning devices or other approved means to locate and identify concealed services prior to drilling.

1.6 SCHEDULE OF WORK

.1 Carefully note and refer to The City's general schedule of Work and include for all requirements to conform to it.

Part 2 Products

2.1 MATERIALS

.1 Provide all materials required for the complete interface and reconnection installation as herein described and as indicated on the drawings.

.2 New fire alarm devices, speakers, starters, panelboards, etc. required to be tied in to existing systems shall match the existing devices.

.3 New wiring required to interconnect new devices to existing systems shall be provided to suit the manufacturers requirements and instructions.

Part 3 Execution

3.1 INSTALLATION

.1 Install boxes, conduit and wiring through existing areas as required for the new installation.

.2 Add modules, switches, etc. in existing control panels, as required, to extend existing systems to new or renovated areas.

.3 Patch and repair walls and ceilings in existing areas that have been damaged or cut open due to the new electrical installation.

.4 Where new cables or conduits have been installed through existing fire rated walls, seal opening around cables and conduit to maintain fire rating.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2No.65, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install pressure type wire connectors and tighten according to manufacturers recommendations.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2 and NEMA.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

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

1.2 REFERENCES

.1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

.2 CSA C22.2 No. 38 Thermoset Insulated Wires and Cables.

.3 CSA C22.2 No. 51 Armoured Cables.

.4 CSA C22.2 No. 131, Type TECK 90 Cable.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 26 05 00 - Common Work Results - For Electrical.

Part 2 Products

2.1 BUILDING WIRES

.1 Wires and cables manufactured to CSA 22.2 No. 38.

.2 Conductors: stranded for 10 AWG and larger. Size as indicated. Minimum size: 12 AWG.

.3 Copper conductors: size as indicated, with minimum 600 V insulation of cross-linked polyethylene (XLPE) material, rated RW90.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Bonding conductor: copper.

.2 Phase conductors: copper, size as indicated. Minimum size 12 AWG.

.3 Insulation:

.1 Cross-linked thermosetting polyethylene rated type RW90, minimum 1000 V.

.2 Colour code: Black, red, blue and white in 4C cable.

.4 Inner jacket: Polyvinyl chloride (PVC) material.

.5 Armour: interlocking aluminum.

.6 Outer jacket: PVC jacket, FT4 rated.

.7 Fastenings:

.1 One hole straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables.

.3 Threaded rods: Minimum 6 mm dia. to support suspended channels.

.8 Connectors:

.1 To be approved for TECK cable.

2.3 CONTROL CABLES

.1 Type LVT: soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket, and armour of closely wound aluminum wire.

Part 3 Execution

3.1 GENERAL

.1 To Minimize Voltage Drop

.1 All branch circuit wiring and conduit shall be installed to minimize voltage drop. Install additional conduit runs as required to take the most direct and shortest route to outlets, light fixtures, etc.

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems.

.2 In cabletroughs (only where noted on drawings).

.3 In surface and lighting fixture raceways.

.4 In wireways and auxiliary gutters.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Group cables wherever possible on channels.

.2 Single conductor cables shall be installed one cable diam. apart on suspended cable tray or channel supports and shall be clamped with aluminum cable clamps. Cables shall be terminated using non-magnetic connectors. Cable armor shall be grounded via an aluminum plate at the supply end and isolated via an insulating plate, at the load end of the cable. A #3/0 AWG bare (unless otherwise noted) copper ground wire shall be installed with each feeder. Cable bending radius shall be at least twelve times the overall cable diam. and bends shall not damage or distort the outer sheath.

.3 Do not install PVC jacketted cables in circulating air plenums.

.4 Single conductor cables installed underground shall be installed in the installation configuration outlined in Appendix B of the Canadian Electrical Code to provide the allowable ampacity required for the feeder.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

3.5 INSTALLATION IN EQUIPMENT

.1 Group and lace-in neatly wire and cable installed in switchboards, panelboards, cabinets, wireways and other such enclosures.

3.6 INSTALLATION IN STEEL STUD WALLS

.1 Building wires and PVC, polyethylene or similar jacketed power cables shall not be fished in steel stud walls.

3.7 TERMINATIONS

.1 Terminate wires and cables with appropriate connectors in an approved manner.

.2 Compression adapters intended to terminate larger feeders on small lugs are not acceptable. All lugs, including breaker lugs, are to be sized to accommodate the cable being terminated.

3.8 IDENTIFICATION

.1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, colour coded as listed below.

.2 Wire in conduit 1/0 AWG and larger and single conductor cables for normal power feeders shall be identified at each outlet box and termination with a 150 mm band of coloured vinyl tape of the appropriate colour. Emergency power feeders shall be provided with an additional 75 mm band of red vinyl tape installed adjacent to the 150 mm band of the coloured phase identification tape, as listed below. Neutral and ground conductors shall be identified. Paint or other means of colouring the insulation shall not be used.

.3 Colour code wire in conduit and single conductor cables as follows:

Phase A - red
Phase B - black
Phase C - blue
Neutral - white
Ground - green

.4 Maintain phase sequence and colour coding throughout project.

.5 Identify control conductors in motor control equipment, contactors, control panel, etc. with mylar/cloth wire markers.

.6 Refer to 26 05 00 for additional requirements.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for connectors and terminations.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.41, Grounding and Bonding Equipment.

1.4 PRODUCT DATA

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

1.5 CERTIFICATES

.1 Obtain inspection certificate of compliance covering high voltage stress coning from manufacturer and include it with maintenance manuals.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

.1 Copper long barrel compression connectors to CSA C22.2 as required sized for conductors.

.2 2, 3, 4 way joint boxes for dry location.

Part 3 Execution

3.1 INSTALLATION

.1 Install terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2No.41.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 05 21 - Wires and Cables (0-1000V)

1.2 REFERENCES

.1 CSA C22.2 No. 0.4, Bonding of Electrical Equipment

.2 CSA C22.2 No. 41, Grounding and Bonding Equipment

.3 CAN/CSA B72, Installation Code for Lightning Protective Systems

.4 CAN/CSA T527, Grounding and Bonding for Telecommunications in Commercial Buildings

.5 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities

.6 IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems

.7 IEEE 837, Qualifying Permanent Connections Used in Substation Grounding

Part 2 Products

2.1 EQUIPMENT

.1 Grounding and bonding conductors shall be green insulated, unless noted otherwise, stranded copper, sized in accordance with the Canadian Electrical Code, minimum #12 AWG.

.2 When insulated conductors are installed in free air inside buildings, conductors shall be type RW-90, FT-4 rated.

.3 Grounding and bonding clamps shall be brass where attached to copper pipes. Clamps for other materials and applications shall be of a type and material that will minimize deterioration from galvanic action due to dissimilar metals.

.4 Use one or two hole copper compression lugs for grounding and bonding connections in equipment.

.5 Compression connectors, lugs, etc., used in outdoor locations, shall have bolts, nuts, etc., of silicon bronze alloy.

.6 Non-corroding accessories necessary for grounding and bonding systems, type, size, material as indicated, including but not limited to:

.1 Grounding and bonding bushings.

.2 Bolted type conductor connectors.

.3 Pressure type conductor connectors.

.4 Bonding jumpers, braided straps.

Part 3 Execution

3.1 INSTALLATION

.1 General (Applies to bonding and grounding)

.1 Install complete, permanent, continuous, system and power circuit, equipment, grounding and bonding systems including but not limited to, rod electrodes, conductors, connectors, bushings, accessories, as indicated, to conform to Canadian Electrical Code, applicable standards and requirements of local authority having jurisdiction.

.2 Conductors shall be continuous, without splices.

.1 Where splicing cannot be avoided (i.e. due to installation alleviation, unavailability of required conductor lengths, delivery issues, transportation issues, etc.), the Contractor must inform the Contract Administrator in writing and provide the reasons for splicing.

