

APPENDIX 'E'

ELECTRICAL SPECIFICATIONS

26 00 00 GENERAL REQUIREMENTS

1. The specification covering the General Conditions of the Contract, Supplementary Conditions, General and Safety Requirements, Instructions to Contractors, and all sections form an integral part of this specification and shall be read in conjunction herewith.

1.1 SCOPE

1. Provide all materials, labour, plant and equipment required for a complete and Working installation as herein specified and as shown on the drawings.
2. The installation shall be in accordance with the current edition of the Provincial and Municipal codes and regulations.
3. All equipment supplied under this Contract shall be new and C.S.A. approved.
4. Arrange for, and coordinate, rough-in and final inspections with inspection authority and Contract Administrator.
5. In the event of conflict between contract documents and Codes, the more stringent requirement shall be adhered to at no additional cost.
6. Engineering Site Reviews: Contractor's Work shall be periodically reviewed by the Contract Administrator for determining general quality of installation. Guidance will be offered as to interpretation of contract documents and to assist in performing the installation. Inspections, reviews and directives issued in no way relieve the Contractor, his agents, employees or subtrades from contractual obligations, conformance to codes or safe and recognized practices.
7. Apply for and pay for all required permits, licenses, inspections and fees.
8. Indicate all permit numbers on all progress draws.
9. Co-ordinate all telephone and cablevision conduit runs with Internet Service Provider before installation begins.

1.2 DEFINITIONS

The following are definitions of terms and expressions used in the Electrical and Mechanical specification:

1. INSPECTION AUTHORITY means agent of any authority having jurisdiction over construction standards associated with any part of Work on Site.
2. SUPPLY AUTHORITY means electrical power utility company responsible for delivery of electrical power to project.
3. PROVIDE means to supply, install and leave in Working order all materials and necessary devices to ensure a fully functional system, tested and complete in every way, unless otherwise noted.
4. Standards, Regulations and Bylaws, hereafter referred to as Codes.

1.3 REQUEST FOR INFORMATION

1. Allow ten (10) full Working days for Contract Administrator to respond to all requests for information.
2. Contractor shall review and approve all requests for information (RFI's) from Subcontractors prior to submission.
3. Contractor shall review and approve all RFI's prior to submittal to ensure information is not already included in contract documents or cannot be reasonably inferred from contract documents.

1.4 SHOP DRAWINGS

1. Submit electronic shop drawings for review by the Contract Administrator prior to ordering equipment and commencing Work. Shop drawings shall be specific to the equipment and materials for this project. Changes to location and arrangement shall be reviewed prior to installation. Review of shop drawings by the Contract Administrator is for the sole purpose of ascertaining conformance to design intent. Contractor retains responsibility for all aspects of installation, performance and coordination.
2. Shop Drawing Procedures are as follows:
 1. Contractor and Contractor shall review, approve and stamp submittals prior to sending to the Contract Administrator for review. Submittals without contractor stamps will be rejected.
 2. A transmittal listing each item of equipment shall accompany each submission.

3. Equipment must be labeled appropriately. Each item of equipment must bear the identifier used on the drawings.
4. Data sheets must clearly indicate model and options being utilized. All information that does not apply must be crossed off.
5. Allow Contract Administrator ten (10) full Working days to review all shop drawings.
6. Send electronic shop drawing submittals (.PDF only) to wpg.shopdrawings@mcw.com only; please do not copy staff members directly.
7. All deviations from specified equipment shall be highlighted by contractor.

1.5 ACCURACY OF DATA

1. Drawings are schematic; exact locations, distances, levels and other dimensions shall be governed by the architectural and/or interior design drawings.
2. Devices or equipment shall be moved to any point within a 3m (10'-0") radius for coordination purposes or when the Contract Administrator requests relocation before the Work has been substantially completed, without additional cost.
3. Provide a typical mock-up of one area, if requested.
4. Drawings and specifications establish scope of Work only and are not detailed installation instructions. Follow manufacturer's recommendations and adhere to all current and applicable Codes.
5. The Contract Administrator shall have the final say in matters of interpretation.
6. Branch circuit wiring shall be installed with circuits arranged exactly as shown on the drawings. Conduit and cable runs shall be modified to suit the installation.

1.6 EXAMINATION

1. Examine entire contract document package to ensure that the Work under this Contract can be satisfactorily carried out. Report any discrepancies to the Contract Administrator prior to submission of Bid.
2. Examine the Site, local conditions and all existing apparatus if any to be re-used and verify that the condition of this equipment is suitable for its intended use in the new construction.

