



## WEST TORONTO COMMUNITY HEALTH SERVICES (WTCHS)

West Toronto Community Health Centre (WTCHC) - 209 Mavety St.  
HDR Architecture Associates Inc. Project No.: 10355669  
WSP Project No.: 221-11662-00

### ISSUED FOR ELECTRICAL ADDENDUM, ADD-E02

October 17th, 2024

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INCLUDE IN YOUR BID AMOUNT FOR THE FOLLOWING ITEMS OF ADDITION, DELETION OR CLARIFICATION. INDICATE IN THE SPACE PROVIDED ON THE BID FORM THAT YOU HAVE RECEIVED AND INCLUDED FOR THE REQUIREMENTS OF THIS ADDENDUM.

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#### 1. ISSUED SPECIFICATIONS

##### 1.1 SECTION 26 00 01 LOC - LIST OF CONTENTS

1.1.1 List of specifications updated to remove deleted specification sections:

- 27 40 10 Distributed Antenna System (DAS)
- 27 51 23 Intercom Systems
- 27 53 20 Cable Television Systems

##### 1.2 SECTION 26 05 70 ELECTRICAL WORK ANALYSIS AND TESTING

1.2.1 Added Brosz as an acceptable company for Subsection 3.5 "Electrical Distribution System Testing and Verification" and Subsection 3.8 "Shock and Arc Flash Analysis".

##### 1.3 SECTION 27 53 13 MASTER CLOCKS SYSTEMS

1.3.1 Updated section for IP PoE synchronized clock system.

#### 2. ISSUED DRAWINGS

Following drawings are issued with and form part of this addendum (include for additional work and/or revisions as shown/noted):

##### 2.1 E-001 - DRAWING LIST AND LEGENDS

2.1.1 Updated drawing list for new sheet E-607.

2.1.2 Added "KS" tag to Maglock symbol to indicate "Maglock Keyswitch"

##### 2.2 E-604 - STANDARD DETAILS - COMMUNICATIONS



2.2.1 IT communications riser diagram updated to include IP PoE synchronized clocks.

**2.3 E-607 - STANDARD DETAILS - SECURITY RISER**

2.3.1 New sheet for Security Riser diagram.

**2.4 E-1101 - SCHEDULES - ELECTRICAL**

2.4.1 Correction to ADD-E01. Clarification of units for size of luminaires in Luminaire Schedule for consistency. No modification to original fixture dimensions.

**END OF ADD-E02**

**SECTION 26 00 01**  
**ELECTRICAL LIST OF CONTENTS**

**DIVISION 26**

**ELECTRICAL**

Section 26 00 10	Electrical Work General Instructions
Section 26 05 00	Basic Electrical Materials and Methods
Section 26 05 19	Low Voltage Power Conductors
Section 26 05 26	Grounding and Bonding
Section 26 05 31	Electrical Concrete Products
Section 26 05 48	Vibration Isolation
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Section 26 08 00	Electrical Work Commissioning
Section 26 09 00	Lighting Control
Section 26 20 00	Electric Service and Distribution
Section 26 22 00	Distribution Transformers
Section 26 24 16	Distribution Panelboards
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Section 26 27 13	Metering
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Section 26 27 28	Service Floor Boxes
Section 26 32 03	Natural Gas Gensets
Section 26 32 05	Genset Enclosures
Section 26 33 54	Uninterruptible Power Supply (UPS) Units
Section 26 36 00	Transfer Switches
Section 26 43 00	Surge Protective Devices
Section 26 50 00	Lighting
Section 26 52 00	Emergency Lighting
Section 26 60 10	Electric Pipe Tracing Cable
Section 26 60 20	Electric Heaters

**DIVISION 27**

**COMMUNICATIONS**

Section 27 10 00	Structured Cabling System
<del>Section 27 40 10</del>	<del>Distributed Antenna System</del>
Section 27 51 13	Paging and Public Address Systems
Section 27 51 19	Sound Masking Systems
<del>Section 27 51 23</del>	<del>Intercom Systems</del>

Section 27 51 25	Assistance Call Systems
Section 27 52 25	Personal Panic Alarm System
Section 27 53 13	Master Clock Systems
<del>Section 27 53 20</del>	<del>Cable Television Systems</del>

**DIVISION 28**

**ELECTRONIC SAFETY AND SECURITY**

Section 28 00 00	General Security System Requirements
Section 28 13 00	Access Control Systems Requirements
Section 28 16 00	Intrusion Detection System Requirements
Section 28 20 00	Video Surveillance System Requirements
Section 28 46 00	Fire Alarm System

**END OF SECTION**

## SECTION 26 05 70 ELECTRICAL WORK ANALYSIS AND TESTING

### PART 1 - GENERAL

#### 1.1 SUBMITTALS

- A. Submit as part of shop drawing submission, copies of:
  - 1. electrical distribution system protective device coordination study and short circuit calculations;
  - 2. system and equipment testing reports;
  - 3. arc flash analysis report;
  - 4. copies of certificate of approvals from local governing inspection authorities.
- B. Submit electrical distribution system coordination study and short circuit calculations reports prior to or with proposed shop drawings of major electrical distribution equipment. Allow in shop drawing process, sufficient time for Consultant to review and make comments and for Contractor and equipment vendors to incorporate Consultant comments, necessary revisions and results of reports into equipment shop drawings. Do not order equipment until shop drawings have been reviewed with Consultant and Consultant's comments have been addressed. Time for this shop drawing review process will be at Consultant's discretion, but typically allow for 15 working days for initial review submission with additional 10 working days added to accommodate each resubmission.
- C. If formal completion of studies and reports may cause delay in equipment manufacture, direction from Consultant may be obtained for preliminary submittal of sufficient data to ensure that selection of device ratings and characteristics will be satisfactory. Subsequently, provide formal studies and reports to verify preliminary findings.
- D. Submit after completion of factory testing, copies of completed product testing reports.
- E. Submit after installation and testing, copies of:
  - 1. completed testing reports with completed test results sheets;
  - 2. certificate of approvals from local governing authorities, manufacturers of systems and equipment and testing companies.
- F. Review form of submittals (submission procedures, number of hard copies and requirements for electronic copies) with Consultant at project start-up. For pricing assume minimum 3 hard coloured copies bound and electronic pdf copy.

### PART 2 - PRODUCTS

#### 2.1 GENERAL SCOPE OF WORK

- A. Include for but not be limited to following:
  - 1. preparing and submitting preliminary coordination study and short circuit calculations and recommendations on required relays, sensors and CT's for proper system selective coordination and protection;
  - 2. determining short-circuit current ratings to check that electrical distribution equipment can safely withstand level of fault current;
  - 3. preparing, determining and submitting arc flash study with calculations to ensure required electric shock and arc flash protection are provided;
  - 4. preparing and submitting ground potential rise (GPR) study;
  - 5. product manufacturers providing equipment inspection, testing, start-up, adjustments and verification;
  - 6. independent 3<sup>rd</sup> party testing of electrical distribution system equipment and associated products;
  - 7. independent 3<sup>rd</sup> party testing of systems and equipment as noted;
  - 8. electricians/trades people on site to handle equipment, make temporary connections, operate equipment and make repairs and adjustments and assist manufacturer's / testing organization's

- personnel during on-site inspection, testing, calibration, start-up, verification work and where supplementary commissioning;
9. coordination of work with testing company and equipment/system manufacturer's authorized technician in performing adjustments and start-up procedures to equipment/systems;
  10. preparing testing reports and documentation for submission to Consultant.

## **PART 3 - EXECUTION**

### **3.1 PRELIMINARY COORDINATION STUDY AND SHORT CIRCUIT CALCULATIONS**

- A. Immediately after award of Contract liaise with local electrical supply authority for information on relays and other protective devices installed on their system and substations which affect co-ordination of site electrical distribution system.
- B. Immediately after award of Contract liaise with proposed manufacturer of electrical distribution equipment to obtain appropriate information and recommended devices to obtain co-ordination of electrical distribution system.
- C. Where project involves provision of major electrical distribution equipment (such as high voltage equipment, low voltage switchgear/switchboards, genset paralleling/synchronization switchboards), prepare preliminary coordination study and calculate available fault currents based on project design requirements and equipment. Combine into preliminary report and submit copies to Consultant for review to allow for comments and findings to be incorporated into equipment shop drawings and to expediate shop drawing process.
- D. During Bid period, review with Mechanical Division Contractor, proposed major mechanical equipment and identify preliminary short circuit current ratings to allow for more accurate pricing for their proposed equipment.
- E. Prepare report to typical standards as specified in respective coordination study and short circuit calculation report articles in this Section.

### **3.2 DISTRIBUTION SYSTEM COORDINATION STUDY AND SHORT CIRCUIT CALCULATIONS**

- A. Prepare final coordination study and short circuit calculations (available fault currents) of system. Perform work to standards of applicable local governing authorities, local electrical inspection authority and CSA Standards.
- B. Final coordination study and short circuit calculations reports to incorporate results and Consultant reviewed comments, into electrical distribution equipment shop drawings, and updated to reflect final equipment being supplied. Check for selective coordination of devices and confirm withstand ratings of equipment meet results from reports. Prepare studies as required to provide full and proper coordination and suitable withstand rating of entire distribution equipment/systems.
- C. Protective system devices have been selected such that protection is adequate and good coordination is possible, however, since differences do exist between manufacturers, some changes in trip ratings or relay settings may be necessary and are to be carried out. Obtain local electrical utility information on their protective devices and include requirements as necessary.
- D. Provide and carry out following:
  1. prepare a set of coordination curves on K.E. No. 336E Time Current Characteristic graph paper;
  2. this is to be accompanied by supporting symmetrical as well as asymmetrical fault current calculation data with tabulations to verify protection of various elements of systems under maximum and minimum fault conditions at various points in systems.
  3. Plot time-current characteristic curves for following:
    - a. main and feeder protective devices at voltage levels used in distribution system;
    - b. protective devices associated with largest motor in each MCC, refrigeration machine compressors and largest device in each distribution panel;
    - c. motor generator protective devices, damage curves and current decrement curves.

- E. Cooperate with and obtain from manufacturers, list of equipment requiring protective devices in distribution system and prepare coordination curves. Verify that proper withstand ratings of equipment are provided and proper control and protective devices are selected for coordination with protective devices. Include major mechanical equipment in studies and coordinate requirements with Mechanical Division Contractor. Identify required short circuit current ratings to Mechanical Division Contractor and respective Division manufacturers of major equipment.
- F. It is responsibility of equipment manufacturers to examine plans and specifications to ensure that relays and protective devices being installed in distribution system provide satisfactory coordination.
- G. Where automatic transfer switches are provided, submit coordination results and available fault current values at locations of transfer switches, to transfer switch manufacturer to ensure that transfer switches provided are of suitable withstand current ratings.
- H. Document testing, coordination study and arc flash analysis in a report stamped and signed by a Professional Engineer licensed in the Place of Work and authorized by testing company. Report to include test results with properly plotted curves, identified trouble areas of coordination, extensive comments regarding test results and recommendations on best course of remedial action. Submit copies of report to Consultant.
- I. Acceptable companies to provide this work include:
  - 1. Eaton Electric Services Division;
  - 2. Schneider Electric Services Division;
  - 3. Siemens Electric Services Division;
  - 4. G.T. Woods;
  - 5. AC Tesla;
  - 6. EnKompass Power and Energy;
  - 7. Eastenghouse.

### 3.3 GENERAL ELECTRICAL WORK TESTING

- A. In addition to tests required by local governing authorities having jurisdiction, local codes and regulations, perform following:
  - 1. after luminaires, switches, receptacles, motors, signals, etc., are installed, whether same are installed as part of this Division or by other Divisions (telephone systems excepted), test work to ensure that there are no leaks, grounds or crosses;
  - 2. establish and ensure proper motor rotation - measure full load running currents and check overload elements - report to Consultant any discrepancies which are found; existing motors which have been worked on (disconnected and reconnected) must be checked with rotation meter to ensure proper rotation; be responsible for any damage caused by reverse rotation;
  - 3. demonstrate to Consultant that branch circuit voltage drop is within specified units;
  - 4. ensure that devices are commissioned and operable.
- B. Rectify deficiencies to satisfaction of Owner.
- C. Document results into distribution system testing report. Report must state that testing was successful and Work complies with project documents, applicable CSA standards, and other applicable governing codes and requirements.