.2 Don’t proceed with splicing without written approval from Contract Administrator.

.3 If splicing is approved by Contract Administrator, provide only crimped (compression type) or cadwelded splicing.

.3 Protect exposed conductors from mechanical damage by rigid metal conduit, steel guards, or other suitable shields. Bond metal guards to ground.

.4 Where grounding or bonding conductors are installed in metal conduit or other metallic encasement, the conductors shall be permanently and effectively bonded to the conduit/encasement at both ends of its length. Use solderless lugs, grounding clamp or ground bushing at each end. This requirement applies to all such conduits/encasements regardless of length.

.5 Where conductors pass through fire rated floor, or wall, etc., provide rigid metal conduit of the required size. Connect each conduit end to the conductor with solderless lug, grounding clamp or grounding bushing.

.6 All surfaces to which conductors are to be bolted shall be cleaned of all paint and applied with rust preventing agent.

.7 Unless otherwise noted in specification, shown on drawings or required by equipment manufacturer, accessible connections may be Cadwelded, welded, brazed, bolted, or crimped.

.8 Connections between dissimilar metals such as between copper and steel, must be thoroughly sealed or painted against moisture to minimize corrosion.

.9 Connections to structural steel shall be Cadwelded.

.10 Soldered connections shall not be used.

.11 Install conductor connectors in accordance with manufacturer's instructions.

.12 Make connections in radial configuration only, with connections terminating at single point. Avoid loop connections.

.13 Provide labels at each end on grounded, transformer neutral grounding and bonding and grounding conductors inside equipment.

.2 Bonding to ground

.1 The bonding of the electrical equipment and systems shall conform to the requirements of the electrical code, referenced standards, the inspection authority having jurisdiction and as described in this specification and as shown on the drawings.

.2 The main metallic water and gas services to a building shall be bonded to ground.

.3 Install bonding conductor for flexible conduit, connected at both ends to conduit by using grounding bushing, solderless lug or grounding clamp.

.4 Install flexible bonding straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.5 In wet or damp areas and near tanks containing liquids, all equipment frames, tanks, boxes, outlets, etc., shall be bonded to ground.

.6 Bond single conductor, metallic armoured cables to ground at supply end, and provide non-metallic entry plate at load end.

.7 Conduit runs containing feeders and branch circuits shall be complete with an insulated green bonding conductor, bonded to all outlet boxes, junction boxes, pull boxes, equipment enclosures, equipment ground busses, etc. The conduit system shall be continuous but shall not be relied on to serve as the equipment bonding means.

.8 Bonding conductors shall be sized according to the Canadian Electrical Code, but shall be minimum #12 AWG.

.9 Conduit expansion joints and telescoping sections of metal raceways and cable trays not thoroughly bonded otherwise, shall be provided with approved bonding jumpers.

.3 Grounding

.1 The grounding of the electrical equipment and systems shall conform to the requirements of the electrical code, referenced standards, the inspection authority having jurisdiction and as described in this specification and as shown on the drawings.

3.2 BONDING EQUIPMENT ENCLOSURES TO GROUND

.1 Connect bonding conductors installed with feeders to non-current carrying parts of equipment included in, but not necessarily limited to following list: service equipment, switchgear, panelboards, transformers, frames of motors, motor control centres, starters, control panels, building steel Work, generators, elevator distributions, control panels, outdoor lighting, capacitor banks, harmonic filters, UPS’s, etc.

.2 Make bonding connections in radial configurations only.

.3 In rooms (new and existing), where equipment rated above 750 Volts is provided as part of this project, bond all metal non-current-carrying items to ground. This applies to equipment provided by other divisions. In existing rooms, also bond to ground all metal non-current-carrying items of existing equipment that wasn’t previously bonded to ground (before the installation of equipment rated above 750V).

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator, if provided, during tests.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size and thickness as required, surface mounted, suspended, or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel Work.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 05 - 34 Conduits, Conduit Fastenings and Conduit Fittings

1.2 SUBMITTALS

.1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 00 - Common Work Results - For Electrical.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 Cast type with gasketted covers where exposed to moisture or weather or where specified.

.4 Explosion proof in hazardous areas to suit the hazardous classification.

Part 3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.3 Install junction and pull boxes clear of all mechanical ductwork and piping.

.4 Support boxes, greater than 4-11/16 x 4-11/16 inches, with independent threaded rod from structure, independent from the conduit support system.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 26 05 34 - Conduits, Conduit Fastenings, and Conduit Fittings

1.2 REFERENCES

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

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

.6 Sectional boxes shall not be used without specific approval of the Contract Administrator.

.7 In finished areas switch, convenience receptacle, and blank cover plates shall be stainless steel. In finished area ceilings, junction and pull box covers shall be solid covers, painted to match the finish of the adjacent surface.

.8 Gasketted watertight or dust tight boxes and covers shall be provided.

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 where exposed to moisture.

2.3 MOULDED VAPOUR BARRIER BOXES

.1 Moulded box vapour barrier: factory moulded polyethylene box c/w flange for use with recessed electric switch and outlet boxes.

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

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

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

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

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come flush with finished surface.

.4 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

.5 Wires in outlet, junction and switch boxes, not having a connection within box shall not be spliced, but shall continue unbroken through the box.

.6 Maintain continuity of vapor barrier where boxes are installed in exterior walls and ceilings. Use air/vapor barrier boxes for outlets installed in walls or ceilings with a vapor barrier.

.7 Boxes to be mounted plumb and square with building lines.

.8 Where outlet boxes are shown on the drawings as being "back-to-back" shall have a minimum offset of 200 mm (8") between boxes to reduce sound transmission. In no case shall "thru-wall" boxes be used.

.9 Install pull boxes, or fittings, in conduit runs where more than four bends are necessary.

.10 Install pull boxes where run exceeds 23.0 (75 feet) in length.

.11 All junction, outlets and pull boxes shall be so installed that they are always readily accessible.

.12 No power driven pins (Ramset) shall be utilized to secure boxes without specific approval from Contract Administrator.

.13 Check opening provided for each recessed outlet box and if it is not completely covered by cover plate, report discrepancy to the division responsible and ensure that it is rectified.

.14 All concealed junction boxes, conduit fittings, etc. to be c/w galv. steel covers, secured with two bolts.

.15 Apply acoustic sealant to seal wires penetrating moulded vapour barrier boxes.

.16 For installations in moist areas, meet all requirements of authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA C22.2 No. 45, Rigid Metal Conduit.
- .2 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .4 CAN/CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.4 Flexible metal conduit: to CSA C22.2 No. 56, and liquid tight flexible metal conduit.

.5 Minimum size of conduit shall be 19mm.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel Work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods to support suspended channels, sized for the load.

2.3 CONDUIT FITTINGS

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

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Steel set screw connectors and couplings. Insulated throat liners on connectors.

.4 Raintight connectors and fittings c/w O-rings for use on weatherproof or sprinklerproof enclosures.

.5 Raintight couplings to be used for conduit installations exposed to moisture or sprinkler heads.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene with 3M spare length at each conduit end.

Part 3 Execution

3.1 INSTALLATION

.1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

.2 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.

.3 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.4 Conceal conduits except in mechanical and electrical service rooms.

.5 Use electrical metallic tubing (EMT) except where specified otherwise.

.6 Use flexible metal conduit for connection to motors, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures, transformers and equipment subject to vibration or movement. Provide a separate insulated grounding conductor within flexible conduit.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.8 Minimum conduit size: 19 mm.

.9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.10 Mechanically bend steel conduit over 19 mm dia.

.11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.12 Install fish cord in empty conduits.

.13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.14 Dry conduits out before installing wire.