1.7 WORKMANSHIP

1. Install equipment in a Workmanlike manner to present a neat appearance to the satisfaction of the Contract Administrator. Install equipment parallel and perpendicular to building lines. Install neatly and group to present a tidy appearance.
2. Install equipment and apparatus including but not limited to junction boxes, valves and balancing dampers requiring maintenance, adjustment or eventual replacement with adequate clearances and accessibility for same.
3. Include in the Work, all requirements shown on the shop drawings or manufacturers' installation instructions.
4. Replace Work unsatisfactory to the Contract Administrator without extra cost.
5. Equipment exposed to exterior weather and / or moisture shall be corrosion and UV protected.
6. Only skilled and qualified licensed tradesperson shall perform the Work. Tradesperson shall provide proof of registered status when requested.
7. Contractor is responsible to carefully examine conditions at the intended place of Work. Verify all services, connection points, and all access openings to permit installation of new equipment.
8. All conduits shall be clipped to structure by means of anchors or supported by unistrut hangers as close to underside of structure as possible. Tie wraps for wire hanging and fastening or perforated strapping is not acceptable.
9. All support material for all luminaires, outlet boxes, junction boxes, etc. in a non-combustible building shall be of non-combustible material. Wood is not acceptable.

1.8 COORDINATION

1. Contractor shall co-ordinate all aspects of the installation with all other trades. There shall be no change notices issued nor changes to the building design (i.e. lowering ceiling heights) due to routing conflicts

amongst trades or lack of coordination. When required, discuss the proposed routing with the Contract Administrator prior to installation. Final responsibility remains with the Contractor.

2. Connect to equipment specified in other sections, installed by other Contractors or the City.
3. Supply access doors or rated doors to match fire rating, at all service points for equipment. Indicate on project record documents the location of all access doors.
4. Openings shall be coordinated with the Contractor. Opening sizes shall be kept to a minimum
5. Contractor shall pay for professional trade to patch openings and install all finishing materials (i.e. drywall, brick, etc.). Openings with potential to compromise the structure shall be approved by a licensed Structural Engineer prior to starting the opening. The contractor shall contact the structural Contract Administrator for instructions prior to cutting or coring. Contractor is to scan structure before making openings and advise Contractor and Contract Administrator of any obstructions found prior to cutting or coring.

1.9 SUPERVISION

1. Supervise the Work at all times through a responsible and competent qualified tradesperson.
2. Full co-operation shall be shown with other trades to facilitate installations and to avoid delays in carrying out the Work.
3. Replace Site supervisor and/or foreman when requested by Contract Administrator.

1.10 CHANGE TO CONTRACT

1. Contractor change pricing shall include a complete breakdown of items of material, labour hours, labour rates and markups. This review period will start when all information indicated above is received.
2. Contractor shall review and approve all contractor change pricing and credits prior to submitting to Contract Administrator. Submission to the Contract Administrator indicates Contractor believes the pricing is fair and reasonable.

1.11 PROGRESS CLAIMS

1. Contractor progress claims will only be reviewed if they provide a complete breakdown by trade and sub trade and list all major equipment and labour complete with costs.

1.12 PROJECT CLOSE OUT

1. PROJECT RECORD DOCUMENTS
 1. Maintain accurate Project Record Documents and current on Site and same shall be present for review at each Site review. Submit these Project Record Documents in electronic format of same program and version of original contract documents and PDF for review at the completion of the project. Note that changes to architectural, and structural and civil floor plans must be included.
 2. A minimum of \$1,000.00 per drawing shall be held-back until all Project Record Documents are submitted and deemed complete.
 3. Transfer changes to electronic disc AutoCAD file. Submit disc and hard copy for final review and submission to The Citys.
 4. After acceptance of Project Record Documents by the Contract Administrator, provide one (1) complete set of AutoCAD and PDF Project Record Documents on three (3) CD-ROM and one (1) set of hard copy design prints and one (1) set of hard copy red line contractor markups.
 1. Electrical shall include:
 1. Circuiting of all new and existing equipment to remain;
 2. Accurate dimensions of all underground or in slab conduit or feeders;
 3. Identify all feeder / branch circuits and conduit routing and size including major junction box locations; and
 4. Any relocated or added equipment shall be identified.
 5. MCW/AGE Consulting Professional Engineers can complete the Project Record Documents from contractor's red-lined markups for a fee of \$250.00 per drawing, with a project minimum of \$1,000.00.
 6. The use of white out (liquid or tape) shall be used for correcting contractor red line errors ONLY.

