Addendum #4 / RFP 12-2055
Electrical Services Sub-metering Project OCC

Metro | Exposition Recreation Commission
600 NE Grand Ave., Portland, OR 97232-2736
503-797-1700

SUBSTITUTION REQUEST

We received a substitution request for the Veris metering product, met with the Veris sales/tech team and recommend accepting this product for this specific project. We have addressed this in our specifications.

The Veris metering product is specified as the basis-of-design. The following are acceptable substitutions for manufacturers of metering equipment:

1. E-Mon
2. Satec

If the product used other than what is noted as the basis-of-design, the Contractor shall assume all additional design and construction costs as noted in the General Conditions.

Please substitute the revised documents listed below and provided as Attachment A for the corresponding documents in the original Bid Packet.

DOCUMENT REVISIONS

1. Sheet E0.01 – Electrical Schedules
   a. Refer to the full size drawing with clouded revisions to the metering matrix.
2. Sheet E6.01 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
3. Sheet E6.02 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
4. Sheet E6.03 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
5. Sheet E6.04 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
6. Sheet E6.06 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
7. Sheet E6.07 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
8. Sheet E6.08 – Existing Electrical One-Line Diagram
   a. Refer to the full size drawing with clouded revisions to the one-line diagram.
9. Specification Section 260913 – Electrical Power Monitoring
   a. Refer to the attached section. **Modifications/additions are noted in bold** whereas ~~deletions are noted by strike-through~~.

All other terms, conditions and requirements of the RFB remain in full force.

Issued April 2, 2012 *Josh Lipscomb*

Josh Lipscomb - Project Manger

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Attachment A:

Specification Section 260913
Sheet E0.01
Sheet E6.02
Sheet E6.03
Sheet E6.04
Sheet E6.06
Sheet E6.07
Sheet E6.08

260913 - ELECTRICAL POWER MONITORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall provide a design-build electrical power monitoring system based on the documents provided using ~~E-Mon~~ **Veris** metering equipment linked to the existing Alerton monitoring and control system for data compilation. All metering points are shown on the drawings and shall be linked to the existing Alerton system for a complete and operational metering system.

B. The metering system will be used for both tenant submetering and energy tracking for various categories as outlined on the drawings and in the specifications. All metering equipment shall be revenue class**. Metering types are as follows and are further described in the drawings and specification below:**

1. **Individual Revenue grade, ANSI 12.20, Class 0.5 (B0.5) meters/CT's**
2. **Individual Revenue grade, ANSI 12.20, Class 1.8 (B1.8) meters/CT's**
3. **Panelboard Strip CT style Revenue grade, ANSI 12.20, Class 1.8 (B1.8) meters**

C. The existing Alerton monitoring and control system shall be expanded as required in order for the metering system to interface seamlessly. Refer to the drawings for further requirements.

D. Specific loads are noted to be programmed using existing Variable Frequency Drive (VFD) data information. Contractor to program the monitoring and control system using amperage data with an equation to output kilo-watts (kW) and kilo-watt-hours (kWh).

E. The existing Alerton monitoring and control system shall be used to capture, record, store, trend, and produce all necessary reports for billing, demand metering, trend logging, and energy modeling. The Alerton monitoring and control system is presently maintained (including programming) by the following company and all requirements of this project shall be coordinated with the company prior to submission of bids:

Environmental Controls Company
Attn: Mike Kucharski
15860 SW Upper Boones Ferry Road
Lake Oswego, OR 97035-4066
(503) 330-5569

F. Section includes the following for monitoring of electrical power system:
1. PC-based workstation(s) and software.
2. Communication network and interface modules for RS-232 and IEEE 802.3 data transmission protocols.

1.3 DEFINITIONS

A. Ethernet: Local area network based on IEEE 802.3 standards.

B. Firmware: Software (programs or data) that has been written onto read-only memory (ROM). Firmware is a combination of software and hardware. Storage media with ROMs that have data or programs recorded on them are firmware.

C. HTML: Hypertext markup language.

D. I/O: Input/output.

E. KY Pulse: A term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay changing status in response to the rotation of the disk in the meter.