### 3.4 SYSTEMS INSPECTION, TESTING, START-UP AND VERIFICATION

- A. When each system and each major piece of equipment installation is complete and ready for acceptance, include for system and equipment manufacturer or manufacturer's authorized representative to visit site to provide system inspection, testing, start-up, and verification. Perform following:
  - 1. check component connections and overall installation;
  - 2. adjust sound systems for high quality, distortion free performance, free from noise, cross-talk, hum or other interference;
  - 3. test and adjust system and ascertain that components are as specified and ensure that products operate as designed;
  - 4. provide start-up procedures for systems and equipment;
  - 5. verify and certify system component operations;

6. prepare, document and evaluate test results;
  7. authenticate test results with signature of authorized testing Engineer/Technician;
  8. check and verify nameplates;
  9. provide maintenance and operating instructions to Owner's personnel.
- B. Integrated Systems Testing:
1. Perform testing of integrated systems and equipment in accordance with CAN/ULC-S1001.
  2. Engage respective systems or equipment vendors or trades to be onsite during inspection and testing work to perform adjustments or remedial work to correct issues identified by inspection and testing work.
- C. Perform work properly documented, and in accordance with manufacturer's instructions and recommendations.
- D. Perform work under presence of Owner/Consultant/Commissioning Agent at times approved by Owner and reviewed with Consultant.
- E. Provide these requirements after each phase (as applicable) to allow Owner option to use area of phase of work. These requirements are also to be provided prior to applying for Certificate of Substantial Performance of the Work of project.
- F. Include for manufacturers authorized technicians of equipment/systems integrated to equipment/systems being tested to be onsite during full integration testing. Coordinate with each manufacturer.
- G. Rectify deficiencies to satisfaction of Owner.
- H. When system inspection, testing, start-up and verification specified above is complete, obtain from supplier/manufacturer (or where specified, independent inspection company) a test report with test sheets, and covering verification letter signed by authorized testing technician, stating that system or equipment has been inspected and tested, performs as specified and is ready for acceptance. Include date and time of testing, testing technician's name and specification section number test fulfilled.
- I. Bind documents under cover and submit copies to Consultant.

### **3.5 ELECTRICAL DISTRIBUTION SYSTEM TESTING AND VERIFICATION**

- A. Provide services consisting of on-site engineering inspection, testing and verification of electrical distribution equipment and other systems and equipment. Perform work to standards of applicable local governing authorities, local electrical inspection authority and CSA Standards.
- B. Services to be performed by an approved independent testing company and be initially conducted prior to system/equipment being energized and further testing when energized, and include following items, where applicable:
1. testing, cleaning when necessary, and calibrating relays and circuit breaker trip devices (calibration of protective devices to conform to requirements of approved coordination curves);
  2. function test of associated control devices;
  3. replacement of fuses destroyed during testing;
  4. acceptance test in presence of Consultant;
  5. presence, for length of time required, of qualified and competent equipment manufacturer's service representative during start-up;
  6. carry out insulation resistance testing of outgoing feeders with respect to ground;
  7. inspection and testing of cables, bus duct, power panels, lighting panels, transformers, power receptacles and switches;
  8. inspection and testing of electrical system auxiliary systems and devices such as metering, power factor capacitors, UPS, isolated power centres, transfer switches, inverters, central battery systems, generators sets and load banks;
  9. inspection and testing of electrical devices and communication system components installed in service consoles, headwalls, furniture systems, etc., whether or not devices are supplied by Electrical Divisions;
  10. inspection and testing of motor control centres, starters and variable frequency drives;

11. inspection and testing of lighting control systems including central control systems, low voltage relays, sensors and dimming controls; ensure that devices perform in conformance with ASHRAE 90.1 requirements;
  12. verification and certification work of equipment and systems;
  13. witness testing of EMI testing and verification (signing of report) of test results.
- C. In addition to above testing and tests required by local governing authorities having jurisdiction, local codes and regulations, perform following:
1. after luminaires, switches, receptacles, motors, signals, etc., are installed, whether same are installed as part of this Division or by other Divisions (telephone systems excepted), test work to ensure that there are no leaks, grounds or crosses;
  2. establish and ensure proper motor rotation - measure full load running currents and check overload elements - report to Consultant any discrepancies which are found; existing motors which have been worked on (disconnected and reconnected) must be checked with rotation meter to ensure proper rotation; be responsible for any damage caused by reverse rotation;
  3. demonstrate to Consultant that branch circuit voltage drop is within specified units;
  4. ensure that devices are commissioned and operable.
- D. Perform services procedures properly documented, and in accordance with manufacturer's instructions and recommendations.
- E. When performing hi-potential testing, disconnect surge protection devices as recommended by SPD manufacturers.
- F. Where relays, breakers, etc., do not perform to Consultant reviewed coordination curves as prepared for in coordination study, revise as part of work.
- G. Provide testing and coordination of emergency power distribution system to ensure that system performs in accordance to latest requirements of CSA Standard C282 and CAN/CSA Z32. Ensure that engine-generator set manufacturer and testing and coordination companies co-operate to ensure compliance with CSA requirements. Provide necessary adjustments and coordination to ensure that emergency power distribution system transfers essential loads to emergency power within required response time of loss of normal power.
- H. Verify and coordinate harmonic analysis testing and testing of power factor correction equipment with manufacturer of equipment.
- I. Provide visual and mechanical inspection of ground system and verify that it is in compliance with issued documents and local governing electrical code requirements.
- J. Perform fall-of-potential test or alternative in accordance with IEEE Standard 81 on main grounding electrode or system to determine current status, possible grounding contamination and proper ground resistance value. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames system neutral, and/or derived neutral points. Resistance between main grounding electrode and ground is not to be typically greater than 5 ohms for commercial or industrial systems and 1 ohm or less for generating or transmission station grounds unless otherwise specified. (Reference: ANSI/IEEE Standard 142). Investigate point-to-point resistance values which exceed 0.5 ohm.
- K. Perform testing of lighting control systems and devices to ensure conformance with ASHRAE 90.1 requirements.
- L. Coordinate testing of equipment and systems with respective product vendors as required to ensure alliance with product vendor standards.
- M. Document testing, coordination study and arc flash analysis in a report stamped and signed by a Professional Engineer licensed in the Place of Work and authorized by testing company. Submit copies of report to Consultant. Report to include test results with properly plotted curves, identified trouble areas of coordination, extensive comments regarding test results and recommendations on best course of remedial action. Report must state that testing was successful and Work complies with project documents, applicable CSA standards, and other applicable governing codes and requirements.

- N. Any work that failed testing that was responsibility of Contractor to be rectified by Contractor and be re-tested and verified, until successful testing, and be at no additional cost to Owner. Rectify deficiencies to satisfaction of Owner and Consultant.
- O. Acceptable companies to provide equipment and system testing and verification work are to be independent of successful manufacturers providing distribution system equipment and include (unless otherwise approved by Owner, do not use company supplying electrical distribution equipment on project):
  - 1. G.T. Woods;
  - 2. AC Tesla;
  - 3. EnKompass Power and Energy;
  - 4. Eaton Electric Services Division;
  - 5. Schneider Electric Services Division;
  - 6. Siemens Electric Services Division;
  - 7. Eastenghouse;
  - 7.8. BROSZ.

### 3.6 BRANCH CIRCUIT WIRING TESTING FOR PATIENT CARE AREAS

- A. Provide on-site engineering inspection and testing of branch circuit wiring and branch circuit devices in patient care areas in accordance with CSA Standard Z32.
- B. Patient Care Areas include applicable critical patient care, intermediate patient care and general patient care areas of renovated and additional areas.
- C. Branch circuit wiring testing to be performed by an approved independent testing company and be executed immediately upon energizing system prior to occupancy of an area by Owner.
- D. Thoroughly review requirements of CSA Standard and ensure that entire scope of branch circuit wiring to be tested is understood by testing company.
- E. Testing to be witnessed by Owner and Consultant. Notify Owner and Consultant in writing minimum of 7 working days in advance of proposed testing date.
- F. Document testing, deficiencies and failed test results in distribution system testing report and submit copies to Consultant.
- G. Contractor to perform remedial work on deficiencies and failed test results and retest, till successful testing, all at no additional cost to Owner.
- H. Acceptable testing companies are as those listed for distribution system testing work.

### 3.7 UPS TESTING

- A. In addition to standard specified testing requirements, UPS system manufacturer to include during onsite testing, full documented testing and results including but not limited to following:
  - 1. recording functional alarms and voltage levels at which alarm occurs, on UPS system;
  - 2. recording critical load alarms and voltage levels at which alarm occurs, on UPS system;
  - 3. recording minimum and maximum adjustment of voltage potentiometer on system;
  - 4. recording levels and checking functionality of battery equalize feature;
  - 5. testing operation of remote EPO functions;
  - 6. recording load testing data with 0%, 50% and 100% load for function of input VAC/IAC/THD%, VDC/IDC (charging), output VAC/ $\Phi$ - $\Phi$ V average/IAC, output kW/kVA/Hz and output voltage THD%;
  - 7. determine voltage regulation from 0% to 100% full load;
  - 8. determine voltage unbalance of system at 0%, 50% and 100% kW load;
  - 9. record transient response of system under load steps of 0-50%, 50-0%, 50-100%, 100-50%, 100% (UPS to bypass), 100% (bypass to UPS) and 100% simulated fuse failure; load percentages; Refer to kW rating of unit; record 3-phases of output voltage, 1-phase of output current and one phase of input voltage; attach printouts with report;
  - 10. perform battery discharge test; record battery details, specifications and operating data; load system to 100% kW load and record DCV and DCA at one minute intervals from 0-20 minutes, record 3-

phases of output voltage, one phase of output current and one phase of input voltage; attach printouts with report;

11. record voltage levels and times at which Battery Discharge/Low Battery Warning/Low Battery Shutdown occur during discharge test;
12. during battery charge (no load), record battery current limit (ADC, 10%) and reduced battery current limit (ADC, 1%);
13. after battery recharge current has reached OA following battery capacity test, perform 125% overload test and verify/record overload alarm, input current limit (115%), reduced input current limit (100%), overload transfer alarm, auto-retransfer primed alarm and auto-retransfer successful (no alarm);
14. perform full load system burn-in; record at 30 minute intervals with 100% kW on system for 4 hours continuous, O/P volts  $\Phi A-B/\Phi B-C/\Phi C-A$ , O/P amps  $\Phi A/\Phi B/\Phi C$ ; if failure occurs, repair and start test over from beginning until 4 hours continuous operation are achieved;
15. test system options and features to ensure proper operation.

B. Document testing in report signed by UPS manufacturer's technician. Submit copies of report to Consultant.

### 3.8 SHOCK AND ARC FLASH ANALYSIS

A. General:

1. Provide analysis for electric shock and arc flash protection as specified herein, and as required by local governing codes and local governing authorities.
2. Prepare study to determine severity of potential exposure and selecting personal protective equipment (PPE) under general guidelines of governing edition of CSA Z462.
3. Determine arc flash hazard distance and incident energy that workers may be exposed to from electrical equipment under general guidelines of IEEE 1584.
4. Design safety signs and labels for applications to equipment under general guidelines of CSA Z462 and ANSI Z535.4.
5. Incorporate documentation with short circuit calculations and coordination study report submitted to Consultant.

B. Arc Flash Hazard Analysis Study:

1. Perform Arc Flash Hazard analysis by calculating arc flash incident energy and arc flash boundaries as outlined in CSA Z462. Analysis to include locations where work could be performed on energized parts of equipment such as switchboards, switchgear, motor-control centres, panelboards, busway and splitters.
2. Retrieve short circuit calculations and clearing times of phase overcurrent devices from short circuit and coordination study specified previously.
3. Arc-Flash Hazard Analysis to include customer owned service entrance equipment down through equipment rated 208 volts with significant locations in 240 V and 208 V systems fed from transformers equal to or greater than 35 kVA.
4. Specify safe working distances based upon calculated arc flash boundary considering incident energy of 1.2 cal/cm<sup>2</sup>.
5. Include Arc Flash Hazard analysis calculations for maximum and minimum contributions of fault current magnitude. Minimum calculation to assume that utility contribution is at a minimum and a minimum motor load. Conversely, maximum calculation to assume a maximum contribution from utility and motors to be operating under full-load conditions. Other switching scenarios are to be included as necessitated by power system design and layout.
6. Arc Flash computation to include both line and load side of main breaker, where necessary.
7. Arc Flash calculations to be based on overcurrent protective device clearing time per coordination study.

C. Arc Flash Warning Labels:

1. Provide minimum 90 mm x 127 mm (3.5" x 5") thermal transfer type label of high adhesion polyester for each work location analysed.