.15 The conduit sizes as shown or indicated are the minimum acceptable and shall not be reduced without the approval of the Contract Administrator.

.16 Conduit to be sized as per Canadian Electrical Code or as shown on drawings and specifications. 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.

.17 Running threads will not be permitted; proper couplings shall be used.

.18 Not less than 900mm (3'-0") of flexible conduit (and of sufficient length to allow the lighting fixture to be relocated to any location within a 6 ft. (1.8m) radius) shall be used for the connection of recessed lighting fixtures. A separate drop to be used for each fixture unless fixtures are mounted in continuous rows.

.19 Liquid tight flexible conduit runs shall not exceed 1.5m.

.20 All conduit runs passing across expansion joints of the building shall be installed utilizing approved expansion fittings, and bonding devices.

.21 Refer to 26 05 00 for identification requirements.

.22 No power driven pins (Ramset) shall be utilized to secure any portion of the conduit.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Provide a coordination/protective study, short circuit, and arc flash study of all equipment specified herein and submit for review.

.2 Include the following:

- .1 600 V cable thermal damage curves.
- .2 600V air circuit breaker overcurrent, overload, ground fault devices, and zone interlocking.
- .3 120/208V circuit breakers in Panels ‘X’ and “Y”
- .4 347/600 and 120/208V panelboards, MCCs, and switchgear, and connecting feeder cables.
- .5 600V transformer damage curves, magnetizing currents for all transformers 150 kVA and larger.
- .6 Locked rotor currents, acceleration times and damage curves for motors 75 kW and larger.
- .7 Any additional data necessary for successful completion of the coordination and short circuit study.

.3 Data shall clearly state the operating time in cycles of each breaker and indicate whether the time current curves for relays are inclusive of breaker trippings time or otherwise.

.4 Prepare a summation chart showing all ratings and settings with easy reference to the appropriate curve.

.5 Symmetrical and asymmetrical fault current calculations shall be submitted to verify the correct choice of the protective elements of the system.

.6 Prepare a systems single line diagram on which the resultant short circuit values, device numbers and equipment ratings are shown.

.7 Include a list of recommended settings for each relay.

1.2 QUALIFICATIONS

.1 This study shall be provided by the supplier of the main switchboard.

.2 This study shall be performed by and bear the stamp of a Professional Engineer registered in the Province of Manitoba.

1.3 SUBMITTALS

.1 Submit the complete study for review prior to carrying out calibration and verification.

.2 Submit typed results of coordination and short circuit study in maintenance manuals.

Part 2 Products

2.1 TRIPPING DEVICES

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

Part 3 Execution

3.1 DATA

.1 Provide the main switchboard supplier with all relevant data for equipment not provided by that supplier.

.2 Provide Arc Flash Hazard Level labels for all new electrical equipment.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

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

.2 Section 26 43 13 – Surge Protective Devices.

.3 Section 26 28 21 – Moulded Case Circuit Breakers.

1.2 REFERENCES

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 ASTM - American Society of Testing Materials

.3 CAN/CSA – C22.2, No. 31 – Switchgear Assemblies

.4 CSA C22.2No.0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding).

.5 CSA Standard C22.2 No. 29 - Panelboards and Enclosed Panelboards

.6 CSA Standard C22.2 No. 5 - Molded Case Circuit Breakers

.7 NEMA AB 1 - Molded Case Circuit Breakers

.8 NEMA PB 1 - Panelboards

.9 NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.3 SUBMITTALS

.1 Submit shop drawings and product data.

.2 Indicate on shop drawings:

- .1 Power ratings.
- .2 Enclosure type.
- .3 Single line diagrams.
- .4 Breaker sizes, and kA ratings.
- .5 Trip unit models and sizes.
- .6 Trip unit range of each adjustable setting.
- .7 Bus kA rating (bracing).
- .8 System kA rating.
- .9 Customer meter model.
- .10 Floor or wall anchoring method and foundation template.
- .11 Dimensioned cable entry and exit locations.
- .12 Dimensioned position and size of bus.
- .13 Overall length, height and depth of complete distribution.
- .14 Dimensioned layout of internal and front panel mounted components.
- .15 Weight of each section.
- .16 Key interlock scheme drawing and sequence of operations (where applicable).

.17 Anti-condensation heater and thermostat models and locations (where applicable).

.3 Include time-current characteristic curves for breakers as required for the coordination study.

1.4 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into maintenance manuals.

1.5 STORAGE

.1 Store distribution on site in protected dry location. Cover with plastic to keep off dust.

1.6 APPROVED MANUFACTURERS

.1 Eaton, Schneider and Siemens.

.2 The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Contract Administrator ten (10) days prior to bid date.

Part 2 Products

2.1 RATING

.1 Distribution shall be totally enclosed, dead front fabricated from formed and welded #12 gauge steel and front accessible only. Verify with plans for maximum overall dimensions. The distribution shall be CDP type.

.2 Distribution shall have door in door design. The distribution trim shall be hinged to the tub to allow full access to all buswork, wireways, breakers, etc. in the interior of the distribution. Bolted trim is not acceptable. A separate door in the trim shall allow access to the front of the breakers. Door over breakers to have lock. All locks to be keyed alike.

.3 Main circuit breaker or switch, where indicated on the drawings, shall be molded case type of size and type as shown on the drawings. Circuit breaker or switch shall have the continuous ampere rating engraved into operating handle such that rating is clearly visible after installation of panel cover.

.4 Provide a pad lockable provision for main breaker or switch. Breaker or switch is to be lockable in either the open or closed position. The locking device is to be attached to the breaker or switch.

.5 Feeder circuit breakers shall be moulded case of sizes and types as shown on the drawings. Each circuit breaker shall have the continuous ampere rating engraved into breaker handle such that rating is clearly visible after installation of panel cover.

.6 All breakers to be CDP type breakers using CDP type connector mounting hardware. Smaller frame breakers that require additional mounting means, additional panelboard interiors, etc. will not be allowed.

.7 Breakers with 400A frames and smaller shall utilize twin breaker hardware mounting kits. Breakers shall be mounted double wide to save space.

.8 All current carrying components such as buswork, interconnecting components, etc. shall be tin plated copper. No aluminum components are allowed.

.9 If wire size exceeds the breaker terminal wire range, use compression wire reducer to terminate feeder onto breaker terminal.

.10 Bus bars shall extend the full length of each section. Neutral bus shall be full capacity. Copper ground bus shall be continuous and extend through main breakers or switch section and each feeder breaker section.

.11 Where installed outside, provide anticondensing heaters, fed from internal bus through suitably sized breakers, for distributions installed outdoors.

.12 Distribution enclosure shall be treated to inhibit rusting and painted with a primer and two (2) coats of ASA61 grey enamel.

.13 Enclosure shall be corrosion resistant.

.14 All breakers shall have individual lamacoid nameplates securely fastened with rivets on panel cover adjacent to respective breaker.

.15 Interrupting capacity of main breaker or switch and feeder circuit breakers shall be RMS symmetrical at applied voltage and as follows:

.1 Up to 250V bus and breakers interrupting capacity (RMS Symmetrical) as shown on drawings, 10 ka minimum when not shown.

.16 All devices must be fully rated, unless noted otherwise.

.17 Double tub distributions are to be sub-feed type.

.18 Distribution to have full height vertical bus.

.19 Distribution shall have a metal frame welded to the inside of panel door, as large as possible but minimum (220 x 280mm) (9" x 11"), and shall be c/w typewritten index card and protective transparent cover. On shop drawings, indicate proposed size of metal frame.

.20 Distribution is to contain surge protective devices (SPD's). SPD's are to be bus connected. SPD's to meet requirements of 26 43 13 – Surge Protective Devices (SPD's).

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification per Section 26 05 00.