F. LAN: Local area network; sometimes plural as "LANs."

G. LCD: Liquid crystal display.

H. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or remote-control, signaling and power-limited circuits.

I. Modbus TCP/IP: An open protocol for exchange of process data.

J. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

K. PC: Personal computer; sometimes plural as "PCs."

L. rms: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

M. RS-232: A TIA standard for asynchronous serial data communications between terminal devices.

N. RS-485: A TIA standard for multipoint communications using two twisted-pairs.

O. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

P. THD: Total harmonic distortion.

Q. UPS: Uninterruptible power supply; used both in singular and plural context.

R. WAN: Wide area network.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
1. Attach copies of approved Product Data submittals for products that describe power monitoring features to illustrate coordination among related equipment and power monitoring.

B. Shop Drawings: For power monitoring equipment. Include plans, elevations, sections, details, and attachments to other work.
1. Outline Drawings: Indicate arrangement of components and clearance and access requirements.
2. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Wiring Diagrams: For power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.

C. Software and Firmware Operational Documentation:
1. Self-study guide describing the process for setting equipment's network address; setting Owner's options; procedures to ensure data access from any PC on the network, using a standard Web browser; and recommended firewall setup.
2. Software operating and upgrade manuals.
3. Software Backup: On a magnetic media or compact disc, complete with Owner-selected options.
4. Device address list and the set point of each device and operator option, as set in applications software.
5. Graphic file and printout of graphic screens and related icons, with legend.

D. Qualification Data: For qualified installer and manufacturer.

E. Field quality-control reports.

F. Operation and Maintenance Data: For power monitoring units, to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Operating and applications software documentation for Alerton system.
2. Software licenses for Alerton system.
3. Software service agreement for Alerton system.
4. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.

G. Other Informational Submittals:
1. Manufacturer's system installation and setup guides, with data forms to plan and record options and setup decisions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing power monitoring equipment similar to that indicated for this Project and with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate features of distribution equipment and power monitoring components to form an integrated interconnection of compatible components.
1. Match components and interconnections for optimum performance of specified functions.

B. Coordinate Work of this Section with those in Sections specifying distribution components that are monitored or controlled by power monitoring equipment.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Meters: Furnish at least one of each type.
2. Current Transformers: Furnish at least three of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide manufacturer's name; product name or designation.
1. ~~E-Mon~~ **Veris** (Metering Equipment)
2. Alerton (Existing Power Monitoring System)

2.2 FUNCTIONAL DESCRIPTION

A. Instrumentation and Recording Devices: Monitor and record load profiles and chart energy consumption patterns.
1. Calculate and Record the Following:
   a. Load factor.
   b. Peak demand periods.
2. Measure and Record Metering Data for the Following:
   a. Electricity.

B. Software: Calculate allocation of utility costs.
1. Automatically Import Energy Usage Records to Allocate Energy Costs for the Following (also see drawing E0.01 for categories):
   a. Kitchen
   b. Concessions
   c. Mechanical
   d. C Hall
   e. C Meetings Rooms/Lobby
   f. C Prefunction
   g. Oregon Ballroom/Lobby
   h. Portland Ballroom/Lobby

C. System: Report equipment status.

2.3 SYSTEM REQUIREMENTS

A. Monitoring System: The Owner will provide the PC-based workstation fitted with the Alerton Control Systems software for the power monitoring system. The Contractor shall provide the software requirements as stated elsewhere in the documents that will capture all data received from the metering equipment.

B. Addressable Devices: All transmitters and receivers shall communicate unique device identification and status reports to monitoring clients.

C. BAS Interface: Provide factory-installed hardware and software to enable the BAS to monitor, display, and record data for use in processing reports.

1. Hardwired Monitoring Points: Electrical power demand (kilowatts), electrical power consumption (kilowatt-hours).
2. BACnet MSTP communication interface with the BAS shall enable the BAS operator to remotely monitor meter information from a BAS operator workstation. Control features and monitoring points displayed locally at metering panel shall be available through the BAS. Connect to the BAS through MSTP cable to the nearest Alerton control panel, unless otherwise noted. Refer elsewhere in the documentes where BAS MSTP is available.
3. The metering system may also communicate with a direct connection to the BAS Ethernet LAN if available in the nearby telecommunications room. Refer elsewhere in the documents where the BAS LAN is available. BAS LAN switching equipment shall be provided by the Owner.