2. Typically, use red header label with "DANGER, ARC FLASH HAZARD" wording. Typically, use orange header label with wording, "WARNING, ARC FLASH HAZARD", and include following information:
    - a. Location/equipment designation;
    - b. nominal voltage;
    - c. arc flash protection boundary;
    - d. incident energy;
    - e. working distance;
    - f. engineering report number, revision number and issue date.
  3. Machine print labels with no field markings. Submit as shop drawing submissions, sample labels and proposed nomenclature for Owner approval and Consultant review.
  4. Provide Arc Flash labels typically for following equipment (and base labels on recommended overcurrent device settings:
    - a. panelboards;
    - b. motor control centres/VFDs;
    - c. distribution transformers;
    - d. switchboards;
    - e. transfer switches;
    - f. genset control equipment;
    - g. switchgear;
    - h. high voltage equipment;
    - i. other equipment as outlined on drawings, and required by local governing authorities.
  5. Document in report, method of calculating and data to support information for labels.
- D. Acceptable companies to provide this work are to be successful manufacturer of electrical distribution system equipment and include:
1. Eaton Electric Services Division;
  2. Schneider Electric Services Division;
  3. Siemens Electric Services Division;
  4. G.T. Woods;
  5. AC Tesla;
  6. EnKompass Power and Energy;
  7. Eastenghouse;
  - 7.8. BROSZ.

### 3.9—EMI TESTING

- A.—~~Electromagnetic interference testing to include provisions as outlined herein. Prior to start of Work, prepare method of procedure using requirements herein as guideline. Submit proposed method of procedure to Consultant for review.~~
- B.—Standards:
- 1.—IEEE 1308-1994 (R2010), IEEE Recommended Practice for Instrumentation: Specifications for Magnetic Flux Density and Electric Field Strength Meters—10 Hz to 3 kHz.
  - 2.—IEEE 644 [994 (R2008), IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines.
- C.—Instrumentation: Single axis or tri-axial probes with appropriate electrical meter, frequency response 40-400Hz., and overall accuracy 1% or better.
- D.—Measurement of Magnetic Fields:
- 1.—~~Measure magnetic field throughout entire area where magnetic field might be present in excess of acceptable limits. Take special care in areas of patient care, intensive care, operating rooms, diagnostic rooms, and above and in close proximity of main electrical rooms and main power feeders such as bus ducts risers, cable runs etc.~~

- 2.—Measure magnetic field in regular space intervals. Standard interval to be a mesh 1800 mm x 1800 mm (6' x 6'). Measurement height above floor to correspond with desk top level (900 mm [3'] above floor) and at either, at floor (in case of magnetic field being generated below), or 1800 mm (6') from floor (in case magnetic field is generated above), and alongside wall in adjacent rooms (500 mm [20"] from wall).
- 3.—Measure each point flux density in three orthogonal directions (X, Y, Z) and recorded separately. Recorded value is average of maximum and minimum values to eliminate time variance of magnetic field.
- 4.—Add recorded values vectorially to obtain representative value of magnetic flux density for individual measuring point.
- 5.—Carry out magnetic field survey at time of maximum electrical power load. If this is impracticable, a simulated load by means of short circuit test at design maximum current is acceptable.
- 6.—Acceptance criterion is 5 mG (RMS) at measuring points.

E.—Substation Radiation Measurements:

- 1.—Measure magnetic field must be measured at points 1800 mm (6') below and/or above, and/or 1800 mm (6') from each side, at representative locations in accordance with switchgear configuration. Points to be covered are incoming cells and larger feeder cells.
- 2.—Load switchgear with a simulated load equal to design maximum closely resembling actual load. Load can be simulated by load banks, but it is recommended to carry out testing using a short circuit test.
- 3.—In case of double-sided substations, it is recommended to test transformers and switchgear together. Test substation both with tiebreaker open and closed.
- 4.—Measure at each point flux intensity in three (3) orthogonal directions (X, Y, Z) and recorded separately. Recorded value is average of minimum and maximum values in each direction to eliminate influence of additive and subtractive external fields.
- 5.—Add 3 orthogonal readings vectorially to obtain representative value for individual measurement point.
- 6.—Measure and record at each measuring point, flux density with switchgear de-energized to establish background magnetic field.
- 7.—Acceptance criterion is 5 mG (RMS) at measuring points.

F.—Testing, verification and certification to be performed by specialist Subcontractor. Consultant and independent testing company performing distribution system testing and coordination study work to witness testing work. Ensure that independent testing company verifies and co-signs test results. Perform testing and verification work at times acceptable to Owner and reviewed with Consultant. Include results in report submitted to Consultant.

G.—Acceptable companies to provide this work includes:

- 1.—C-Intech;
- 2.—Power Line Systems Engineering.

### **3.103.9 INFRARED SCANNING**

- A. Provide infrared scanning of Work and connections to electrical distribution equipment as noted.
- B. Infrared scanning process to include but not be limited to following:
  1. use of latest technology infrared fast scanning thermal imaging camera with colour digital conversion thermographic imaging capabilities; camera to determine temperature differences using generated isotherms;
  2. scanning distribution system with ability to detect 1°C between subject area and reference at 30°C;
  3. equipment to detect emitted radiation and convert detected radiation to visual image;
  4. infrared surveys to be performed during periods when equipment is under intended full operating load;
  5. perform scanning of essential power equipment when gensets are in operation and essential power is on line.
- C. Some guidelines for interpretation of temperature gradients are:
  1. temperature gradients of 3°C to 7°C indicate possible deficiency and warrant investigation;

2. temperature gradients of 7°C to 15°C indicate deficiency; required repair as time permits as directed by Consultant;
  3. temperature gradients of 16°C and above indicate major deficiency; requires repair immediately.
- D. Document testing in a report stamped and signed by a Professional Engineer licensed in the Place of Work and authorized by testing company. Submit copies of report to Consultant. Report to include but not be limited to include:
1. indication of problem area (location of "hot spot");
  2. indication of temperature rise between "hot spot" and normal or reference area;
  3. indication of cause of heat rise;
  4. indication of phase unbalance, if present;
  5. indication of areas scanned;
  6. colour photographs and thermograms of deficient area as seen on imaging system;
  7. summary of work;
  8. list of test equipment;
  9. faults, corrections required, recommendations;
  10. retesting of corrected faults.
- E. Acceptable infrared scanning companies:
1. GT Wood;
  2. EnKompass Power and Energy;
  3. AC Tesla;
  4. Eaton Electric Services Division;
  5. Schneider Electric Services Division;
  6. Siemens Electric Services Division;
  7. Eastenghouse.

**END OF SECTION**

## SECTION 27 53 13 MASTER CLOCK SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUBMITTALS

##### A. Product Data:

1. Submit manufacturer product literature, specifications, installation instructions and datasheets.
2. Include product characteristics, performance criteria, physical size, finish and limitations.

##### B. Shop Drawings:

1. Submit shop drawings for products of this Section.
2. Identify:
  - a. Type of clocks.
3. Submit for large systems with multiple clocks:
  - a. Matrix identifying type and locations.
  - b. Drawing identifying system layout and connected clocks.

##### A.C. Submit testing and verification reports~~Submit shop drawings for products specified in this Section.~~

#### 1.2 SOFTWARE NOMENCLATURE REPROGRAMMING

- Include additional costs for system manufacturer to make necessary on site final changes to applicable system/equipment software. Make such changes after successful testing and verification of systems, but prior to turn over to Owner. After successful final verification of work, confirm and obtain approval of final nomenclature in writing from Owner and Consultant. Software revisions to incorporate final room names/area names/building names and equipment identification.

#### 1.3 SYSTEM SUPPLIER/INSTALLER QUALIFICATIONS

- Supplier/installer of system to be an established communications and electronics contractor that has and currently maintains a locally run and operated business for at least 5 years and holds applicable provincial and local licenses.
- Supplier/installer to be a valid authorized distributor for product/system proposed with full manufacturer's warranty privileges.
- Supplier/installer to employ technicians who have attended and successfully completed manufacturer's technical certification training for proposed system.
- Supplier/installer to show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to system. Supplier/installer to maintain at their facility necessary spare parts in proper proportion as recommended by system manufacturer to maintain and service equipment being supplied.

### PART 2 - PRODUCTS

#### ~~2.1 MASTER WIRELESS GPS CLOCK SYSTEMS~~

##### ~~A. Primex Wireless, GPS (Global Positioning System) type wireless system that continually synchronizes clocks throughout facility using GPS technology to provide atomic time. Features include:~~

- ~~1. clock readouts in multiple time zones;~~
- ~~2. automatic adjustment for Daylight Savings Time;~~
- ~~3. analogue clocks synchronized to within 10 milliseconds 6 times per day;~~
- ~~4. internal oscillator maintains plus or minus one second per day between synchronizations, so clock accuracy does not exceed plus or minus 0.2 seconds;~~
- ~~5. internal clock reference so that failure of GPS signal does not cause clocks to fail in indicating time;~~

6. fail-safe design so that failure of any component does not cause failure of system; upon restoration of power or repair of failed component, system to resume normal operation without need of resetting system or any component thereof;
  7. clocks are portable;
  8. system operates in accordance with a "Technical Acceptance Certificate" issued by Industry Canada and Ministry of Industry; license granted to and held by end user (Owner).
- B. System manufacturer to make payments and to provide required documents and technical information to Industry Canada and other governing local authorities, for approval.
- C. Include for provision of following:
1. XR series, 5/30 watt master transmitters with GPS receiver/ antennae, rack, surge protector, UPS back-up system;
  2. XR series, 5/30 watt master transmitters with NTP interface, rack, surge protector, UPS back-up system;
  3. satellite transmitters with receiver switch, rack, surge protector, UPS back-up system;
  4. external outdoor antennae;
  5. exterior weatherproof coaxial antennae cabling; antennae/receiver cable to be provided in length to suit installation location on rooftop;
  6. standard round, 317 mm (12.5") satellite clocks with 12/24 hour display and complete with long life maintenance free batteries, high impact polycarbonate frame and lens, and clock lock; face to include Owner logo; exact clock dial face, logo and finish to be confirmed with and approved by Consultant prior to ordering; optional 120 VAC power supply operation; synchronized from master or satellite transmitter;
  7. digital time clocks: 63 mm (2.5") x 6 digit, 7 segment LED display with user configurable alternating time and date; 12 or 24 hour display, 120 Vac power supply; synchronized from master or satellite transmitter; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim;
  8. digital time clocks with elapsed timer; clocks: 63mm (2.5") x 6 digit, 7 segment LED display unit of hours, minutes and seconds, that start and stop with push of a button and counts up or down until stopped; logs of elapsed time events including duration of event, time of day and date are sent to server and are available for retrieval by authorized users; 12 or 24 hour display, count up or count down timer; power outage memory back-up for up to 8 hours; 120 Vac power supply; synchronized from master or satellite transmitter; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim;
  9. Code Blue Timer: 65mm (2.5") x 6 digit, 7 segment LED display unit of hours, minutes and seconds, to indicate elapsed time during Code Blue event that integrates with Code Blue system and also operates through remote control unit; logs of elapsed time events including duration of event, time of day and date are sent to server and are available for retrieval by authorized users; 12 or 24 hour display, count up or count down timer; power outage memory back-up for up to 8 hours; 120 Vac power supply; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim; remote switch control allows user to run, hold or reset timer and consists of 3 pushbuttons mounted on stainless steel faceplate complete with required interconnection cable and connectors;
  10. clock lock feature;
  11. protective wireguards;
  12. mounting hardware and ancillary devices as required for full installation;
  13. system wiring as per system manufacturer's requirements;
  14. system software programme;
  15. Industry Canada licence.
- D. Engage system manufacturer to review documents prior to submission of pricing before close of Bids. Ensure that equipment selection proposed meets requirements of Work and that signal strength and clock coverage areas are adequate to give proper system performance throughout.
- E. Final selection of clocks to be as directed by Owner at a later date.
- F. Manufacturer's representative to provide following on site work:
1. programme system head end;

- 2.—inspect installation;
- 3.—adjust, test, start-up and certify system;
- 4.—instructions on system operating and maintenance.

G.—Base Bid manufacturer/supplier is Primex Wireless Canada (1-800-330-1459). Other manufacturers may be accepted subject to following (submit proof with shop drawings):

- 1.—that system features and performance at least match base specified system;
- 2.—systems are CSA approved and ULC listed and labelled, as applicable;
- 3.—system has been installed and operating in other Canadian facilities for at least past three (3) years;
- 4.—system products and parts are stocked and serviced by a Canadian distributor/vendor within Province of install.

## 2.2—MASTER WIRELESS NETWORK CLOCK SYSTEMS

A.—Primex Wireless, SNS (Synchronous Network System) type wireless system that continually synchronizes and automates management of clocks throughout facility using 802.11 wireless network.

B.—System features wireless network connected clocks with network time protocol (NTP) synchronization, data collection, data backup, and user access from anywhere in world. SNS clocks are synchronized by signals from network Gateway SNS Applications Management Platform (AMP) server over an 802.11b/g wireless network or 10/100 Base T Ethernet system. Time signals originate from local Network Time Protocol (NTP) server, keeping clocks in synch with time shown on network computers.