Part 3 Execution

3.1 INSTALLATION

.1 Locate distribution as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Distribution shall be mounted on wall.

.3 Connect breakers in distribution to feeders.

.4 Connect control and communication wiring.

.5 Check factory made connections for mechanical security and electrical continuity.

.6 Program all trip units per coordination study.

.7 Test all breakers after trip units are programmed.

.8 Provide test report to Contract Administrator for review.

.9 Incorporate test report in maintenance manuals.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

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

.2 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.3 Up to 250V branch circuit panelboards: bus and breakers interrupting capacity (RMS Symmetrical) as shown on drawings, 10 ka minimum when not shown.

.4 All devices must be fully rated, unless noted otherwise.

.5 Sequence phase bussing such that circuit breakers will be numbered in consecutive order, with each breaker identified by permanent number identification as to circuit number and phase.

.6 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.7 Provide panel covers for all panelboards and supply two keys for each panelboard and key panelboards alike.

.8 Plated copper bus with neutral of same ampere rating as mains.

.9 Mains: suitable for bolt-on 25mm wide breakers.

.10 Trim and door finish: baked grey enamel.

.11 Enclosure shall be corrosion resistant.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to The City.

.5 Lock-on devices for receptacles, fire alarm, emergency, door supervisory, intercom, stairway, exit, night light circuits and similar circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 MANUFACTURERS

.1 Acceptable Manufacturers: Eaton, Schneider, Square D and Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - For Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect branch circuit neutral conductors to common neutral bus. Common neutrals shall be shared by vertically adjacent breakers except for GFI protected branch circuits and dimmer circuits which shall not share neutrals with other circuits. Neutral conductors shall be identified with mylar/cloth wire markers showing the circuit numbers of the circuits sharing the neutral.

.6 Trims of recessed panelboards to be flush with wall. Coordinate installation with wall installer to ensure that walls with recessed equipment will be deep enough to accept the equipment.

.7 Finish parking lot panel enclosures to match site lighting poles.

.8 Wiring in panelboards shall be neat and set in as if laced. All neutral conductors shall be identified in the panel with their associated circuit numbers by means of Brady Markers.

.9 All panelboards throughout the building shall be phased together such that the left-hand, centre and right-hand panelboard busses represent phases A, B and C respectively. All indicating meters shall be identified to this sequence.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 05 21 - Wires and Cables.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.4 Section 26 28 23 - Disconnect Switches - Non-Fused

.5 Section 26 29 10 - Motor Starters to 600V.

1.2 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association (CSA)

.1 CSA C22.2No.0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding).

1.3 SYSTEM DESCRIPTION

.1 Provide complete electrical power and control connections for mechanical equipment, except as noted herein.

1.4 COORDINATION

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

Part 2 Products

2.1 MATERIALS

.1 Include motor starters, disconnects, conduit, wire, fittings, interlocks, outlet boxes, junction boxes, and all associated equipment required to provide power wiring for mechanical equipment, unless otherwise indicated.

.2 Include motor protective switches, interlocks, conduit, wire, devices and fittings required to provide control wiring for mechanical equipment except for temperature/humidity control systems.

Part 3 Execution

3.1 POWER WIRING

.1 Install power feeders, starters, disconnects and associated equipment and make connections to all mechanical equipment.

.2 Install branch circuit wiring to all mechanical equipment.

3.2 CONTROLS

.1 Install all controls wiring noted herein.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

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

.2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

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

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 - Common Work Results - For Electrical.

Part 2 Products

2.1 SWITCHES

.1 Toggle operated general purpose AC Switches 15A and 20A 120Vac 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 toggle for normal power; red toggle for emergency power.
- .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
Hubbell	1200 Series
Bryant	4800 Series

Leviton	1200 Series
Pass & Seymour	AG-1 Series

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 Vac, 15 A, U ground, with following features:

.1 Nylon face, brown or ivory for normal power, red for emergency power.

.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 rivetted grounding contacts.

.2 Receptacles of one manufacturer throughout project.

.3 Acceptable manufacturers: Hubbell, Arrow Hart, Bryant, Pass & Seymour, Slater. Catalogue No. 5262 for all manufacturers.

2.3 COVER PLATES

.1 Cover plates from one manufacturer throughout project.

.2 Stainless steel cover plates for wiring devices mounted in flush-mounted outlet boxes to be minimum plate thickness of 1.0mm.

.3 Cast gasketted cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height specified in Section 26 05 00 or as indicated.

.4 Switches shall be mounted 1.4m (4'-6") above finished floor on the strike side of the door.

.2 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 00 or as indicated.

.3 Horizontally mounted receptacles shall have the hot line terminal on the bottom.

.4 Where switch and convenience outlets are shown close to one another, mount receptacles below and in line with the switch.

.5 Where finished construction of walls consist of a symmetrical pattern of wood or other panels, install and locate receptacles and switches as directed to suit the pattern.

.6 Suitably ground all receptacles with #12 green insulated wire to outlet box. Provide additional separate ground conductor to isolated ground receptacles.

.3 Coverplates:

.1 Install suitable common cover plates where wiring devices are ganged.

.2 Do not use cover plates intended for flush outlet boxes on surface-mounted boxes.

.3 Provide a coverplate on each outlet.

3.2 IDENTIFICATION

.1 Identify receptacles with size 1 nameplate indicating panel and circuit number. Nameplates to be mechanically fastened. Refer to Section 26 05 00.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

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

.2 Section 26 24 16 - CDP Type Distribution (Up To 1200 A).

.3 Section 26 24 17 - Panelboards Breaker Type.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS

.1 Submit product data & shop drawings in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Include time-current characteristic curves for breakers.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings of breakers with adjustable trips to range from 5-10 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 All devices must be fully rated, unless otherwise noted.

.7 Interrupting ratings (RMS symmetrical) to match bus interrupting ratings shown on drawings.

.8 When interrupting ratings are not shown on drawings shall be as follows:
.1 Up to 250 Volts - 10,000 Amps

.9 Maximum breaker sizes, except for motors:

.1 20A for #12 copper conductor.

.2 30A for #10 copper conductor.

2.2 THERMAL MAGNETIC BREAKERS DESIGN

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

2.3 MAGNETIC BREAKERS DESIGN

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 ARC FAULT CIRCUIT INTERRUPTERS (AFCI)

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

.2 Integrated processor which trips the breaker upon recognized unique current and/or voltage signatures associated with arcing faults. MANUFACTURERS

.3 Acceptable manufacturers: Eaton, Schneider, Square D, Siemens.

2.5 REQUIRED FEATURES

.1 Include:

.1 On-off locking device.

.2 Handle mechanism.

.3 Handle accessories.

.1 Circuit breaker handle accessories shall provide provisions for locking handle in the on and off position.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

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

1.2 SUBMITTALS

.1 Submit product data in accordance with Section 26 05 00 - Common Work Results - For Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4, Enclosed Switches.

.2 CSA C22.2 No.39, Fuseholder Assemblies.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Non-fusible disconnect switch in CSA Enclosure and size as indicated.

.2 Enclosure shall be corrosion resistant.

.3 Metal enclosure with provision for padlocking in on-off switch position by three locks.

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

.5 Quick-make, quick-break action, heavy duty industrial grade.

.6 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Result - For Electrical.

.2 Indicate name of load controlled and voltage on size 6 nameplate.

2.3 APPROVED MANUFACTURERS

.1 Schneider Electric.

.2 Eaton.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches as indicated.

.2 Install additional brackets, supports, etc. required for mounting the disconnect switches.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 24 31 - Mechanical Equipment Connections.

1.2 SUBMITTAL

.1 Submit shop drawings in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Indicate:

.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Enclosure types and colour.
.5 Wiring diagram for each type of starter.
.6 Interconnection diagrams.
.7 Indicate quantities and respective load. Load name to match load name on drawings (i.e. starter for Pump P-3).