2.4 APPLICATIONS SOFTWARE

A. Basic Requirements:

1. Fully compatible with and based on the approved operating system.
2. Password-protected operator login and access; three levels, minimum.
3. Password-protected setup functions.
4. Context-sensitive online help.
5. Capability of creating, deleting, and copying files; and automatically maintaining a directory of all files, including size and location of each sequential and random-ordered record.
6. Capability for importing custom icons into graphic views to represent alarms and I/O devices.
7. Automatic and encrypted backups for database and history; automatically stored at central control PC and encrypted with a nine-character alphanumeric password, which must be used to restore or read data contained in backup.
8. Operator audit trail for recording and reporting all changes made to user-defined system options.

B. Data Formats:

1. User-programmable export ~~and import~~ of data to and from commonly used Microsoft Windows spreadsheet, database, billing, and other applications; using dynamic data exchange technology.
2. Option to convert reports and graphics **using Java on the webport and utilizing the graphics displays on existing dashboard presently used by Metro** ~~HTML format~~.
3. Interactive graphics.
4. Option to send preprogrammed or operator designed e-mail reports.

C. Metered Data: Display metered values in real time and 15-minute intervals.

D. Equipment Documentation: Database for recording of equipment ratings and characteristics; with capability for graphic display on monitors.

E. Graphics: Interactive color-graphics platform with pull-down menus and mouse-driven generation of power system graphics, in formats widely used for such drafting; to include the following:

1. ~~Pie graphs comparing different categories, load points, etc..~~
2. Charts comparing different categories, load points, milestones, etc..
3. ~~Single-line diagrams showing location of meter with hyperlink to specific page showing output data.~~

F. User-Defined Monitoring Events: Display and record with date and time stamps accurate to 0.1 second, and including the following:

1. Operator log on/off.
2. Attempted operator log on/off.
3. All alarms.
4. Equipment operation counters.

G. Trending Reports: Display data acquired in real-time from different meters or devices, in historical format over user-defined time; unlimited as to interval, duration, or quantity of trends.

1. Spreadsheet functions of sum, ~~delta, percent, average, mean, standard deviation,~~ and related functions applied to recorded data.
2. Charting, statistical, and display **kW and kWh** functions of standard Windows-based spreadsheet.

H. Alarms: Display and record alarm messages from discrete input and controls outputs, according to user programmable protocol.

1. Functions requiring user acknowledgment shall run in background during computer use for other applications and override other presentations when they occur.

I. Data Sharing: Allow export of recorded displays and tabular data to third-party applications software **such as Microsoft Excel and Microsoft Access**.

1. Tabular data shall be in the comma-separated values.

J. Activity Billing ~~Software~~:

1. Utilize the existing Alerton software to track energy consumption (kWh) and demand (kW) for the following:

a. Automatically compute and prepare activity demand and energy-use statements based on metering of energy use and peak demand integrated over user-defined interval.

b. Intervals shall be same as used by electric utilities, including current vendor.

c. Import metered data from saved records that were generated by metering and monitoring software.

d. Maintain separate directory for each activity's historical billing information.

e. Prepare summary reports in user-defined formats and time intervals.

~~**K.** Reporting: User commands initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.~~

~~1. Print a record of user-defined alarm, supervisory, and trouble events on workstation printer.~~

~~2. Sort and report by device name and by function.~~

~~3. Report type of signal (alarm, supervisory, or trouble), description, date, and time of occurrence.~~

~~4. Differentiate alarm signals from other indications.~~

~~5. When system is reset, report reset event with same information concerning device, location, date, and time.~~

~~**L.** Display Monitor:~~

~~1. Backlighted LCD to display metered data.~~

~~2. Display four values on one screen at same time.~~

2.5 COMMUNICATION COMPONENTS AND NETWORKS

A. Network Configuration: High-speed, multi-access, open nonproprietary, industry standard communication protocol; LANs complying with EIA 485, 100 Base-T Ethernet, BacNet MSTP and BacNet TCP/IP.