7. DO NOT use white out to delete original contract drawings deleted items shall be crossed out in red ink.
8. ME Schedules and sheets shall bear a watermark, indicating "REFER TO O&M".
2. OPERATION AND MAINTENANCE MANUALS
 1. Prior to requesting any Substantial Performance Site review, all aspects of the installed system shall be complete and operational. Testing shall be complete along with device and equipment identification, equipment startups.
 2. At the completion of Work submit three (3) electronic media storage devices and one (1) hard covered loose leaf binder showing all major components and divided by trade sections. Manuals shall be complete with all warranty information, instructions for operation, maintenance and replacement parts as required. Include copies of reviewed shop drawings, Contract Administrator contact information, Contractor and Subcontractor information. Include copies of valve tag lists, all inspection certificates, and balancing reports. The Contract Administrator may not perform final inspections nor certify for occupancy until the O&M Manuals are received, reviewed and approved.
 1. Provide manufacturers start-up reports and letters of certification that the following equipment and systems are started, commissioned and Working correctly:
 1. Submit a Certificate of Inspection from the local Inspection Authority upon completion of Work and include with Project Record Documents.
 3. Each of the Contractors shall instruct the city's operating staff on the operation, maintenance, and adjustment of equipment and/or system that they have installed or set. Provide sign off sheets for training indicating who was trained and number of hours of training.
3. CERTIFICATION REQUIREMENTS
 1. The installation shall be completely tested demonstrating that the equipment and systems installed perform in the manner intended.
 2. Prior to electrical final inspection or certification provide the following:
 1. Fire Alarm Verification Report;
 2. Copies of manufacturer's startup or certification reports;
 3. Training sign off sheets; and
 4. Copy of the Electrical Permit

26 00 10 BASIC MATERIAL AND METHODS

1.1 GROUNDING

1. The entire installation shall be grounded in accordance with the Canadian Electrical Code.

1.2 TEST

1. The electrical installation shall be completely tested demonstrating that the equipment and systems installed perform in the manner intended.

1.3 IDENTIFICATION OF EQUIPMENT

1. All equipment shall be identified with engraved lamacoid nameplates secured with self-adhesive backing. Lamacoid shall identify equipment designation, voltage, phasing and fed from.
2. The utilization of Dynamo Rhino Industrial 6000, P-Touch is acceptable for receptacles.
3. Wording for coverplates shall be confirmed by Contract Administrator.
4. All coverplates and junction boxes shall be identified with system and/or Panel/Voltage on cover.

1.4 USE OF EQUIPMENT BEFORE TURNOVER TO THE CITY

1. The Contractor may operate equipment for testing only. The use of equipment for any other purpose must be approved by the City in writing prior to use. Approval must indicate who is paying for utilities used.
2. Any equipment that is placed in use for any reason prior to the beginning of the guarantee period shall be cleaned and provided with maintenance and repairs as required, to ensure conditions are equal to that of new equipment, or shall be replaced, at no cost to the City.

1.5 WIRING METHODS

1. Unless otherwise shown on the drawings, all wires shall be copper, minimum #12 AWG with 90°C x-link insulation. Wiring to be installed in conduit.
2. Wiring in concrete or masonry construction shall be in steel electrical metallic tubing (EMT). Provide a separate grounding conductor in EMT conduit runs embedded in concrete slabs. Conduits installed in areas exposed to moisture shall have watertight fittings.
3. All wiring shall be concealed where possible. Conduits shall be run at right angles to the structure lines above ground.
4. Conduit and wiring shall be grouped where possible and clipped in a neat and Workmanlike manner.
5. AC-90 cable is not acceptable.
6. Conduit runs shall be installed and inspected to ensure conformance with Item 5 herein.
7. The use of electrical non-metallic tubing (ENT) shall be limited to in-slab installations only.
8. Main underground wiring shall be run in 53mm (2") red DB2 U/G conduit.
9. U/G wiring shall be as specified on the drawings. Utilize #12 AWG RW90 Cu. for connection to post-top luminaires unless specified otherwise on the drawings.

1.6 MOUNTING

1. Mounting height of equipment is from finished floor to centerline of equipment unless specified or indicated otherwise.
2. If mounting height of equipment is not indicated, verify with Contract Administrator before proceeding with installation.
3. Install electrical equipment at the following heights unless indicated or directed otherwise.
 - .1 As per Architectural elevations.