1.3 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide listed spare parts for each different size and type of starter:

.1 3 contacts, stationary.
.2 3 contacts, movable.
.3 1 contacts, auxiliary.
.4 1 control transformers.
.5 1 operating coil.
.6 2 fuses.
.7 10% indicating lamp bulbs used.
.8 1 HOA kit.

Part 2 Products

2.1 MATERIALS

.1 Starters: EEMAC E14-1.

.1 Half size starters not acceptable.
.2 Provide NEMA rated starters only; IEC rated starters are not acceptable.

2.2 MANUAL MOTOR STARTERS

.1 Single and Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 Overload heaters, manual reset, trip indicating handle.

.2 Accessories:

.1 Toggle switch: heavy duty labelled as indicated.

.2 Indicating light: heavy duty type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

.4 Flush mounted in public areas, finished areas or as indicated.

.3 Enclosure shall be corrosion resistant.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fused disconnect switch or circuit breakers with operating lever on outside of enclosure to control disconnect or circuit breaker, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Pushbuttons and selector switches: heavy duty labelled as indicated.

.2 Indicating lights: heavy duty oil tight type and colour as indicated.

.3 2-N/O and 2-N/C spare auxiliary contacts.

.4 HOA selector switch.

.4 Enclosure shall be corrosion resistant.

2.4 AUTO RESTART (POWER ON) TIME DELAY RELAY

.1 Provide time delay relay inside motor starter, for motors 3 horsepower and larger, to sequence restarting of motors in order to ensure staggered restart of multiple motors upon return of voltage after voltage loss condition.

.1 Relay to be adjustable, 0-500 seconds.

.2 Adjust relay so the largest motor starts first, second largest to start next and so on.

.3 Provide minimum 10 seconds delay between motor startups.

2.5 FINISHES

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

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 Manual starter designation label, size 1, engraved as indicated.

.3 Magnetic starter designation label, size 4 engraved as indicated.

2.7 MANUFACTURERS

.1 Acceptable manufacturers: Allen Bradley Canada Ltd.; Eaton Canada Ltd.; "System 89" Siemens Electric Limited; Square D.

.2 All manufacturers shall provide their industrial quality product line; commercial quality starters are not acceptable.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - For Electrical and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.5 Ensure motor rotation corresponds with the direction required by the driven equipment.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 24 16 – CDP Type Distribution (Up to 1200A)

.2 Section 26 24 17 – Panelboards Breaker Type

1.2 REFERENCES

.1 SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 - Common Work Results - For Electrical.

.2 The following information shall be submitted to the Contract Administrator:

.1 Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).

.2 For sidemount mounting applications (SPD mounted external to electrical assembly), electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.

.3 Where applicable the following additional information shall be submitted:

.1 Descriptive bulletins

.2 Product sheets

1.4 SCOPE

.1 The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the Contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers. Refer to related sections for surge requirements in:

1.5 QUALIFICATIONS

.1 The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

.2 For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

.3 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Contract Administrator, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

.4 The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.7 OPERATION AND MAINTENANCE MANUALS

.1 Operation and maintenance manuals shall be provided with each SPD shipped.

Part 2 PRODUCTS

2.1 VOLTAGE SURGE SUPPRESSION – GENERAL

.1 Electrical Requirements

.1 Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.

.2 Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.

.3 The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.

.4 Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

.5 Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.

.6 ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

MODES	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

.2 SPD Design

.1 Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

.2 Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

.3 Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.

.4 Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

.5 Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

.1 Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.

.1 For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.

.2 For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

.3 The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual

status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

.2 Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

.3 Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

.4 Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

.1 The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

.6 Overcurrent Protection

.1 The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

.7 Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

.8 Safety Requirements

.1 The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

.2 SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

.3 Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit.

2.2 SYSTEM APPLICATION

.1 The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

.2 Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
CATEGORY	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

.3 SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.3 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

.1 The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

.1 The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.

.2 SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.

.3 The panelboard shall be capable of re-energizing upon removal of the SPD.

.4 The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.

.5 The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.

.6 The SPD shall be of the same manufacturer as the panelboard.

.7 The complete panelboard including the SPD shall be UL67 listed.

.2 Sidemount Mounting Applications Installation (SPD mounted external to electrical assembly)

.1 Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.

.3 Switchgear, Switchboard, MCC and Busway Requirements

.1 The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.

.2 The SPD shall be of the same manufacturer as the switchgear, switchboard, MCC, and busway

.3 The SPD shall be factory installed inside the switchgear, switchboard, MCC, and/or bus plug at the assembly point by the original equipment manufacturer

.4 Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

.5 The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.

.6 The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.

.7 All monitoring and diagnostic features shall be visible from the front of the equipment.

2.4 ACCEPTABLE MANUFACTURERS

.1 Acceptable Manufacturers: Schneider, Siemens, Eaton.

Part 3 Execution

3.1 FACTORY TESTING

.1 Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.2 INSTALLATION

.1 The Contractor shall install all equipment per the manufacturer's recommendations and the Contract drawings.

3.3 WARRANTY

.1 The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION

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MARGARET GRANT POOL
ELECTRICAL DISTRIBUTION
UPGRADE

WINNIPEG MB

SHOP DRAWING COMPLIANCE LIST
SAMPLE

Drawn By	Approved By	Reference
EBB	SB	0
File No.	Date	Detail Sheet
17-187-01	JULY 2017	ED-DT100

(Space for system manufacturer's name)

SHOP DRAWING REVIEW

DETAILED PLC COMPLIANCE LIST

EACH COMPONENT SHALL BE INDIVIDUALLY MARKED

.3 The controller system shall be of a modular design with a plug-in processing unit, Input/Output frames or assemblies, and plug-in peripherals. All plug-in components of the controller system shall have the same physical mounting dimensions, and shall have provision for both mounting in a rack on a wall or panel. Wherever possible, all assemblies and sub-assemblies performing similar functions in separate controllers purchased under this specification shall be interchangeable. All necessary interconnecting cables shall be included.

.3 Yes, plug into rack, and are the same size.

Modules cannot be mounted separately on a wall or panel.

Does not apply, only one plc supplied.

.4 All major assemblies, sub-assemblies, circuit cards, and end devices shall be permanently marked with the manufacturers part of identification number.

.4 As per quote all internal interconnecting cables supplies. Details will be supplied to contractor for external communication cables to programming terminal etc. Contractor to supply and install cable.

.5 All components of the controller system shall be capable of continuous operation at temperatures of 10 to 40°C and humidity levels of 10 – 95%.

.5 Yes, the controller will operate within this temperature range.

.6 Electrical supply voltage to the controller shall be 24V DC. Controller system power supplies shall have circuit breakers for overload protection.

.6 Yes

.7 All programming and monitoring equipment (e.g. CRT programming panel, graphic annunciator) shall be able to be connected or disconnected with the controller in operation.

.7 Yes

.8 The controller, including output devices, shall shut down and alarm in an orderly fashion in the event of: a disruption of program execution or scan, a loss of logic power, loss of communication between controller essential devices, or a memory error. Shut down shall be "fail safe" and shall allow the balance of the system to operate in the manual mode. Unless otherwise noted, all output contacts shall return to a normally open (NO) state upon controller shut down.