2.6 CURRENT SENSORS

A. Provide split-core current sensors (CT) with ampacities equal to or greater than the load being monitored. CT's shall be able to be monitored a minimum of **100** ~~2,000~~ feet from the metering point. CT's shall be compatible with the meters provided. **CT's shall meet the revenue class ANSI rating as noted.**

B. The Contractor shall provide line voltage inputs to the terminal block of the metering equipment per the metering equipment manufacturer's recommendations. Provide line fusing as required by the National Electrical Code.

~~2.7 INTERVAL DATA RECORDERS~~

~~**A.** Provide Interval Data Recorders (IDR) that reads and records up to 16 meters with the following:~~

~~1. External meter pulse input.~~

~~2. RS-232/RS-485 communications.~~

~~3. Ethernet~~

~~a. Modbus TCP.~~

~~b. BACnet IP.~~

~~4. Modbus TCP.~~

~~5. BACnet IP.~~

~~6. Internal data storage for up to 36 days of 15 minute intervals.~~

~~7. Selectable baud rate up to 19,200 bps.~~
~~8. Maintains data in case of power failure.~~
~~9. Mountable in multiple meter unit cabinet.~~
~~10. Reads kWh and kW in 15, 30, or 60 minute intervals.~~
~~11. Reads meters individually or in groups.~~
~~12. MV-90 compatible.~~

2.8 POWER MONITORS

A. Separately mounted, permanently installed instrument for power monitoring, complying with UL 1244.
1. Enclosure: NEMA 250, Type 1, unless otherwise noted.
2. Where multiple meters are located in a single room, provide a multiple meter unit cabinet with ~~both~~ meters ~~and interval data recorders~~ mounted within the unit.

B. Environmental Conditions: System components shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
1. Indoor installation in nontemperature-controlled spaces that have environmental controls to maintain ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

C. rms Real-Time Measurements:
1. Current: Each phase, neutral, average of three phases, percent unbalance.
2. Voltage: Line-to-line each phase, line-to-line average of three phases, line-to-neutral each phase, line-to-neutral average of three phases, line-to-neutral percent unbalance.
3. Power: Per phase and three-phase total **of kW**.
4. Accumulated Energy: Real kWh.
5. Incremental Energy: Real kWh.
6. Conditional Energy: Real kWh.

D. Demand Current Calculations, per Phase, Three-Phase Average and Neutral:
1. Present.
2. Running average.
3. Last completed interval.
4. Peak.

~~**E.** Demand Real Power Calculations, Three-Phase Total:~~
~~1. Present.~~
~~2. Running average.~~
~~3. Last completed interval.~~
~~4. Predicted.~~
~~5. Peak.~~
~~6. Coincident with peak kVA demand.~~
~~7. Coincident with kVAR demand.~~

F. Power Demand Calculations: According to one of the following calculation methods, selectable by the user:

1. Thermal Demand: Sliding window updated every second for the present demand and at end of the interval for the last interval. Adjustable window that can be set in 1-minute intervals, from 1 to 60 minutes.
2. Block Interval with Optional Subintervals: Adjustable for 1-minute intervals, from 1 to 60 minutes. User-defined parameters for the following block intervals:
   a. Sliding block that calculates demand every second, with intervals less than 15 minutes, and every 15 seconds with an interval between 15 and 60 minutes.
   b. Fixed block that calculates demand at end of the interval.
   c. Rolling block subinterval that calculates demand at end of each subinterval and displays it at end of the interval.
3. Demand Calculation Initiated by a Synchronization Signal:
   a. Signal is a pulse from an external source. Demand period begins with every pulse. Calculation shall be configurable as either a block or rolling block calculation.
   b. Signal is a communication signal. Calculation shall be configurable as either a block or rolling block calculation.
   c. Demand can be synchronized with clock in the power meter.