C.—SNS clock incorporates automated monitoring, alerting, and reporting firmware. Clock firmware performs diagnostics on battery life, time accuracy, and strength of wireless connection, and sends this data to AMP Gateway server. SNS AMP Gateway server also receives and stores event logs showing time and date records from Elapsed Timers. These logs, backed up on central server, are available to authorized users on AMP and can be e-mailed to assigned staff.

D.—System operates over building WIFI system. Clocks are controlled from signals transmitted over WIFI system or through wired network cabling to local RJ45 jacks. Coordinate work with structured network cabling work section.

E.—Additional system features include:

- 1.—clock readouts in multiple time zones;
- 2.—automatic adjustment for Daylight Savings Time;
- 3.—clocks continue to indicate accurate time within plus or minus 0.35 seconds in 24 hours;
- 4.—internal clock reference so that failure of NTP system signal does not cause clocks to fail in indicating time;
- 5.—fail safe design so that failure of any component does not cause failure of system; upon restoration of power or repair of failed component, system to resume normal operation without need of resetting system or any component thereof;
- 6.—clocks are portable;
- 7.—system operates in accordance with a "Technical Acceptance Certificate" issued by Industry Canada and Ministry of Industry; license granted to and held by end-user (Owner).

F.—System manufacturer to make payments and to provide required documents and technical information to Industry Canada and other governing local authorities, for approval.

G.—Include for but not be limited to provision of following:

- 1.—SNS applications management platform system software;
- 2.—round, 317 mm (12.5") SNS clocks with 12/24 hour display and complete with long life maintenance free batteries, high impact polycarbonate frame and lens, and clock lock; face to include Owner logo; exact clock dial face, logo and finish to be confirmed with and approved by Consultant prior to ordering; optional PoE or 120 VAC power supply operation; synchronized from master or satellite transmitter;
- 3.—SNS digital time clocks: 63 mm (2.5") x 6 digit, 7 segment LED display with user configurable alternating time and date; 12 or 24 hour display, 120 Vac power supply; synchronized from wired Ethernet connection or wireless WiFi; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim; optional PoE powered;

4. SNS digital time clocks with elapsed timer; clocks: 63 mm (2.5") x 6 digit, 7 segment LED display unit that start and stop with push of a button and counts up or down until stopped; logs of elapsed time events including duration of event, time of day and date are sent to server and are available for retrieval by authorized users; 12 or 24 hour display, count up or count down timer; power outage memory back up for up to 8 hours; 120 Vac power supply; synchronized from wired Ethernet connection or wireless WiFi; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim;
  5. SNS Code Blue Timer: 63 mm (2.5") x 6 digit, 7 segment LED display unit to indicate elapsed time during Code Blue event that integrates with Code Blue system and also operates through remote control unit; logs of elapsed time events including duration of event, time of day and date are sent to server and are available for retrieval by authorized users; 12 or 24 hour display, count up or count down timer; power outage memory back up for up to 8 hours; 120 Vac power supply; flush or surface mounted; complete with mounting bracket for surface mounting; flush trim; remote switch control allows user to run, hold or reset timer and consists of 3 pushbuttons mounted on stainless steel faceplate complete with required interconnection cable and connectors;
  6. clock lock feature;
  7. protective wireguards;
  8. mounting hardware and ancillary devices as required for full installation and integration to network system (include programming of transmitter and system devices as required);
  9. system wiring as per system manufacturer's requirements;
  10. gateway server: standard 19 inch wide single rack unit that synchronizes clocks over network with signals from NTP server, stores and forwards system information from clocks;
  11. Industry Canada licence;
  12. SNS temperature sensor;
  13. SNS humidity sensor;
  14. SNS vibration sensor;
  15. synchronous crash car kit.
- H. Engage system manufacturer to review documents prior to submission of pricing before close of Bids. Ensure that equipment selection proposed meets requirements of Work and that signal strength and clock coverage areas are adequate to give proper system performance throughout.
- I. Final selection of clocks will be as directed by Owner at a later date.
- J. Manufacturer's representative to provide following on site work:
1. programme system head end;
  2. inspect installation;
  3. adjust, test, start up and certify system;
  4. instructions on system operating and maintenance.
- K. Base Bid manufacturer/supplier is Primex Wireless Canada (1-800-330-1459). Other manufacturers may be accepted subject to following (submit proof with shop drawings):
1. that system features and performance at least match base specified system;
  2. systems are CSA approved and ULC listed and labelled, as applicable;
  3. system has been installed and operating in other Canadian facilities for at least past three (3) years;
  4. system products and parts are stocked and serviced by a Canadian distributor/vendor within Province of install.

### 2.32.1 MASTER WIRED CLOCK SYSTEM – IP POE

- A. General System Requirements:
1. CSA certified, or ULC listed and labeled.
  2. Components designed to operate as part of complete system.
  3. Operates utilizing Power over Ethernet (PoE) to IEEE 802.3.
  4. Synchronizes clocks and devices to each other via network time protocol (NTP) protocol.
  5. Monitoring software for system controls from one location and includes:
    - a. Marking clocks as priority for quick viewing.
    - b. Uploading and downloading configuration capabilities.

- c. Sending numeric messages to digital clocks.
  - d. Sending countdown functions to digital clocks.
  - e. Sending alphanumeric messages to digital clocks.
  - f. Displaying which clocks are not receiving NTP time.
  - 6. No licensing restrictions or recurring service fees.
  - 7. Capable of operating without physical servers and software.
  - 8. Each clock with built-in web interface for programming.
  - 9. Programming clocks immediately upon receipt of signal.
  - 10. Clocks:
    - a. Analog and digital clocks automatically correct themselves on receipt of signal.
    - b. Include built-in closed-loop system in analog clocks allowing clocks to detect position of hands and bring clocks to correct time even when clocks are manually altered.
    - c. Analog and digital clocks diagnostic function allowing user to view how long since clock received digital signal.
    - d. Analog clocks perform functional tests of electronics and gears.
    - e. Upon loss of power, either upon resumption of power, clock self-corrects to current time or includes memory backup and maintains correct time for minimum of 1 hour without power.
- B. Master Clocks/Transmitter:
- 1. In accordance with UL 863.
  - 2. Acting as NTP server which other devices can point to receive time through NTP protocol.
  - 3. Includes multiple pre-programmed NTP backup addresses.
  - 4. Receiving NTP time signal via Ethernet.
  - 5. Receiving digital signals through RS485 connection.
  - 6. Correcting secondary clocks for Daylight Saving Time and customizing Daylight-Saving Time, in event of international use or change in government regulations.
  - 7. Outputting RS485 signals.
  - 8. Minimum two clock circuits for outputting signals including:
    - a. 59-minute correction.
    - b. 58-minute correction.
    - c. Once a day pulse.
    - d. Correction with multiple vendor clocks.
  - 9. Communications Interface:
    - a. Programmed remotely through online interface accessible through LAN and compatible with various web browsers, as reviewed with Consultant.
    - b. Includes functions as follows:
      - 1) Allow users to schedule bells and other events.
      - 2) Display features.
      - 3) Show IP settings.
      - 4) Show other master clock settings.
      - 5) Set time and date.
      - 6) Download or upload master clock settings.
      - 7) Configure e-mail alerts for various instances.
  - 10. Display and Programming:
    - a. Multi-line and multi-character LED and backlit LED display.
    - b. Operator programming via keypad and built-in web interface.
    - c. Non-volatile memory contains minimum 500 events and minimum 200 schedule changes.
    - d. Interfaces with GPS, Internet and intranet systems.
    - e. Set countdown time between events and make digital clocks count down.
    - f. Internal set countdown time between events and make digital clocks count down. Battery saves settings and operate internal real-time clock for minimum 10 years.
  - 11. Relays:
    - a. Relays for zones used for scheduling facility systems controlling bells and lights.
  - 12. Input Voltage: 85 V AC – 264 V AC, 60 Hz, suiting intended applications, as noted.
- C. Wired Secondary Clocks:

1. Analog Clocks:
  - a. Designed for IP-PoE system with fully automatic plug and play capability.
  - b. Receiving NTP protocol through CAT 5 or CAT 6.
  - c. Clock display: 24 hour white face with black Arabic numerals.
  - d. Size: Round 300 mm.
  - e. Built-in Web Interface includes features:
    - 1) Password protected interface.
    - 2) Naming of clock.
    - 3) Selecting time interval clock receives NTP time.
    - 4) Bias seconds configuration for altering correct time +/- 9999 seconds.
    - 5) Setting Greenwich Mean Time (GMT) offset for time zone configuration.
    - 6) Built-in diagnostic mode.
    - 7) Select IP settings.
    - 8) Dynamic Host Configuration Protocol capability.
    - 9) Domestic and International Daylight-Saving Time capability.
    - 10) E-mail alerts for situations as follow:
      - a) NTP synchronization received larger than specified interval.
      - b) Time sync received larger than specified interval.
      - c) Clock reset.
  - f. Materials:
    - 1) Dial: Polystyrene.
    - 2) Case: Low profile, smooth surface reinforced ABS.
    - 3) Mounting: Surface or wall and double mount housing, as noted, and reviewed with Consultant. Include backbox suitable for installation.
    - 4) Shatter-proof, side-molded, polycarbonate.
  - g. Power Requirements: Power over Ethernet (PoE), 48 V DC with suitable connector or port.
2. Digital Clocks:
  - a. Designed for IP-PoE system.
  - b. Clock Display:
    - 1) High-efficiency red LED numeral display with 6 digits.
    - 2) Display size: 100 mm.
      - a) Format: 24 hour and reviewed with Consultant.
      - b) Brightness: Minimum four level of brightness adjustment.
      - c) Bezel: Smooth surface, red colored.
      - d) Bezel size: Suiting number of digits and visibility of minimum 30 m and reviewed with Consultant.
    - 3) Messaging capabilities such as "BELL" and "Fire" from software on network.
    - 4) Alternating Time/Date functionality.
  - c. Built-in Web Interface Features:
    - 1) Password protected interface.
    - 2) Naming of clock.
    - 3) Selecting time interval clock receives NTP time.
    - 4) Bias seconds configuration for altering correct time +/- 9999 seconds.
    - 5) Setting Greenwich Mean Time (GMT) offset for time zone configuration.
    - 6) Built-in diagnostic mode.
    - 7) Troubleshooting capability.
    - 8) Select IP settings.
    - 9) Dynamic Host Configuration Protocol capability.
    - 10) Domestic and International Daylight-Saving Time capability.
    - 11) E-mail alerts for situations as follow:
      - a) NTP synchronization received larger than specified interval.
      - b) Time sync received larger than specified interval.
      - c) Clock reset.
      - d) Count up activated (clock interfacing with elapsed timer control panel).
      - e) Countdown activated (clock interfacing with elapsed timer control panel).

12) Brightness Scheduling.

- d. Mounting: ABS, surface or wall and double mount housing, as noted, and reviewed with Consultant. Include backbox suitable for installation.
- e. Power Requirements: Power over Ethernet (PoE), 48 V DC with suitable connector/port.
- f. Elapsed Timer Station:
  - 1) Flush wall-mounted control station with display.
  - 2) Digital timer for digital clocks as noted.
  - 3) Count-up functionality from 00:00:00 to 99:59:59.
  - 4) Programmable count-down functionality starting at 99:59:59.
  - 5) Customizable backlit buttons.