.8 Yes

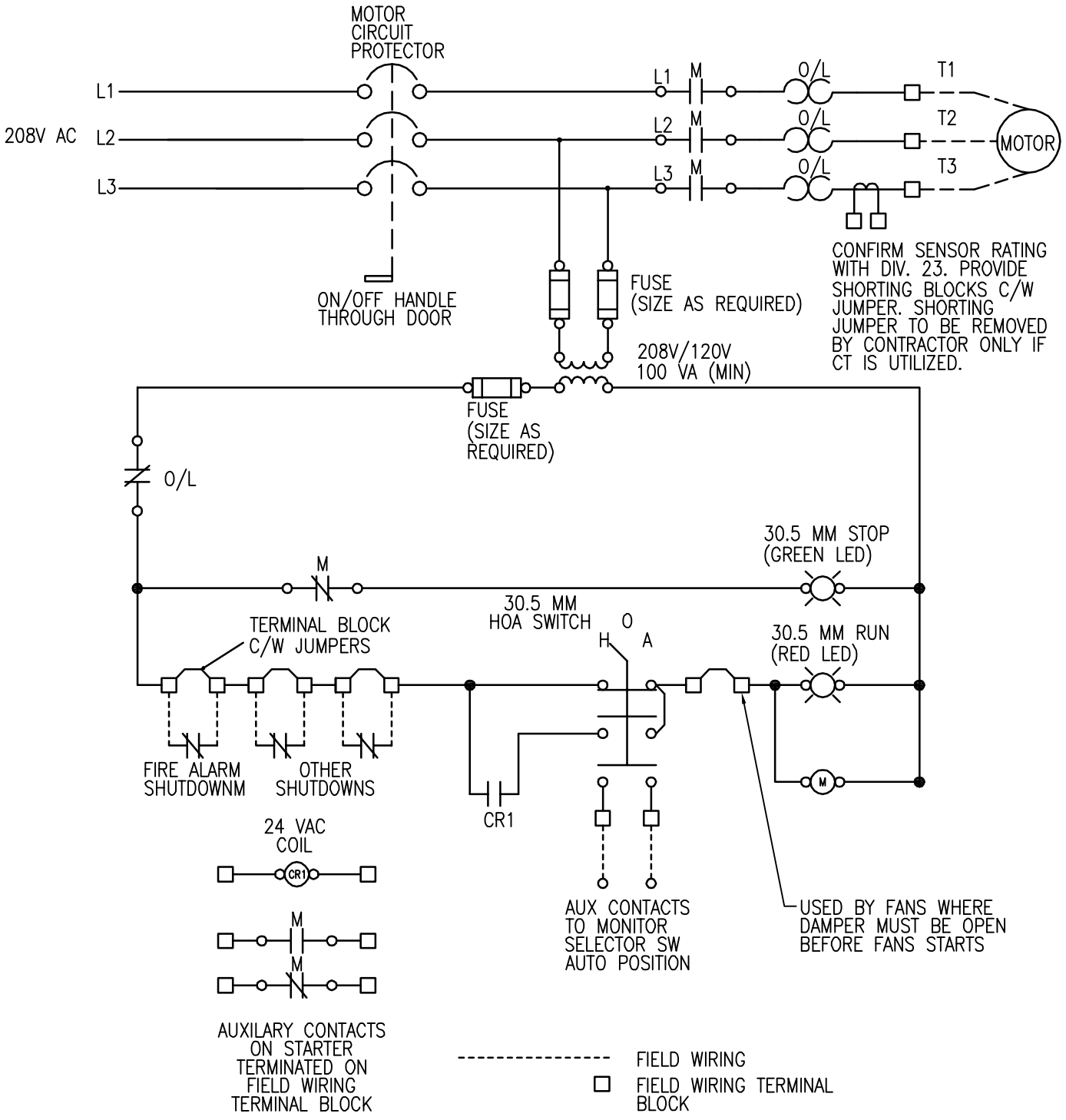
.7 Central Processing Unit (CPU):

.1 The CPU shall be a completely solid state device consisting of a mounting rack c/w plug-in power supply, control and memory modules as further described.

.7.1 Yes

.2 The mounting rack shall be standard 19" width with sufficient space to mount all necessary power supplies and modules. The mounting rack shall contain a system backplane which includes all necessary power and data connections to allow any modules to be plugged in and operate without any additional connecting cables.

.2 Yes, with the exception of an internal ribbon cable which connects the artithmatic control modules to the logic control module.



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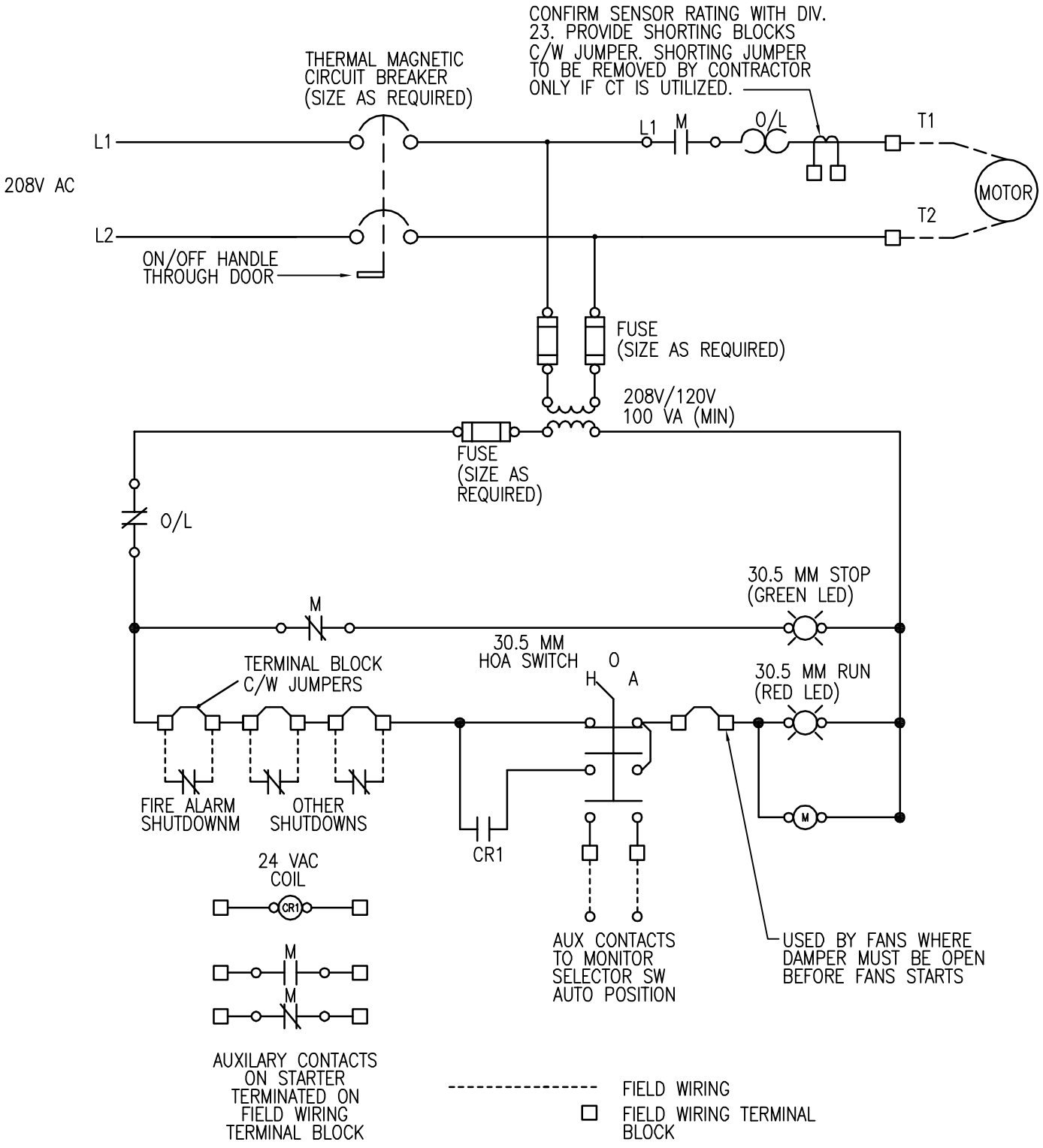
WINNIPEG MB