G. Sampling:

1. Current and voltage shall be digitally sampled at a rate high enough to provide accuracy to 63rd harmonic of 60-Hz fundamental.
2. Power monitor shall provide continuous sampling at a rate of 128 samples per cycle on all voltage and current channels in the meter.

H. Minimum and Maximum Values: Record monthly minimum and maximum values, including date and time of record. For three-phase measurements, identify phase of recorded value. Record the following parameters:

1. Total power.

I. Current and Voltage Ratings:

1. Designed for use with current inputs from standard instrument current transformers with 5-A secondary and shall have a metering range of 0-10 A.
2. Withstand ratings shall not be less than 15 A, continuous; 50 A, lasting over 10 seconds, no more frequently than once per hour; 500 A, lasting 1 second, no more frequently than once per hour.
3. Designed for use with voltage inputs from standard instrument potential transformers with a 120-V secondary.

J. Accuracy:

1. Comply with ANSI C12.20, Class 0.5; and IEC 60687, Class 0.5 for revenue meters **as noted in the drawings**. Accuracy from Light to Full Rating shall meet the following criteria:
   a. Power: Accurate to 0.25 percent of reading, plus 0.025 percent of full scale.
   b. Voltage and Current: Accurate to 0.075 percent of reading, plus 0.025 percent of full scale.

c. Power Factor: Plus or minus 0.002, from 0.5 leading to 0.5 lagging.
d. Frequency: Plus or minus 0.01 Hz at 45 to 67 Hz.

2. For **all other** meters ~~that are circuit-breaker accessories~~, metering accuracy at full-scale shall not be less than the following:
   a. Current: Plus or minus 2.5 percent.
   b. Voltage: Plus or minus 1.5 percent.
   c. Energy, Demand, and Power: Plus or minus 4.0 percent.
   d. Frequency: Plus or minus 1 Hz.

K. Input: One digital input signal(s).
1. Normal mode for on/off signal.
2. Demand interval synchronization pulse, accepting a demand synchronization pulse from a utility demand meter.
3. Conditional energy signal to control conditional energy accumulation.

L. Outputs:
1. Operated either by user command sent via communication link, or set to operate in response to user-defined alarm or event.
2. Closed in either a momentary or latched mode as defined by user.
3. Each output relay used in a momentary contact mode shall have an independent timer that can be set by user.
4. One digital KY pulse to a user-definable increment of energy measurement. Output ratings shall be up to 120-V ac, 300-V dc, 50 mA, and provide 3500-V rms isolation.
5. One relay output module(s), providing a load voltage range from 20- to 240-V ac or from 20- to 30-V dc, supporting a load current of 2 A.
6. Output Relay Control:
   a. Relay outputs shall operate either by user command sent via communication link or in response to user-defined alarm or event.
   b. Normally open and normally closed contacts, field configured to operate as follows:
      1) Normal contact closure where contacts change state for as long as signal exists.
      2) Latched mode when contacts change state on receipts of a pickup signal; changed state is held until a dropout signal is received.
      3) Timed mode when contacts change state on receipt of a pickup signal; changed state is held for a preprogrammed duration.
      4) End of power demand interval when relay operates as synchronization pulse for other devices.
      5) Energy Pulse Output: Relay pulses quantities used for absolute kWh.

~~**M.** Onboard Data Logging:~~
~~1. Store logged data, alarms, events, and waveforms in 80 KB of onboard nonvolatile memory.~~
~~2. Stored Data:~~
~~a. Billing Log: User configurable; data shall be recorded every 15 minutes, identified by month, day, and 15-minute interval. Accumulate 24 months of monthly data,~~

~~32 days of daily data, and between 2 and 52 days of 15-minute interval data, depending on number of quantities selected.~~

~~b. Custom Data Logs: One user-defined log(s) holding up to 96 parameters. Date and time stamp each entry to the second and include the following user definitions:~~

~~1) Schedule interval.~~

~~2) Event definition.~~

~~3) Configured as "fill-and-hold" or "circular, first-in-first-out."~~

~~c. Alarm Log: Include time, date, event information, and coincident information for each defined alarm or event.~~

~~d. Waveform Log: Store captured waveforms configured as "fill-and-hold" or "circular, first-in-first-out."~~

~~3. Default values for all logs shall be initially set at factory, with logging to begin on device power up.~~

N. Control Power: 90- to 457-V ac or 100- to 300-V dc.

O. Communications:

1. Power monitor shall be permanently connected to communicate via BacNet TCP/IP via a 100 Base-T Ethernet or RS-485 BacNet MSTP.
2. Local plug-in connections shall be for RS-232 and 100 Base-T Ethernet.