26 05 35 OUTLET BOXES

1. Outlet, junction and switch boxes shall be galvanized pressed steel of size and type to suit each individual application.
2. All outlet boxes exposed to damp locations shall be sealed FS/FD or RAB style.
3. Sectional boxes shall not be utilized.

26 06 22 MISCELLANEOUS APPARATUS AND APPLIANCES

1.1 GENERAL

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

1.2 RECEPTACLES

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

26 27 26 WIRING DEVICES

1. Colours of receptacles, switches, outlets and coverplates shall be confirmed with Contract Administrator.
2. Receptacles shall be 20 ampere, 125 VAC, ivory, parallel slot, U-ground, side and back wiring screw terminate. Approved manufacturers are: Hubbell No. 5262, Arrow Hart No. 5262, Bryant No. 5262 or equal.
3. Provide stainless steel coverplates for recessed devices.

4. Wet location covers shall be equal to Cooper, Metal WeatherBox While-In-Use protective covers, WIUMV-1 for vertical mounting and WIUMH-1 for horizontal mounting. Plastic covers will not be accepted.

26 50 00 LIGHTING – 1919 MARQUEE

1.1 GENERAL

1. Supply and install all luminaires complete with lamps. All new luminaires shall be provided with Driver or electronic ballast, Power Smart approved.
2. Install luminaires supplied by the City, as indicated.
3. Lighting shall adhere to the Manitoba Hydro Power Smart Program.
4. All LED fixtures shall utilize Power Smart approved ballasts or drivers.
5. Equals for lighting will not be accepted.

1.2 BALLASTS AND ACCESSORIES

1. Provide ballasts and accessories as indicated.
2. Ballasts and Drivers used in exterior luminaires shall be rated at -20°C (-4°F) starting.

1.3 SITE LIGHTING

1. Provide post top, landscape and roadway luminaires as indicated.
2. Coordinate with the Contractor to provide concrete bases for pole-mounted luminaires and bollards as detailed. Anchor bolts to be designed to suit local wind conditions.
3. Provide a hand hole, complete with gasketed cover and ground lug on each pole.

1.4 LED LIGHTING

1. All LED lighting shall have the following I.E.S. testing to be considered for installation.
2. LM 80 08 Approved methods measuring lumen maintenance for SSL light sources.
3. LM 79 08 Approved methods for electrical photo and metric measurements of solid state lighting products.
4. All LED lamps and drivers shall have minimum 5 year warranty with minimal hours of operation of 50,000 hours or equal to luminaires hours.
5. Heat dissipation and maximum heat build up shall be submitted for review.

1.5 INSTALLATION (LUMINAIRES)

1. Install luminaires at locations indicated, complete with all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.
2. Install luminaires and lens materials in architectural details, as indicated.
3. Install luminaires parallel with building lines. Wall-mounted luminaires shall be installed plumb.
4. Review all construction details and mounting arrangements before placing luminaire orders and ensure that all mounting assemblies, frames, rings and similar features are included for and match the required installation.
5. All luminaires and assemblies shall be properly secured and supported. Support luminaires complete with all fasteners, framing and hangers, as may be required.
6. Coordinate the installation of luminaires with the work of other trades, ensuring that the necessary depths and mounting spaces are provided. Luminaires which cannot be installed due to a conflict with structural members, pipes or ductwork shall be relocated to a more suitable location, as directed by the Consultant and/or Architect.
7. Install post top, landscape and roadway luminaires plumb.

1.6 WIRING

1. Connect luminaires to lighting circuits as indicated.

1.7 LAMPS

1. Adjust lamp position in adjustable lamp holder-type luminaires to produce the proper beam distribution for the specified lamp.

1.8 TESTS

1. Check luminaires and replace defective lamps, ballasts, lenses and accessories.

1.9 CLEANING

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

26 50 10 LIGHTING CONTROLS

1. Hard wired dimmable LED luminaires shall be provided with 0-10V driver with compatible dimmer control.
2. Provide a dedicated neutral for all electronic dimming and driver controls.
3. Provide line voltage and control wiring in independent conduit systems as necessary for operational systems. Refer to Manufacturer's wiring diagrams and schematics on drawings.
4. Provide adjustable DC potentiometer for 0-10V dimming wiring. Coordinate set position with the City at time of installation.

END OF SECTION