TYPICAL 208V, 3 PHASE COMBINATION MAGNETIC STARTER WIRING

Drawn By	Approved By	Reference
EBB	SB	–
File No.	Date	Detail Sheet
17–187–01	JULY 2017	ED–DT200



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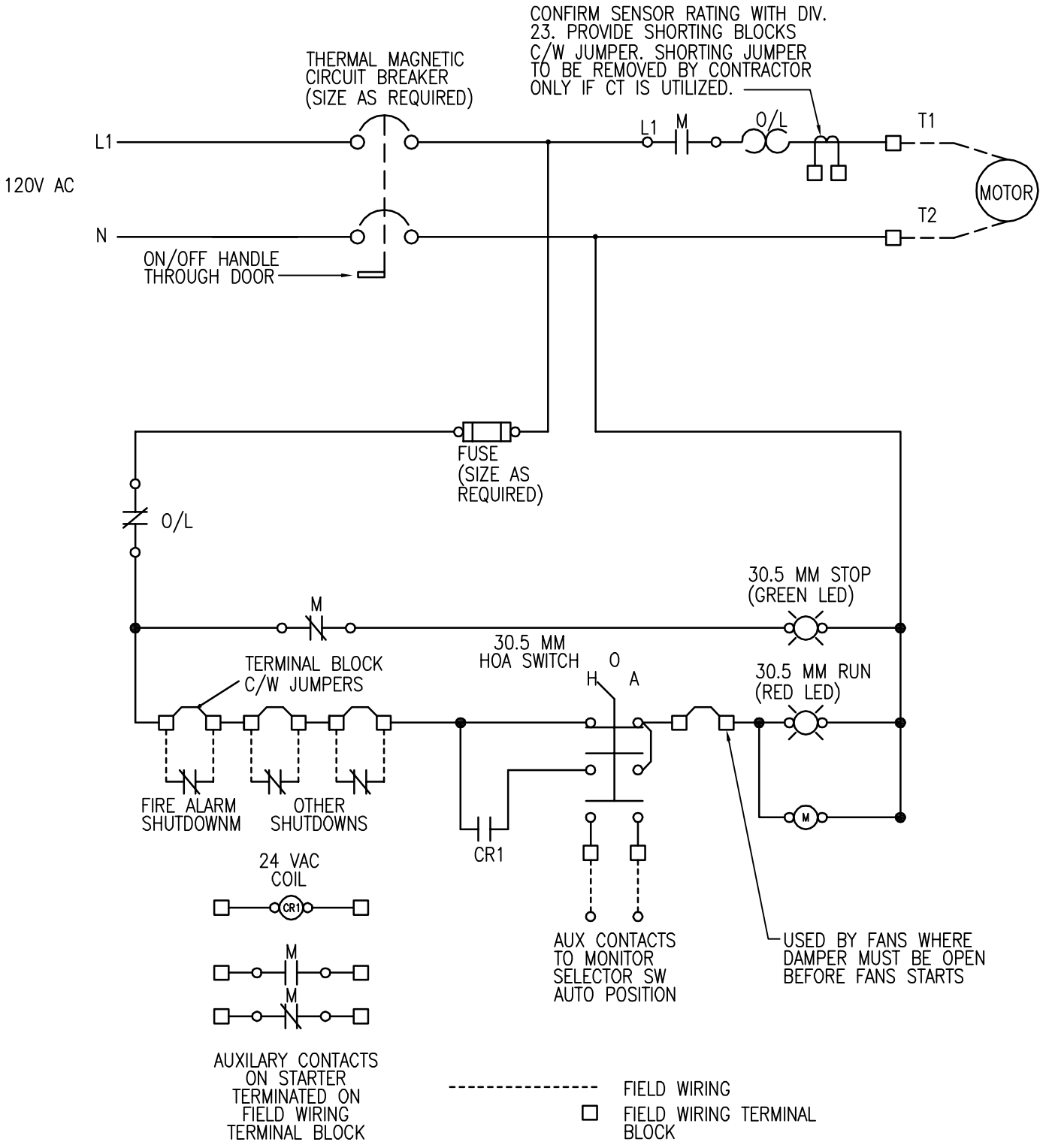
WINNIPEG MB

TYPICAL 208V, SINGLE PHASE COMBINATION MAGNETIC STARTER WIRING

Drawn By	Approved By	Reference
EBB	SB	–
File No.	Date	Detail Sheet
17–187–01	JULY 2017	ED–DT300



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MARGARET GRANT POOL ELECTRICAL DISTRIBUTION UPGRADE

WINNIPEG MB

TYPICAL 120V, SINGLE PHASE COMBINATION MAGNETIC STARTER WIRING

Drawn By	Approved By	Reference
EBB	SB	–
File No.	Date	Detail Sheet
17–187–01	JULY 2017	ED–DT400

S1 - LUMINAIRE SCHEDULE

FIXT. TYPE	LAMPS	VOLTAGE PHASE	DESCRIPTION	NOTES	APPROVED MANUFACTURERS
MG	2 F54 T5HO	120V 1ø	2L FIBERGLASS REINFORCED POLYESTER HOUSING C/W GASKETTED ACRYLIC LENS WITH ELECTRONIC BALLAST RATED FOR WET LOCATIONS C/W CAM ACTION LATCHES		LITHONIA: DMW254T5HO METALUX: VT2-254T5HO-DR-WL DAYBRITE: V2WPB254T5HO-EB10R

S2 - MOTOR SCHEDULE

MOTOR No.	NAME	LOCATION	H.P. (kW)	VOLTS	STARTER & ACC.				CIRCUIT	STARTER LOCATION	FEEDER	TIME DELAY RELAY	REMARKS
					MAN	MAG	PL	HOA					
F-1	OFFICE RETURN AIR FAN	BOILER ROOM 126 (CEILING)	3H.P.	208V 3Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	3#12	✓	
F-2	OFFICE SUPPLY AIR FAN	BOILER ROOM 126	3H.P.	208V 3Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	3#12	✓	PROVIDE 30A-3P NON-FUSEIBLE DISCONNECT SWITCH AT MOTOR
F-3	POOL SUPPLY FAN	BOILER ROOM 126	3H.P.	208V 3Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	3#12	✓	PROVIDE 30A-3P NON-FUSEIBLE DISCONNECT SWITCH AT MOTOR
F-4	WASHROOM EXHAUST FAN	BOILER ROOM 126	2.8A (FLA)	208V 3Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	3#12		
F-5	POOL EXHAUST FAN	AT POOL (CEILING)	3H.P.	208V 3Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	3#10	✓	PROVIDE 30A-3P NON-FUSEIBLE DISCONNECT SWITCH AT MOTOR
P-1	MAIN POOL PUMP	BOILER ROOM 126 NORTH-EAST	10H.P.	208V 3Ø		✓	✓	✓	CDP-1	BOILER ROOM 126	3#6	✓	PROVIDE 30A-3P NON-FUSEIBLE DISCONNECT SWITCH AT MOTOR
P-2	PUMP	BOILER ROOM 126 NORTH-EAST	10H.P.	208V 3Ø		✓	✓	✓	CDP-1	BOILER ROOM 126	3#6	✓	EXISTING BALDOR PUMP. PROVIDE 30A-3P NON-FUSEIBLE DISCONNECT SWITCH MOTOR
P-3	DOMESTIC HOT WATER TANK PUMP	BOILER ROOM 126 NORTH WALL	180W	120V 1Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	2#12	✓	SMALL RED COLOR PUMP
P-4	PUMP	BOILER ROOM 126 NORTH WALL	2.1A (FLA)	120V 1Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	2#12		SMALL BRONZE COLOR PUMP EXISTING BELL & GOSSETT PUMP FORMER P-2 RENAME TO P-4
P-5	SUMP PUMP	CRAWLSPACE	3/4H.P.	120V 1Ø					PANEL C	BOILER ROOM 126	2#10		RECEPTACLE
P-6	CONVERTOR PUMP	BOILER ROOM 126 NORTH WALL (CEILING)	FRAC	120V 1Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	2#12		
P-7	DOMESTIC HOT WATER RECIRCULATION PUMP	BOILER ROOM 126 (CEILING)	1.4A (FLA)	120V 1Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	2#12		PUMP ON CEILING
P-8	GLYCOL CIRCULATION PUMP	BOILER ROOM 126 (CEILING)	2.7A (FLA)	120V 1Ø		✓	✓	✓	PANEL C	BOILER ROOM 126	2#12		PUMP ON CEILING