D. Miscellaneous:

- 1. PoE injectors or switch.
  - 2. Wiring and installation ancillary devices, as recommended by manufacturer.
  - 3. Manufacturer installation training to installers.
  - 4. Manufacturer field service representative: Provides site start-up and testing and prepare verification and test reports, signed by testing technician.
- A.—SimplexGrinnell, CSA approved Series 6400 series system with clocks and controls as specified in paragraphs which follow. Note that series numbers may be obsolete. Confirm updated series with manufacturer and provide approved equivalent series.
- B.—General 6400 series time control centre shall include:
- 1.—six (6) programmable microprocessor program control circuits, 4 program schedules; system software programme;
  - 2.—LCD display;
  - 3.—7 day battery standby;
  - 4.—automatic daylight savings adjustment;
  - 5.—manual override switches;
  - 6.—impulse clock control;
  - 7.—interface to external synchronization via RS232;
  - 8.—clock load relays as required.
- C.—SimplexGrinnell, CSA approved, analogue, synchronous wired clocks as follows:
- 1.—300 mm (12") round;
  - 2.—face, hands and numbers to be confirmed by Owner during shop drawing submission;
  - 3.—integral nickel cadmium battery backup;
  - 4.—moulded high impact ABS case (confirm exact finish with Architect);
  - 5.—protective wire guards;
  - 6.—protective ABS acrylic guards;
  - 7.—flush mounting backbox with semi-flush mounting kit;
  - 8.—120 VAC operation;
  - 9.—system wiring as per manufacturer's requirements.
- D.—SimplexGrinnell, CSA approved, 2301, "Celestra" direct read, digital, synchronous wired clocks as follows:
- 1.—illuminated 50 mm (2") high LCD;
  - 2.—integral nickel cadmium battery backup;
  - 3.—line amplifiers as required;
  - 4.—moulded high impact ABS case (confirm exact finish with Architect);
  - 5.—protective wire guards;
  - 6.—protective ABS acrylic guards;
  - 7.—flush mounting backbox with semi-flush mounting kit;
  - 8.—low voltage operation, as required to suit system requirements;
  - 9.—system wiring as per manufacturer's requirements.
- E.—Provide manufacturer's supplied and recommended suitable power and hanging receptacle that is integrated with backbox to allow for recessed wall mounting of clocks.
- F.—Manufacturer's representative to provide following on site work:

- ~~1. programme system head end;~~
- ~~2. inspect installation;~~
- ~~3. adjust, test, start-up and certify system.~~

~~G.E.~~ Acceptable manufacturers are:

- ~~1. Primex;~~
- ~~2. Sapling (Time Trackers).~~
- ~~1. SimplexGrinnell;~~
- ~~2. Chubb Edwards;~~
- ~~3. Siemens;~~
- ~~4. Dukane;~~
- ~~5. Rauland.~~

#### **2.42.2 BATTERY OPERATED STANDARD CLOCKS**

- A. GE model 24A716, ULC listed and labelled, 300 mm (12") round faced, battery operated standard clocks as follows:
  1. stand alone, analogue type with quartz movement;
  2. surface mounting;
  3. 12/24 hour display;
  4. black minute and hour hands and red seconds hand;
  5. high impact polycarbonate housing;
  6. polycarbonate lens;
  7. wire guard where noted;
  8. alkaline batteries.
- B. Acceptable manufacturers/vendors:
  1. SimplexGrinnell;
  2. GE/Chubb Edwards;
  3. Rauland;
  4. Siemens.

### **PART 3 - EXECUTION**

#### **INSTALLATION OF MASTER WIRELESS CLOCK SYSTEM**

~~Provide specified master clock system. Include for and arrange for system manufacturers authorized representative to program system and to integrate to other low voltage systems. Connect complete. Provide wiring in conduit and/or in cable trays where noted. Provide suitable recessed backboxes for mounting of clocks.~~

~~Obtain required training from manufacturer's representative on any special installation procedures. Install devices and perform work in accordance with the manufacturer's instructions and requirements and in accordance to applicable codes of the governing authorities having jurisdiction.~~

~~Size transmitters and of quantity to provide coverage of areas throughout complex, as per manufacturer's recommendations.~~

~~Locate clocks in coverage areas of wireless access points to ensure WiFi signal is available for proper synchronization and operation of clocks.~~

~~Perform a site coverage test to ensure proper operation of clocks in locations as shown and in areas where future clocks may be added. Adjust, relocate, and/or add to system as required to provide full coverage of building.~~

~~Provide 120VAC power circuits to clocks requiring such power. Digital clocks with timers require 120 VAC power as confirmed with manufacturer.~~

~~Install remote control units of digital clock timers, in recessed wall boxes. Connect to clock units with required wiring in conduit.~~

~~Coordinate location of GPS antennae installation with Consultant to suit exterior architectural aspects of building. Obtain Consultant's approval of location and routing of cabling prior to roughing in.~~

~~Coordinate network connections to Owner's LAN with Owner's IT Department. Install software onto server and programme to suit project requirements and Owner's directions.~~

~~Coordinate RJ45 outlet and structured cabling requirements with vendor responsible for providing structured network cabling system. Install telecom jack at each clock outlet and extend telecom UTP cabling back to LAN equipment serving area. Refer to section regarding structured network cabling for product and installation requirements.~~

~~Confirm exact clock requirements with Consultant prior to ordering.~~

~~Confirm locations of clocks and equipment with Consultant prior to roughing-in.~~

~~Ground and bond system as required by local governing electrical code and authority and system manufacturer.~~

~~Provide onsite system inspection, testing, adjusting, start-up, and verification as specified in Part 1.~~

~~Demonstrate operation to Owner and Consultant.~~

~~Refer to drawings for system riser diagram and locations of equipment.~~

### 3.1 INSTALLATION OF MASTER WIRED CLOCK SYSTEM

A. Provide master clock system. Manufacturer authorized representative to program system and to integrate to other low voltage systems. Connect complete. Provide wiring in conduit, and in cable trays and J-hooks, where noted, in accordance with Division 27 specifications. Provide recessed backboxes for mounting of clocks.

B. Obtain training from manufacturer representative on special installation procedures. Install devices and perform work in accordance with manufacturer instructions and requirements.

C. Provide PoE to PoE type clocks. Where PoE is provided through user switch, coordinate requirements with end user reviewed with Consultant. Where switch connections are not supplied, provide PoE injectors for providing power to clocks.

D. Review network connections to master clocks with Consultant. Install system software onto server and program, suiting project requirements and programming reviewed with Consultant.

E. Coordinate telecommunications jacks and cabling requirements with Division 27 vendor responsible for providing telecommunications system. Install jack at each clock outlet and extend telecommunication cabling back to LAN equipment serving area. Perform work in accordance with Division 27 telecommunications standards and requirements.

F. Prior to ordering, review clock types, faces, finishes and sizes with Consultant.

G. Prior to roughing-in, review locations of clocks and equipment with Consultant.

A.—Ground and bond system. Provide specified clocks and controller and install devices in accordance with manufacturer's requirements. Programme system to suit Owner's requirements.

B.—Install clocks on mounting hanger type receptacles and connect complete. Provide wiring in conduit.

C.—Confirm exact locations of devices and finishes with Consultant prior to roughing-in.

D.—Ground and bond system as required by local governing electrical code and authority and system manufacturer.

E.—Provide onsite system inspection, testing, adjusting, start-up, and verification as specified in Part 1.

F.—Demonstrate operation to Owner and Consultant.

G.H.——Refer to drawings for system riser diagram and locations of equipment.

### 3.2 INSTALLATION OF BATTERY OPERATED STANDARD CLOCKS

A. Install clocks in accordance with manufacturer's instructions to suit application.

B. Provide backbox suitable for wall installation.

C. Confirm clock face 12 or 24 hour display requirements and finishes with Consultant prior to ordering.

D. Check and test operation.

### **3.3 SOFTWARE NOMENCLATURE REPROGRAMMING**

A. Make onsite final changes to system and equipment software, incorporating final room names/area names/building names and equipment identification. Review naming nomenclature with Consultant.

### **3.4 IDENTIFICATION**

A. Provide product identification.

B. Identify main system equipment with engraved nameplates, size 4 unless otherwise noted.

C. Permanently tag cable and equipment installation with identification noted and cross referenced on as-built drawings. Upon completion, verification and acceptance of installed systems, submit drawings to Consultant.

### **3.5 FIELD QUALITY CONTROL**

A. Inspection, Start-up, Testing and Verification:

1. Inspect, start-up, test and verify products as per manufacturer requirements.
2. Check connections and operations.

D.B. Prepare testing and verification reports, signed by testing technicians. Submit reports to Consultant.

**END OF SECTION**

FIRE ALARM SYMBOLS	
SYMBOL	DESCRIPTION
	RECESSED OR SURFACE FIRE ALARM CONTROL PANEL.
	RECESSED OR SURFACE MOUNTED FIRE ALARM ANNUNCIATOR PANEL.
	FIRE ALARM SYSTEM LOCAL GRAPHIC ANNUNCIATOR PANEL.
	FIRE ALARM PULL STATION MOUNTED 3'-10" (1150mm) ABOVE FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED.
	SIMILAR TO ABOVE, EXCEPT: "CG" WHERE SHOWN, DENOTES DEVICE c/w CLEAR GLASS. "WG" WHERE SHOWN, DENOTES DEVICE c/w WIRE GUARD. "WP" WHERE SHOWN, DENOTES WEATHERPROOF DEVICE. "EX" WHERE SHOWN, DENOTES EXPLOSION PROOF. "A" WHERE SHOWN, DENOTES DEVICE c/w AUXILIARY CONTACTS FOR CONNECTION TO MAGLOCK ELEVATOR CONTROL. "BG" WHERE SHOWN, DENOTES "BREAK GLASS" TYPE. "K" WHERE SHOWN, DENOTES DEVICE c/w KEY RESET. "ML" WHERE SHOWN, DENOTES DEVICE c/w AUXILIARY CONTACTS FOR MAG-LOCK.
	AUTOMATIC HEAT DETECTOR 15°F (8.3°C) RATE OF RISE AND FIXED TEMPERATURE TYPE 135°F (57°C) RATED AT 2500 SQFT (232sqm) COVERAGE, CEILING MOUNTED TYPE.
	AUTOMATIC HEAT DETECTOR 15°F (8.3°C) RATE OF RISE AND FIXED TEMPERATURE TYPE 135°F (57°C) RATED AT 2500 SQFT (232sqm) COVERAGE, WALL MOUNTED TYPE.
	PRODUCTS OF COMBUSTION DETECTOR IONIZATION, CEILING MOUNTED TYPE.
	PRODUCTS OF COMBUSTION DETECTOR IONIZATION, WALL MOUNTED TYPE.
	PRODUCTS OF COMBUSTION DETECTOR PHOTO ELECTRIC, CEILING MOUNTED TYPE.
	PRODUCTS OF COMBUSTION DETECTOR PHOTO ELECTRIC, WALL MOUNTED TYPE.
	PRODUCTS OF COMBUSTION DETECTOR, DUCT TYPE WITH SAMPLING TUBES.
	FIRE ALARM HORN, CEILING MOUNTED.
	FIRE ALARM HORN, CEILING MOUNTED AND STROBE LIGHT, CEILING MOUNTED.
	COMBINATION FIRE ALARM HORN AND STROBE LIGHT, MOUNTED APPROXIMATELY 12" (300mm) BELOW FINISHED CEILING, UNLESS OTHERWISE NOTED.
	FIRE ALARM STROBE, CEILING MOUNTED TYPE.
	FIRE ALARM STROBE, MOUNTED APPROXIMATELY 12" (300mm) BELOW FINISHED CEILING, UNLESS OTHERWISE NOTED.
	FIRE ALARM ISOLATION MODULE.
	FIRE ALARM ISOLATION MODULE.
	FIRE ALARM END OF LINE RESISTOR.

CLOCK SYMBOLS	
SYMBOL	DESCRIPTION
	CLOCK.
	DUAL FACE CLOCK.

POWER SYMBOLS	
SYMBOL	DESCRIPTION
	120V, 1PH CONNECTION TO EQUIPMENT.
	208V, 1PH CONNECTION TO EQUIPMENT.
	208V, 3PH CONNECTION TO EQUIPMENT.
	600V, 1PH CONNECTION TO EQUIPMENT.
	600V, 3PH CONNECTION TO EQUIPMENT.
	SINGLE-PHASE AND THREE-PHASE MOTOR CONNECTIONS.
	FUSED DISCONNECT SWITCH.
	NON-FUSED DISCONNECT SWITCH.
	MOTOR STARTER.
	VARIABLE FREQUENCY DRIVE.
	SYSTEMS FURNITURE CONNECTION (POWER & DATA).
	SURFACE & RECESSED ELECTRICAL DISTRIBUTION PANEL.
	AUTOMATIC DOOR OPERATOR PUSH BUTTON.

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RECEPTACLE SYMBOLS	
SYMBOL	DESCRIPTION
	DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED. "W" WHERE SHOWN, DENOTES WEATHERPROOF DEVICE. "WP" WHERE SHOWN, DENOTES WEATHERPROOF DEVICE. "C" WHERE SHOWN, DENOTES CEILING MOUNTED TYPE. "TL" WHERE SHOWN, DENOTES TWIST LOCK. "GFI" WHERE SHOWN, DENOTES GFCI CIRCUIT BREAKER IN PANEL. "HK" WHERE SHOWN, DENOTES HOUSEKEEPING RECEPTACLE.
	DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED WITHIN FURNITURE.
	DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED GFI TYPE RECEPTACLE MOUNTED APPROXIMATELY 18" (450 mm) ABOVE FINISHED FLOOR.
	TWO DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED. MOUNTED IN COMMON DEVICE BOX.
	SPLIT WIRED DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	TAMPER PROOF (SAFETY SHUTTER) DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE WITH TWO USB CHARGING OUTLETS MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	DUPLEX U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	DUPLEX U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED WITHIN FURNITURE.
	DUPLEX U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED GFI TYPE RECEPTACLE MOUNTED APPROXIMATELY 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	TWO DUPLEX U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED. MOUNTED IN COMMON DEVICE BOX.
	DUPLEX U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE WITH TWO USB CHARGING OUTLETS MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 5-20R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE MOUNTED 18" (450 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 6-15R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 6-20R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 6-30R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 6-30R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 14-15R, 120/240 VOLT, 3-POLE, 4 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 14-20R, 120/240 VOLT, 3-POLE, 4 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 14-30R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 14-30R, 240 VOLT, 2-POLE, 3 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	SINGLE U-GROUND 14-50R, 120/240 VOLT, 3-POLE, 4 WIRE GROUNDED RECEPTACLE MOUNTED 12" (300 mm) ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED.
	RECESSED FLOORBOX CW DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLE.
	RECESSED FLOORBOX CW TWO DUPLEX U-GROUND 5-15R, 120 VOLT, 3 WIRE GROUNDED RECEPTACLES.