2.9 CONTROL POWER

A. The Contractor shall provide 24VAC control power to each meter and CT combination as required by the metering manufacturer and mechanical controls manufacturer (Alerton). The Contractor shall provide all necessary control transformers, enclosures, raceways, overcurrent devices, fuses, wiring, terminations, etc. to provide control power to all meters and mechanical system (Alerton) controllers.

2.10 LAN CABLES

A. Comply with Division 26 Section "Control-Voltage Electrical Power Cables." All cabling shall be installed in a raceway system.

B. RS-485 Cable:

1. Plenum-Type, RS-485 Cable: As specified in Division 26 Section "Control-Voltage Electrical Power Cables."

C. RS-232 Cable:

1. Plenum-Type, RS-232 Cable: As specified in Division 26 Section "Control-Voltage Electrical Power Cables."

D. Unshielded Twisted Pair Cables: Category 6 as specified for horizontal cable for data service in Division 26 Section "Control-Voltage Electrical Power Cables."

2.11 LOW-VOLTAGE WIRING

A. Comply with Division 26 Section "Control-Voltage Electrical Power Cables."

B. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 18 AWG copper, minimum.
1. Sheath: PVC; except in plenum-type spaces, use sheath listed for plenums.
2. Ordinary Switching Circuits: Three conductors unless otherwise indicated.
3. Switching Circuits with Pilot Lights or Locator Feature: Five conductors unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABLING

A. Comply with NECA 1.

B. Install cables and wiring according to requirements in Division 26 Section "Control-Voltage Electrical Power Cables."

C. Wiring Method: Install wiring in raceway and/or cable tray except within consoles, cabinets, gutters, wireways. Conceal raceway and wiring except in unfinished spaces. All cabling shall be plenum rated.

D. Install LAN cables using techniques, practices, and methods that are consistent with specified category rating of components and that ensure specified category performance of completed and linked signal paths, end to end.

E. Install cables without damaging conductors, shield, or jacket.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

B. Label each power monitoring and control module with a unique designation.

3.4 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Powering and Grounding Electronic Equipment."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
1. Electrical Tests: Use caution when testing devices containing solid-state components.
2. Continuity tests of circuits.
3. Operational Tests: Set and operate controls at workstation and at monitored and controlled devices to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Submit sequences for approval. Note response to each test command and operation. Note time intervals between initiation of alarm conditions and registration of alarms at central-processing workstation.
   a. Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled.
   b. Test LANs according to requirements in Division 26 Section "Control-Voltage Electrical Power Cables."
   c. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of calculated battery operating time.
   d. Verify accuracy of graphic screens and icons.
   e. Metering Test: Load feeders, measure loads on feeder conductor with an rms reading clamp-on ammeter, and simultaneously read indicated current on the same phase at central-processing workstation. Record and compare values measured at the two locations. Resolve discrepancies greater than 5 percent and record resolution method and results.
   f. Record metered values, control settings, operations, cues, time intervals, and functional observations and submit test reports printed by workstation printer.