Project: Margaret Grant Pool
Job Number: 17-187-01
8/10/2017 11:32 AM

S2 - MOTOR SCHEDULE

MOTOR No.	NAME	LOCATION	H.P. (kW)	VOLTS	STARTER & ACC.				CIRCUIT	STARTER LOCATION	FEEDER	TIME DELAY RELAY	REMARKS
					MAN	MAG	PL	HOA					
P-9	DEEP END SUMP PUMP	CRAWLSPACE	3/4H.P.	120V 1Ø					PANEL C	BOILER ROOM 126	2#10		RECEPTACLE
24VDC	24V/6.5A DC POWER SUPPLY	BOILER ROOM 126	156W	120V 1Ø					PANEL C	BOILER ROOM 126	2#12		
UH-2	UNIT HEATER	BOILER ROOM 126	1/6H.P.	120V 1Ø	✓				PANEL EE	BOILER ROOM 126	2#12		
UH-3	UNIT HEATER	BOILER ROOM 126	1/6H.P.	120V 1Ø	✓				PANEL EE	BOILER ROOM 126	2#12		
ETS CONTROLS		BOILER ROOM 126	18FLA	208V 1Ø					PANELC	BOILER ROOM 126	2#10		
PEUMATIC TUBE CONTROL		BOILER ROOM 126	200W	120V 1Ø					PANELC	BOILER ROOM 126	2#12		
TEMP CONTROLS AT TANK		BOILER ROOM 126	200W	120V 1Ø					PANELC	BOILER ROOM 126	2#12		

NOTES:
1. PROVIDE BONDING CABLE ON ALL FEEDERS.
2. CONFIRM MOTOR AND WIRE SIZES PRIOR TO START OF WORK. SUBMIT REVISED MOTOR SCHEDULE WITH ACTUAL MOTOR SIZES TO CONTRACT ADMINISTRATOR FOR REVIEW. SUBMIT TOGETHER WITH MOTOR STARTER SHOP DRAWINGS

PANEL: **PANEL C (PART 1)** LOCATION: BOILER 126
FED FROM: CDP-1 LOCATION: BOILER 126

Designation	Load (VA)	Ckt. Trip	bkr. No.	Phase	Ckt. No.	bkr. Trip	Load (VA)	Designation
			1	A	22			
PANEL EE		50				20		F-3
		3P	2	B	23	3P		POOL SUPPLY FAN
			3	C	24			
HEATER AND RECEPTACLE IN CHLORINE ROOM		15	4	A	25			
RECEPTACLE NORTH WALL 2R		15	5	B	26	20 3P		F-5 POOL RETURN FAN
P-9 DEEP END SUMP PUMP RECEPTACLE		15	6	C	27			
RTU		15	7	A	28	20		EXTERIOR LIGHTS
		2P	8	B	29	15		P-8 GYLCOL CIRC. PUMP
SOUTH CRAWLSPACE LIGHTS		15	9	C	30	15		EXTERIOR LIGHTS
JOHNSON CONTROL PANEL		15	10	A	31	15		SPARE
BECSYS-3 - RECEPTACLE NORTH WALL 2R		15	11	B	32	15		SPARE
RECEPTACLE NEAR CDP-1 1R		15	12	C	33	15		DEEP END SOLENOID
P-7 HOT WATER PUMP		15	13	A	34			
NORTH CRAWLSPACE LIGHTS		15	14	B	35	20 3P		F-2 OFFICE SUPPLY AIR FAN
P-5 SUMP PUMP		15	15	C	36			
SPARE		15	16	A	37			
SPARE		15	17	B	38	15 3P		F-4 WASHROOM EXHAUST FAN
SPARE		15	18	C	39			
			19	A	40			
F-1 OFFICE RETURN AIR FAN		20 3P	20	B	41	15 3P		DUCT HEATER #1
			21	C	42			

VOLTAGE: **120/208V,3Ø,4W** LOADS - PH.A 0
CAPACITY: 225A PH.B 0
MOUNTING: SURFACE PH.C 0
REMARKS: TOTAL **0** NOT INCLUDING PART 2

CONFIRM EXISTING LOADS AND WIRE SIZES PRIOR TO START OF WORK. SUBMIT REVISED PANEL SCHEDULE TO CONTRACT ADMINISTRATOR FOR REVIEW WITH MOTOR STARTER SHOP DRAWINGS

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S3-PANEL SCHEDULE PANEL C (PART 1)

PROJECT: MARGARET GRANT POOL
FILE: 17-187-01
DATE: 10-Aug-17

PANEL: **PANEL C (PART 2)** LOCATION: BOILER 126
FED FROM: CDP-1 LOCATION: BOILER 126

Designation	Load (VA)	Ckt. Trip	bkr. No.	Phase	Ckt. No.	bkr. Trip	Load (VA)	Designation
			43	A	64	20		PNEUMATIC TUBE CONTROL
DUCT HEATER #3		15 3P	44	B	65			SPACE
			45	C	66			SPACE
EXHAUST FAN #1		15	46	A	67			SPACE
SPARE		15	47	B	68			SPACE
CO GAS DETECTION		15	48	C	69			SPACE
P4 PUMP		15	49	A	70			SPACE
AIR COMPRESSOR		30	50	B	71			SPACE
RECEPTACLE (5HP/208V) 1R		2P	51	C	72			SPACE
CHLORINE RM BB HEATER		15	52	A	73			SPACE
		2P	53	B	74			SPACE
P-3 DOMESTIC HOT WATER TANK PUMP		15	54	C	75			SPACE
P-7 HOT WATER RECIRC. PUMP		15	55	A	76			SPACE
RECEPTACLE NEAR AIR COMPRESSOR 1R		15	56	B	77			SPACE
P-6 CONVERTOR PUMP		15	57	C	78			SPACE
EXISTING FACP		15	58	A	79			SPACE
BATTERY BANK COMPLETE WITH DOUBLE HEADS AND EXIT LIGHTS		15	59	B	80			SPACE
TEMP CONTROLS AT TANK		15	60	C	81			SPACE
ETS CONTROLS		30	61	A	82			SPACE
		2P	62	B	83			SPACE
SPARE		15	63	C	84			SPACE

VOLTAGE: **120/208V,3Ø,4W**
CAPACITY: 225A
MOUNTING: SURFACE
REMARKS:

LOADS TOTAL PH.A 0 NOT INCLUDING PART1
TOTAL PH.B 0 NOT INCLUDING PART1
TOTAL PH.C 0 NOT INCLUDING PART1
TOTAL **0** INCLUDING PART 1

CONFIRM EXISTING LOADS AND WIRE SIZES PRIOR TO START OF WORK. SUBMIT REVISED PANEL SCHEDULE TO CONTRACT ADMINISTRATOR FOR REVIEW WITH MOTOR STARTER SHOP DRAWINGS

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SMS ENGINEERING

S3-PANEL SCHEDULE PANEL C (PART 2)

PROJECT: MARGARET GRANT POOL
FILE: 17-187-01
DATE: 10-Aug-17