LIGHTING CONTROLS SYMBOLS	
SYMBOL	DESCRIPTION
	LINE VOLTAGE SWITCH, MOUNTED 4'-0" (1200mm) ABOVE FINISHED FLOOR LEVEL TO CENTER LINE, UNLESS OTHERWISE NOTED.
	SIMILAR TO EXCEPT: "K" WHERE SHOWN, DENOTES KEY SWITCH. "P" WHERE SHOWN, DENOTES SWITCH AND PILOT LIGHT. "3" WHERE SHOWN, DENOTES 3-WAY SWITCH. "4" WHERE SHOWN, DENOTES 4-WAY SWITCH. "M" WHERE SHOWN, DENOTES MANUAL SWITCH. "DV" WHERE SHOWN, DENOTES DIMMER PLUS VACANCY SENSOR. "TV" WHERE SHOWN, DENOTES MANUAL TIME SWITCH. "LV" WHERE SHOWN, DENOTES LOW VOLTAGE SWITCH. "V" WHERE SHOWN, DENOTES VARIABLE SPEED CONTROLLER SWITCH. "WP" WHERE SHOWN, DENOTES WET LOCATION DEVICE. "EX" WHERE SHOWN, DENOTES EXPLOSION PROOF.
	DIMMER SWITCH, MOUNTED 4'-0" (1200mm) ABOVE FINISHED FLOOR LEVEL TO CENTER LINE, UNLESS OTHERWISE NOTED.
	OCCUPANCY SWITCH, MOUNTED 4'-0" (1200mm) ABOVE FINISHED FLOOR LEVEL TO CENTER LINE, UNLESS OTHERWISE NOTED. REFER TO ELECTRICAL SPECIFICATIONS FOR DETAILS.
	VACANCY SWITCH, MOUNTED 4'-0" (1200mm) ABOVE FINISHED FLOOR LEVEL TO CENTER LINE, UNLESS OTHERWISE NOTED. REFER TO ELECTRICAL SPECIFICATIONS FOR DETAILS.
	OCCUPANCY SENSOR, REFER TO ELECTRICAL SPECIFICATIONS FOR DETAILS.
	COMBINATION OCCUPANCY SENSOR WITH BUILT IN DAYLIGHT SENSOR FUNCTIONALITY. REFER TO ELECTRICAL SPECIFICATIONS FOR DETAILS.
	VACANCY REFER TO ELECTRICAL SPECIFICATIONS FOR DETAILS.

DEMOLITION LEGEND	
SYMBOL	DESCRIPTION
	EXISTING DEVICE TO REMAIN
	EXISTING DEVICE TO BE DEMOLISHED
	EXISTING DEVICE TO BE RELOCATED
	EXISTING DEVICE TO BE REMOVED AND REPLACED

SINGLE LINE DIAGRAM SYMBOLS	
SYMBOL	DESCRIPTION
	DISTRIBUTION TRANSFORMER
	MOLDED CASE CIRCUIT BREAKER
	FUSE
	UNFUSED VOLTAGE DISCONNECT SWITCH
	FUSE DISCONNECT SWITCH
	AUTOMATIC TRANSFER SWITCH WITHOUT MANUAL BYPASS
	CURRENT/POTENTIAL METER c/w TRANSFORMER
	CURRENT METER c/w TRANSFORMER
	BUSBAR
	SURGE PROTECTION DEVICE
	GENERATOR
	MOTOR
	PANELBOARDS RPP: DENOTES RECEPTACLE PANELBOARD (120/208V SYSTEM) PPP: DENOTES POWER PANELBOARD (120/208V SYSTEM) DP: DENOTES DISTRIBUTION PANELBOARDS

LIGHTING FIXTURE SYMBOLS	
SYMBOL	DESCRIPTION
	LINEAR RECESSED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR SURFACE LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR SUSPENDED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR STRIP LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	RECESSED WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	SURFACE WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	RECESSED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR RECESSED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR SURFACE LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR SUSPENDED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR STRIP LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	LINEAR WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	RECESSED WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	SURFACE WALL MOUNTED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	RECESSED LUMINAIRE, REFER TO LUMINAIRE SCHEDULE FOR FIXTURE TYPE AND DETAILS.
	EXIT SIGN - CEILING MOUNTED, COMPLETE WITH DIRECTIONAL ARROWS AS SHOWN. "WP" DENOTES WEATHERPROOF TYPE. NUMBER INDICATES BATTERY SUPPLY CIRCUITING.
	EXIT SIGN - WALL MOUNTED, COMPLETE WITH DIRECTIONAL ARROWS AS SHOWN. "WP" DENOTES WEATHERPROOF TYPE. NUMBER INDICATES BATTERY SUPPLY CIRCUITING.
	REMOTE EMERGENCY LIGHTING HEAD, NUMBER INDICATES BATTERY SUPPLY CIRCUITING.
	EMERGENCY BATTERY PACK c/w DUAL HEADS AND DUPLEX RECEPTACLE (6-15R); NUMBER INDICATES BATTERY AND REMOTE HEAD CIRCUITING.

LINETYPE / SHADING LEGEND	
SYMBOL	DESCRIPTION
	FIRE ALARM ZONE BOUNDARY (FIRE ALARM DRAWINGS)
	DAYLIGHT ZONE FOR LIGHTING CONTROL (LIGHTING DRAWINGS)
	PROPOSED SHELLED SPACE AREAS

SECURITY SYMBOLS	
SYMBOL	DESCRIPTION
	ACCESS CONTROL PANEL.
	INTRUSION ALARM CONTROL PANEL.
	ACCESS CONTROL CARD READER.
	ACCESS CONTROL COMBINATION CARD READER KEYPAD.
	ACCESS CONTROL BIOMETRIC READER.
	ACCESS CONTROL KEYPAD.
	ACCESS CONTROL KEYPAD SWITCH.
	BUZZER MOUNTED MAXIMUM 6'-0" (2400mm) ABOVE FINISHED FLOOR.
	SECURITY SYSTEM DOOR ALARM CONTACTS, RECESSED IN DOOR AND FRAME.
	ACCESS CONTROL ELECTRIC STRIKE.
	LOCK STATUS SENSOR.
	LOCKABLE DEVICE - TO BE DETERMINED BY DOOR HARDWARE CONSULTANT.
	EXIT SENSOR.
	REQUEST TO EXIT PUSHBUTTON.
	REMOTE READER ELECTRONICS CONTROL BOX.
	REQUEST TO EXIT MOTION DETECTOR.
	REQUEST TO EXIT HANDLE.
	INTRUSION ALARM GLASSBREAK DETECTOR.
	INTRUSION ALARM MOTION DETECTOR.
	INTRUSION ALARM KEYPAD.
	CEILING MOUNTED INTRUSION ALARM STROBE INDICATOR.
	WALL MOUNTED INTRUSION ALARM STROBE INDICATOR.
	CEILING MOUNTED INTRUSION ALARM HORN INDICATOR.
	WALL MOUNTED INTRUSION ALARM HORN INDICATOR.
	CEILING MOUNTED INTRUSION ALARM HORN STROBE INDICATOR.
	WALL MOUNTED INTRUSION ALARM HORN STROBE INDICATOR.
	DURESS ALARM INTERCOM STATION.
	MASTER INTERCOM STATION.
	SLAVE INTERCOM STATION.
	DURESS ALARM PANIC BUTTON.
	DURESS ALARM PANIC BUTTON WIRELESS.
	SECURITY SYSTEM JUNCTION BOX.
	POWER TRANSFORMER FOR SECURITY DEVICES.
	CEILING OR WALL MOUNTED CLOSED CIRCUIT TELEVISION CAMERA FOR SECURITY SYSTEM. "WP" WHERE SHOWN, DENOTES WET LOCATION HOUSING.
	CEILING OR WALL MOUNTED CLOSED CIRCUIT TELEVISION CAMERA FOR SECURITY SYSTEM REQUIRING 120V POWER CONNECTION. "WP" WHERE SHOWN, DENOTES WET LOCATION HOUSING.
	CEILING OR WALL MOUNTED CLOSED CIRCUIT TELEVISION CAMERA FOR SECURITY SYSTEM REQUIRING 120V POWER CONNECTION. "WP" WHERE SHOWN, DENOTES WET LOCATION HOUSING.
	CEILING OR WALL MOUNTED CLOSED CIRCUIT TELEVISION CAMERA FOR SECURITY SYSTEM. "TH" WHERE SHOWN, DENOTES THERMAL CAMERA.

DATA & VOICE SYMBOLS	
SYMBOL	DESCRIPTION
	VOICE OUTLET, MOUNTED 18" (450mm) ABOVE FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED. (1V - WHERE #V DENOTES NUMBER OF VOICE DROPS).
	FURNITURE MOUNTED VOICE OUTLET (1V - WHERE #V DENOTES NUMBER OF VOICE DROPS).
	DATA OUTLET, MOUNTED 18" (450mm) ABOVE FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED. (1D - WHERE #D DENOTES NUMBER OF DATA DROPS).
	FLOORBOX MOUNTED DATA OUTLET. (1D - WHERE #D DENOTES NUMBER OF DATA DROPS).
	FURNITURE MOUNTED DATA OUTLET (1D - WHERE #D DENOTES NUMBER OF DATA DROPS).
	COMBINATION DATA/VOICE OUTLET, MOUNTED 18" (450mm) ABOVE FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED. (1D/1V - WHERE #D DENOTES NUMBER OF DATA DROPS AND #V DENOTES NUMBER OF VOICE DROPS).
	FURNITURE MOUNTED COMBINATION DATA/VOICE OUTLET. (1D/1V - WHERE #D DENOTES NUMBER OF DATA DROPS AND #V DENOTES NUMBER OF VOICE DROPS).
	AMPLIFIED SPEAKER COMMUNICATION SYSTEM.
	WIRELESS ACCESS POINT.
	AUDIO VISUAL SYSTEM SPEAKER - CEILING MOUNTED.
	PUBLIC ADDRESS SPEAKER - WALL MOUNTED.
	PUBLIC ADDRESS SPEAKER - CEILING MOUNTED.