E. Power monitoring and control equipment will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

H. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

I. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

J. Remove and replace malfunctioning devices and circuits and retest as specified above.

3.6 DEMONSTRATION

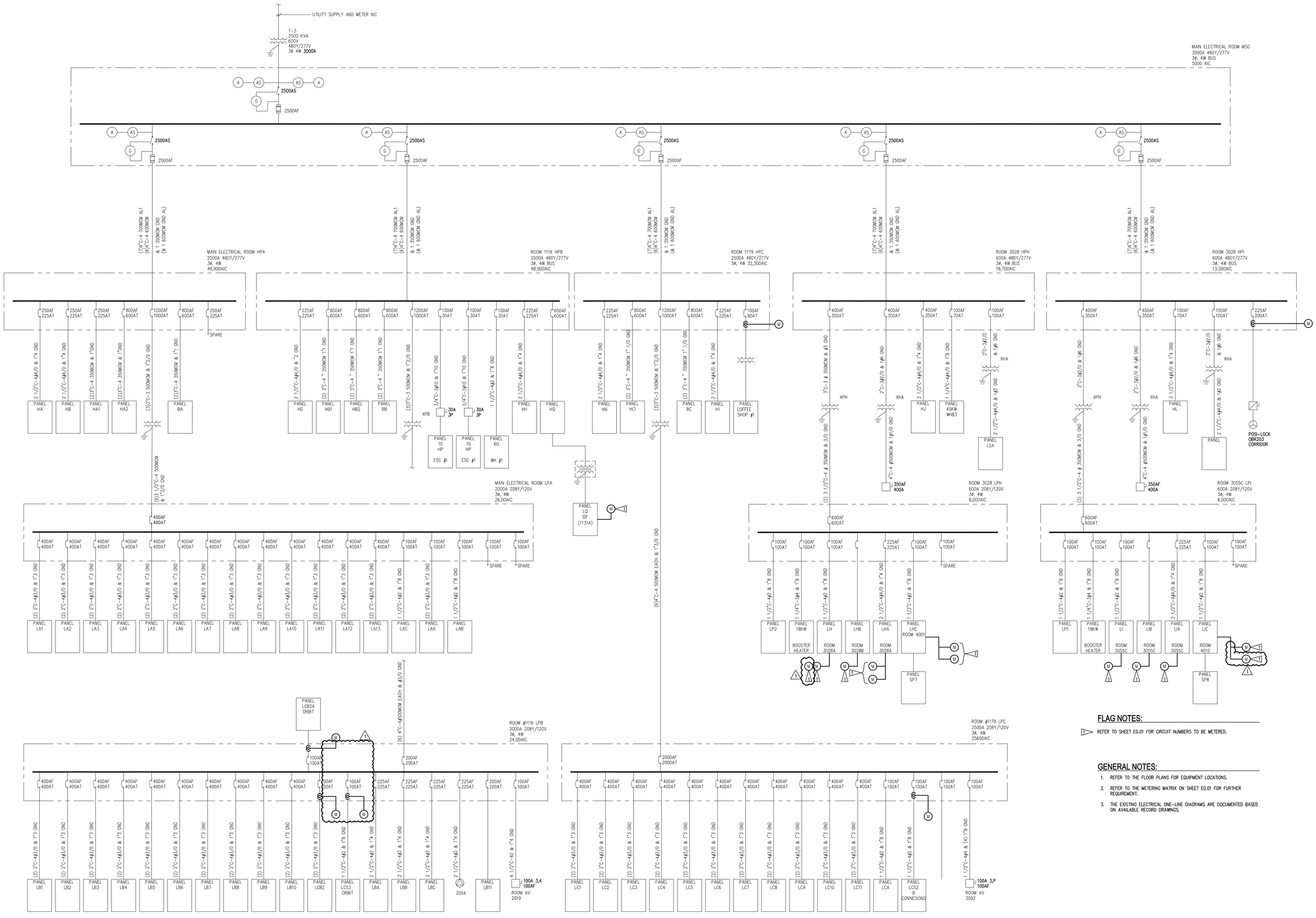
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. See Division 01 Section "Demonstration and Training."

1. Train Owner's management and maintenance personnel in interpreting and using monitoring displays and in configuring and using software and reports. Include troubleshooting, servicing, adjusting, and maintaining equipment. Provide a minimum of 16 hours' training.
2. Training Aid: Use approved final versions of software and maintenance manuals as training aids.