ABBREVIATIONS	
SYMBOL	DESCRIPTION
WP	"WP" WHERE SHOWN, DENOTES DEVICE MOUNTED IN WEATHERPROOF BACK BOX WITH WEATHERPROOF COVER.
C	"C" WHERE SHOWN, DENOTES DEVICE IS CEILING MOUNTED.
UIC	"UIC" WHERE SHOWN, DENOTES MOUNTED UNDERCOUNTER.
UIF	"UIF" WHERE SHOWN, DENOTES UNFUSED DISCONNECT SWITCH.
AF	"AF" WHERE SHOWN, DENOTES BREAKER AMPERAGE FRAME SIZE.
AT	"AT" WHERE SHOWN, DENOTES BREAKER AMPERAGE TRIP SETTING.
MLO	"MLO" WHERE SHOWN, DENOTES MAIN LUG ONLY.
ADO	AUTOMATIC DOOR OPERATOR.
A.F.F.	ABOVE FINISHED FLOOR.
C.W	COMPLETE WITH.
SP	SPARE.
Cu	COPPER CONDUCTOR.
PR	PRINTER.
SC	SCANNER.
SH	SHREDDER.
MFP	MULTI-FUNCTION PRINTER.
MW	MICROWAVE.
FR	FRIDGE.
FRZ	FREEZER.
DW	DISHWASHER.
ACLV	AUTOCLAVE.
INC	INCUBATOR.
CFG	CENTRIFUGE.
CM	COFFEE MACHINE.
US CLN	ULTRASONIC CLEANER.
WD	WATER DISPENSER.
SD	STANDING DESK.
EL	EXAMINATION LIGHT.
ET	EXAMINATION TABLE.
EB	ELECTRIC BED.
EF	ELECTRONIC FAUCET.
(B)	SYMBOL INDICATES 'BASIC PATIENT CARE AREA'

ELECTRICAL DRAWING LIST	
SHEET No.	SHEET NAME
E-001	DRAWING LIST AND LEGENDS
E-101	SITE PLAN - ELECTRICAL.
E-200	LEVEL B1 - LIGHTING
E-201	LEVEL 01 - LIGHTING
E-202	LEVEL 02 - LIGHTING
E-300	LEVEL B1 - POWER
E-301	LEVEL 01 - POWER
E-302	LEVEL 02 - POWER
E-303	ROOF - POWER
E-400	LEVEL B1 - COMMUNICATIONS
E-401	LEVEL 01 - COMMUNICATIONS
E-402	LEVEL 02 - COMMUNICATIONS
E-500	LEVEL B1 - SECURITY AND FIRE ALARM
E-501	LEVEL 01 - SECURITY AND FIRE ALARM
E-502	LEVEL 02 - SECURITY AND FIRE ALARM
E-601	STANDARD DETAILS - ELECTRICAL
E-602	STANDARD DETAILS - ELECTRICAL
E-603	STANDARD DETAILS - ELECTRICAL DOOR DETAILS
E-604	STANDARD DETAILS - COMMUNICATIONS
E-605	STANDARD DETAILS - COMMUNICATIONS
E-606	STANDARD DETAILS - MAGLOCK WIRING SCHEMATIC
E-607	STANDARD DETAILS - SECURITY RISER
E-701	SINGLE LINE DIAGRAMS / DEMOLITION AND NEW
E-702	ELECTRICAL RISERS - SHEET 1
E-801	ENLARGED PLANS - ELECTRICAL
E-802	FEEDER ROUTING PLANS
E-900	LEVEL B1 - DEMOLITION WORK
E-901	LEVEL 01 - DEMOLITION WORK
E-902	LEVEL 02 - DEMOLITION WORK
E-1101	SCHEDULES - ELECTRICAL
E-1102	SCHEDULES - ELECTRICAL
E-1103	SCHEDULES - ELECTRICAL
E-1104	SCHEDULES - ELECTRICAL
E-1105	SCHEDULES - ELECTRICAL
E-1106	SCHEDULES - ELECTRICAL
E-1107	SCHEDULES - ELECTRICAL



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Project Manager	DG
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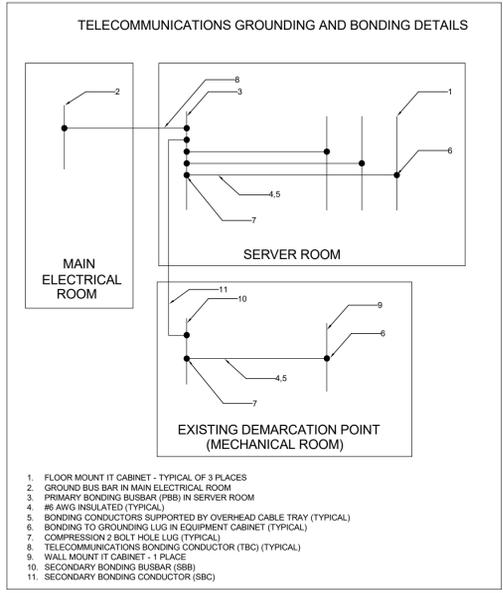
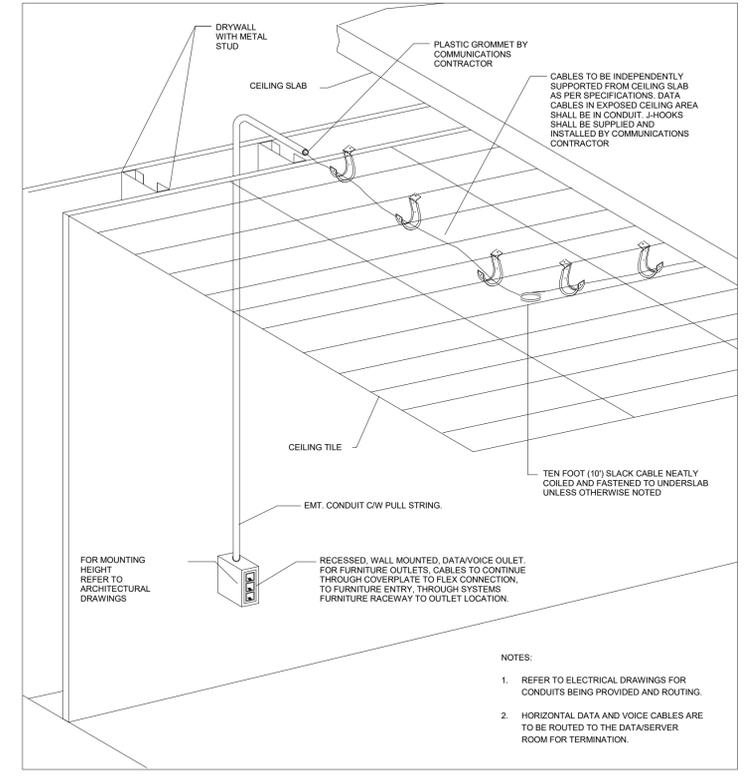


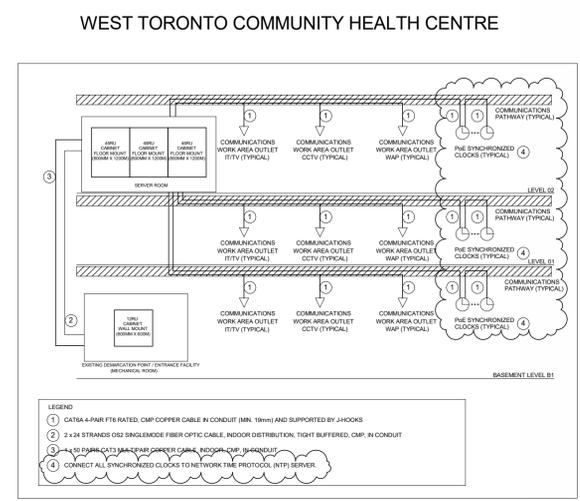
TABLE - TBB CONDUCTOR SIZE VS LENGTH

TBB LINEAR LENGTH M (FT)	CONDUCTOR SIZE (AWG)
LESS THAN 4 (13)	6
4 - 6 (14 - 20)	4
6 - 8 (21 - 26)	3
8 - 10 (27 - 33)	2
10 - 13 (34 - 41)	1
13 - 16 (42 - 52)	1 / 0
16 - 20 (53 - 66)	2 / 0
20 - 26 (67 - 84)	3 / 0
26 - 32 (85 - 105)	4 / 0
32 - 38 (106 - 125)	250 kcmil
38 - 46 (126 - 150)	300 kcmil
46 - 53 (151 - 175)	350 kcmil
53 - 76 (176 - 250)	500 kcmil
76 - 91 (251 - 300)	600 kcmil
GREATER THAN 91 (301)	750 kcmil

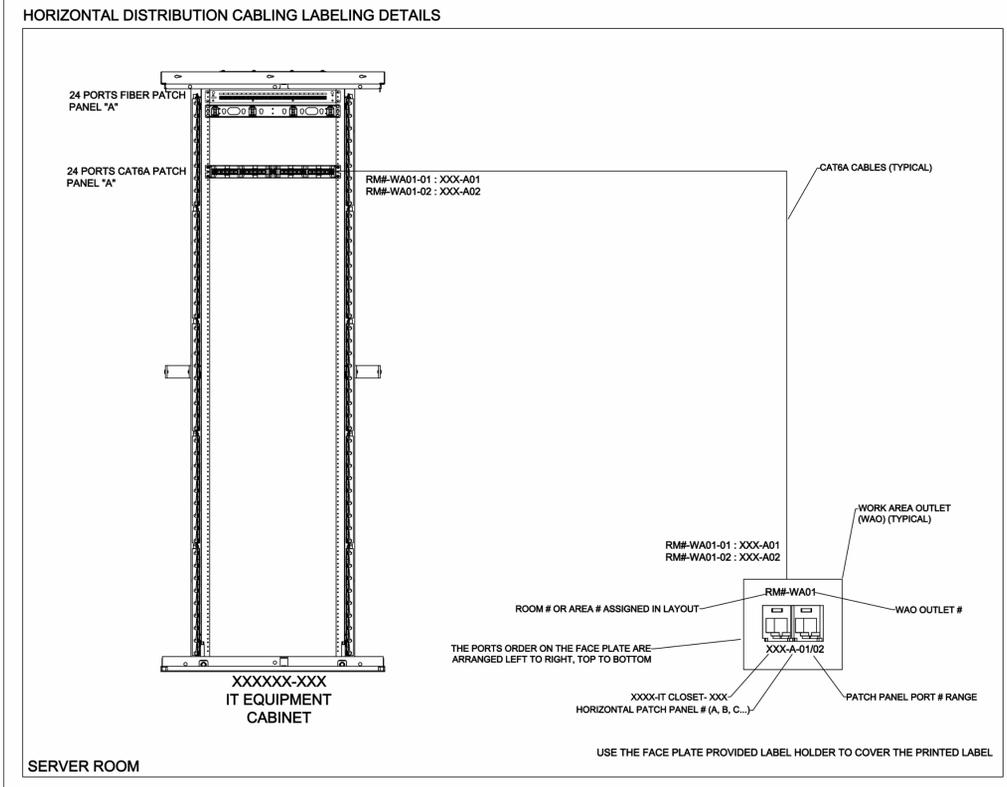
2 TELECOM GROUNDING AND BONDING SINGLE LINE DIAGRAM NTS.



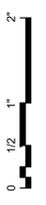
1 TYPICAL DATA DROP INSTALLATION & J-HOOK CABLE MANAGEMENT NTS.



4 IT COMMUNICATIONS RISER DIAGRAM NTS.



3 HORIZONTAL DISTRIBUTION CABLES LABELING DETAILS NTS.



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Project Architect	HDR
Landscape Architect	
Civil Engineer	WSP
Structural Engineer	WSP
Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	HDR
Interior Designer	HDR
Equipment Planner	
Wayfinding	

Sheet Reviewer	NM
----------------	----

MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR PERMIT
6	2024-09-17	ISSUED FOR ESA
7	2024-09-13	ISSUED FOR TENDER
8	2024-10-17	ISSUED FOR ADD-E02

Project Number	10355669
Original Issue	07/08/22

Sheet Name  
**STANDARD DETAILS - COMMUNICATIONS**

Sheet Number  
**E-604**

Project Status  
ISSUED FOR ADD-E02





C

B

A

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PANEL 'DP-BA'													
NORMAL POWER													
LOCATION: ELECTRICAL 003			VOLTAGE: 600V/3Ø/4W			BUS MATERIAL: COPPER			ISOLATED GROUND: <input type="checkbox"/>				
FED FROM:			PHASE: 3Ø			MAINS TYPE: MAIN BREAKER			100% RATED: <input type="checkbox"/>				
FEEDERS: REFER TO SLD			WIRES: 4W			MAIN BREAKER: 600 A							
MOUNTING: SURFACE			MAINS RATING: 600 A			SUB-FEED LUGS: <input type="checkbox"/>							
ENCLOSURE: NEMA 2			KAIC RATING: 25 kA			FEED-THROUGH LUGS: <input type="checkbox"/>							
CCT No.	LOAD DESCRIPTION	NOTE	POLES	RATING	LOAD (VA)	LOAD (VA)	RATING	POLES	NOTE	LOAD DESCRIPTION	CCT No.		
1											2		
3	MDP-BA		3	300 A	277513	54040	70 A	3		ELEVATOR MOTOR - ELEV. MACHINE ROOM	4		
5											6		
7											8		
9	TX-BA		3	250 A	262911						10		
11											12		
13											14		
15											16		
17											18		
19											20		
21	SPACE		3	--	--	--	--	3	--	SPACE	22		
23											24		
LOAD CLASSIFICATION		CONNECTED LOAD (VA)	DEMAND FACTOR (%)	ESTIMATED DEMAND (VA)	PANEL TOTALS								
LIGHTING		14031 VA	90.00%	12628 VA	LOAD	ESTIMATED DEMAND (VA)	CURRENT (A)						
MISC.		24444 VA	70.00%	17111 VA	TOTAL	347666 VA	335 A						
MOTOR		357268 VA	60.00%	214361 VA	AVAILABLE	151165 VA	145 A						
OTHER		3590 VA	100.00%	3590 VA									
RECEPTACLE		129270 VA	50.00%	64635 VA									
POWER		6600 VA	50.00%	3300 VA									
MECH EQUIP.		1800 VA	70.00%	1260 VA									
KITCHEN		32641 VA	50.00%	16320 VA									
** AVAILABLE CURRENT IS CALCULATED ASSUMING 80% RATED EQUIPMENT**													
NOTES:													

PANEL 'DP-BEA'													
NORMAL POWER													
LOCATION: ELECTRICAL 003			VOLTAGE: 208V/3Ø/4W			BUS MATERIAL: COPPER			ISOLATED GROUND: <input type="checkbox"/>				
FED FROM:			PHASE: 3Ø			MAINS TYPE: MAIN BREAKER			100% RATED: <input type="checkbox"/>				
FEEDERS: REFER TO SLD			WIRES: 4W			MAIN BREAKER: 200 A							
MOUNTING: SURFACE			MAINS RATING: 400 A			SUB-FEED LUGS: <input type="checkbox"/>							
ENCLOSURE: NEMA 2			KAIC RATING: 25 kA			FEED-THROUGH LUGS: <input type="checkbox"/>							
CCT No.	LOAD DESCRIPTION	NOTE	POLES	RATING	LOAD (VA)	LOAD (VA)	RATING	POLES	NOTE	LOAD DESCRIPTION	CCT No.		
1											2		
3	ATS-BEA		3	200 A	22196						4		
5											6		
7											8		
9											10		
11											12		
13											14		
15											16		
17											18		
19											20		
21	SPACE		3	--	--	--	--	3	--	SPACE	22		
23											24		
LOAD CLASSIFICATION		CONNECTED LOAD (VA)	DEMAND FACTOR (%)	ESTIMATED DEMAND (VA)	PANEL TOTALS								
LIGHTING		1250 VA	90.00%	1125 VA	LOAD	ESTIMATED DEMAND (VA)	CURRENT (A)						
MISC.		2750 VA	70.00%	1925 VA	TOTAL	12662 VA	35 A						
MOTOR		5436 VA	60.00%	3262 VA	AVAILABLE	44981 VA	125 A						
OTHER		540 VA	100.00%	540 VA									
RECEPTACLE		11100 VA	50.00%	5550 VA									
POWER		100 VA	50.00%	50 VA									
MECH EQUIP.		300 VA	70.00%	210 VA									
** AVAILABLE CURRENT IS CALCULATED ASSUMING 80% RATED EQUIPMENT**													
NOTES:													

LUMINAIRES SCHEDULE														
TYPE	MANUFACTURER AND CATALOG ORDER KEY	PRODUCT DESCRIPTION	SIZE	VOLTS	WATTS	CRI	COLOUR TEMP	LUMENS	DRIVER	MOUNTING			NOTES	
										POLE	RECESSED	SURFACE		
A1	LITHONIA LIGHTING - CSS L48 AL03 MVOLT 35K 80CRI	SINGLE STRIP LED, SWITCHABLE LUMENS 3000/4000/5000	1219 mm	120	27.3	80	3500	3000	0-10V			X	1	
A2	LITHONIA LIGHTING - CSS L48 AL03 MVOLT 35K 80CRI	SINGLE STRIP LED, SWITCHABLE LUMENS 3000/4000/5000	1219 mm	120	36.2	80	3500	4000	0-10V			X	1	
A3	LITHONIA LIGHTING - CSS L48 AL03 MVOLT 35K 80CRI	SINGLE STRIP LED, SWITCHABLE LUMENS 3000/4000/5000	1219 mm	120	43.3	80	3500	5000	0-10V			X	1	
A4/OS	LITHONIA LIGHTING - BLWP4 48L ADP GZ10 LP835 RES7PDT	LOW PROFILE 4' LED WRAPAROUND, CURVED, RIBBED LENS, C/W INTEGRAL OCC. SENSOR AND AUTOMATIC DIMMING	1219 mm	120	40	82	3500	5137	0-10V			X	1	
B1	GOTHAM IVO65 D 20LM 35K 80CRI MWD MIN10 MVOLT ST NCH TRIM: P-AR-LSS-F	6" ROUND DOWNLIGHT, ULTRA SHALLOW, SELF FLANGED, CLEAR SEMI-SPECULAR OPEN REFLECTOR, MEDIUM WIDE BEAM DISTRIBUTION	152 mm dia.	120	17.5	90	3500	2046	0-10V		X		1	
B2	GOTHAM IVO65 D 15LM 35K 80CRI MWD MIN10 MVOLT ST NCH TRIM: P-AR-LSS-F	6" ROUND DOWNLIGHT, ULTRA SHALLOW, SELF FLANGED, CLEAR SEMI-SPECULAR OPEN REFLECTOR, MEDIUM WIDE BEAM DISTRIBUTION	152 mm dia.	120	13.3	90	3500	1541	0-10V		X		1	
C1	GOTHAM EVO6 SH 3520 DFF S0L MVOLT EZ1	6" SHOWER DOWNLIGHT, IP66 RATED, FLUSH CLEAR LENS	152 mm dia.	120	19.7	85	3500	1729	0-10V		X		1	
E1	LITHONIA LIGHTING - CPX 2X2 AL07 4000LM 80CRI SWW7 35KA12 MVOLT	2' X 2' BACK LIT LED FLAT PANEL, HIGH LUMEN PACKAGE, PRISMATIC LENS	610mmx610mm	120	34.9	80	3500	4322	0-10V		X		1	
E2	LITHONIA LIGHTING - CPX 2X2 AL07 2500LM 80CRI SWW7 35KA12 MVOLT	2' X 2' BACK LIT LED FLAT PANEL, LOW LUMEN PACKAGE, PRISMATIC LENS	610mmx610mm	120	20.5	80	3500	2587	0-10V		X		1	
F1	LITHONIA LIGHTING - 2BLT2 33L S0SM GZ10 LP935 WH	2' X 2' LOW PROFILE VOLUMETRIC RECESSED LED, CENTER BASKET DESIGN, SQUARE SMOOTH LENS, GLOSSY WHITE	610mmx610mm	120	26.5	90	3500	3332	0-10V		X		1	
F2	LITHONIA LIGHTING - 2BLT2 40L S0SM GZ10 LP935 WH	2' X 2' LOW PROFILE VOLUMETRIC RECESSED LED, CENTER BASKET DESIGN, SQUARE SMOOTH LENS, GLOSSY WHITE	610mmx610mm	120	31	90	3500	4034	0-10V		X		1	
F3	LITHONIA LIGHTING - 2BLT2 48L S0SM GZ10 LP935 WH	2' X 2' LOW PROFILE VOLUMETRIC RECESSED LED, CENTER BASKET DESIGN, SQUARE SMOOTH LENS, GLOSSY WHITE	610mmx610mm	120	42.9	90	3500	5022	0-10V		X		1	
L1	PAL LIGHTING - AS350-HO-K35-80-FW-LOH-F10M-UNV-DIM1	3 1/2" SQUARE FLUSH WALL MOUNT LUMINAIRE, MATE WHITE FINISH	2438 mm	120	27.5	80	3500	3495	0-10V			X	1	
O1	HOLOPHANE - WCNG P4 30K T3M MVOLT ZT 10K BKSDP SCRW BSPC	OUTDOOR LED WALLPACK, TYPE III MEDIUM DISTRIBUTION, GLASS REFRACTOR, BLACK FINISH, C/W INTEGRAL PHOTOCELL CONTROL	457mm x 1168mm	120	72	70	3000	8179	0-10V			X	1	
O2	GOTHAM EVO6 35/29 BR LSS MWD CGL MVOLT GZ10	6" VANDAL RESISTANT DOWNLIGHT, BATHING MEDIUM WIDE DISTRIBUTION	152 mm dia.	120	19.7	80	3500	1742	0-10V		X		1	
U1	HEALTHCARE LIGHTING- SPECTRA SF LED - HUC523 120 LED35 S1 GW	23" UNDERCABINET TASK LIGHTING, ANTIMICROBIAL, C/W SWITCH	584 mm	120	12.25	80+	3500	1221	0-10V			X	1	
W1	MARK ARCH LIGHTING - SLOT4 LED-SL4L LOP_FT FLP FL 80CRI 35K 1000L WW MIN10 120 ZT	RECESSED LINEAR LED, FLUSH LENS, MOUNTED IN CONTINUOUS ROW,	VARIOUS	120	10w/ft	80	3500	1000lm/ft	0-10V			X	1	
XC		CEILING MOUNTED RUNNING MAN LED EXIT LIGHT. CONFIGURED AS SINGLE OR DOUBLE SIDED FACE. DIE-CAST ALUMINUM. EDGE-LIT, FLAT TRIM, WHITE. MEET AND EXCEEDS CSA 22.1.NO 141-15	380 mm x 175 mm	12	3							X	1, 2	
XW1	EMERGI-LITE- EDE SERIES , AC/DC STANDARD	WALL MOUNTED RUNNING MAN LED EXIT LIGHT. CONFIGURED AS SINGLE OR DOUBLE SIDED FACE. DIE-CAST ALUMINUM. EDGE-LIT, FLAT TRIM, WHITE. MEET AND EXCEEDS CSA 22.1.NO 141-15												
BU1	EMERGI-LITE - 12LC300-2-150-LJ	WALL MOUNTED BATTERY UNIT. DUAL HEAD LIGHTS, WALL MOUNTED, 250W CAPACITY, WHITE		12	300								X	1
R1	EMERGI-LITE - EF9 - M -LM	REMOTE BATTERY HEAD - SINGLE, WALL MOUNTED		12	6									1
R2	EMERGI-LITE - EF9 - D - M -LM	REMOTE BATTERY HEAD - DOUBLE, WALL MOUNTED		12	12								X	1
R2/C	EMERGI-LITE - EF9 - D - M -LM	REMOTE BATTERY HEAD - DOUBLE, CEILING MOUNTED		12	12								X	1
NOTES: 1. CONTRACTOR TO VERIFY AND PROVIDE ALL NECESSARY MOUNTING ACCESSORIES BEFORE ORDERING THE FIXTURE. 2. PROVIDE ARROWS AS PER FLOOR PLANS. FOR DOUBLE ARROW CONFIGURATION PROVIDE TWO EXIT SIGNS.														

FIRE ALARM ZONE SCHEDULE		
FIRE ALARM INITIATING ZONE NO.	DESCRIPTION	DEVICES
FA-Z-B1-1	LEVEL B1 - FLOOR AREA	HORNS, STROBES, HORNS/STROBES, DETECTORS, MANUAL PULLSTATIONS
FA-Z-L1-1	LEVEL B1 - MECHANICAL AND ELECTRICAL ROOMS	HORNS/STROBES, DETECTORS, MANUAL PULLSTATIONS
FA-Z-L1-1	LEVEL 1	HORNS, STROBES, HORNS/STROBES, DETECTORS, MANUAL PULLSTATIONS
FA-Z-L2-1	LEVEL 2	HORNS, STROBES, HORNS/STROBES, DETECTORS, MANUAL PULLSTATIONS
FA-Z-ST-N	NORTH STAIR SHAFT	DETECTORS, HORNS/STROBES
FA-Z-ST-S	SOUTH STAIR SHAFT	DETECTORS, HORNS/STROBES
FA-Z-EL-A	ELEVATOR SHAFT	DETECTORS
SUPERVISORY TROUBLE ZONE NO.	DESCRIPTION	DETAILS
NOT USED	-	-
GEN-1	NG-1A, GENERATOR RUNNING	GENERATOR PANEL CONNECTION
GEN-2	NG-1A, GENERATOR TROUBLE	GENERATOR PANEL CONNECTION
ATS-B1-1	ATS-B1, LEFT IN OPEN POSITION	MAIN ELECTRICAL ROOM - BASEMENT
ATS-B1-2	ATS-B1, ON EMERGENCY POWER	MAIN ELECTRICAL ROOM - BASEMENT

Emergency Battery Sizing Chart					
Level	Battery Unit Circuit	Number of remote heads connected (Single Lamp, 6W)	Number of exit signs connected (1.5W)	Total Load (W)	Battery Unit Size for 30 minute runtime
B1	#1	30	10	195	250W (12ESL250)
1	#1	27	12	180	250W (12ESL250)
1	#2	24	9	157.5	250W (12ESL250)
2	#1	22	5	139.5	250W (12ESL250)



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Project Architect	HDR
Landscape Architect	
Civil Engineer	WSP
Structural Engineer	WSP
Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	HDR
Equipment Planner	HDR
Wayfinding	

Sheet Reviewer: NM

MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR PERMIT
6	2024-09-04	RE-ISSUED FOR PERMIT
7	2024-09-17	ISSUED FOR ESA
8	2024-09-13	ISSUED FOR TENDER
9	2024-10-07	ISSUED FOR ADD-E01
10	2024-10-17	ISSUED FOR ADD-E02

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Sheet Name  
SCHEDULES -  
ELECTRICAL

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ISSUED FOR ADD-E02