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

End of Section



FLAG NOTES:

1. REFER TO SHEET E0.01 FOR CIRCUIT NUMBERS TO BE METERED.

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENT.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

1 E6.01 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

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1 ADD #1 04.02.12

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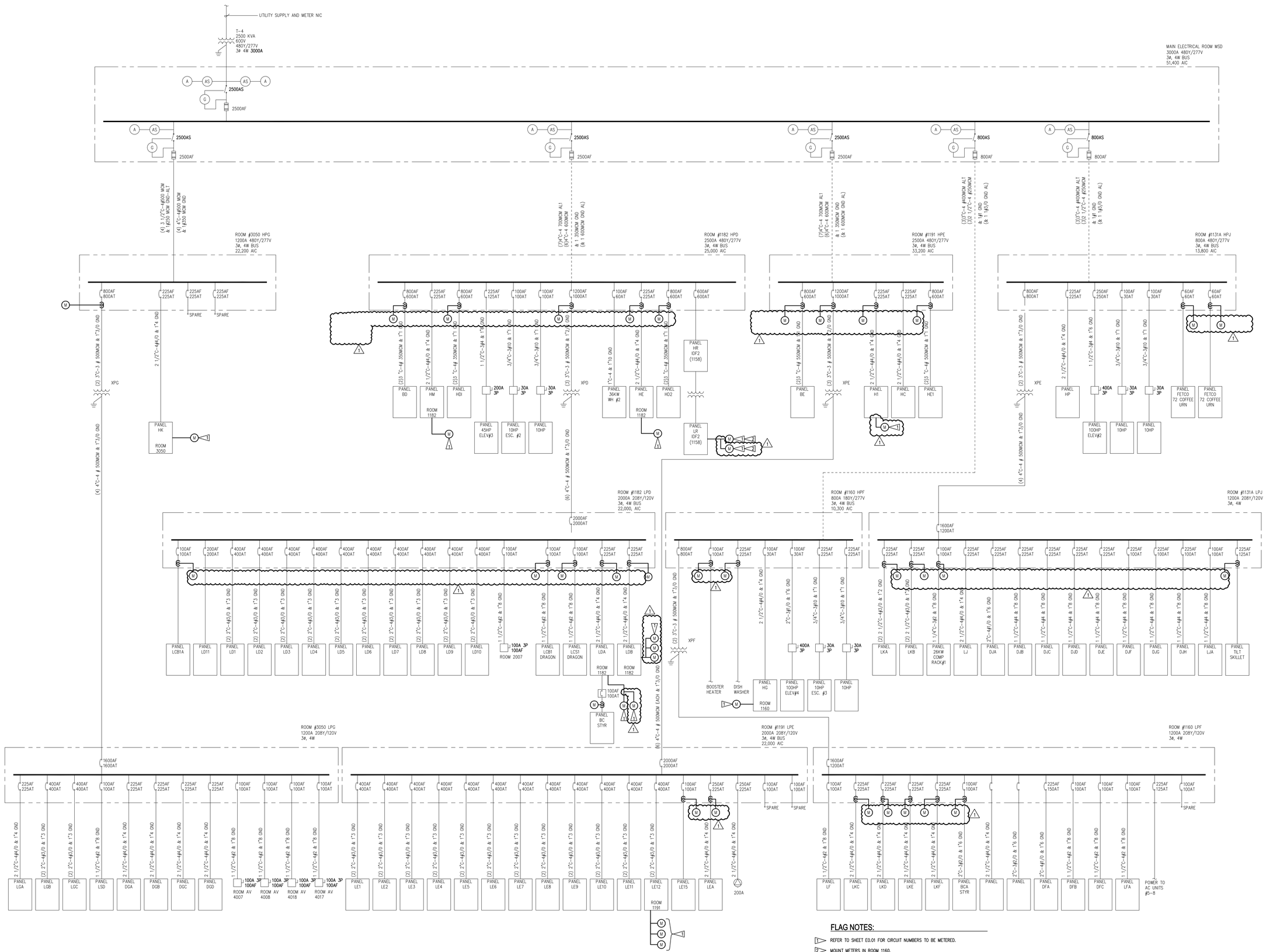
SHEET:
E6.01



FLAG NOTES:

1. REFER TO SHEET E0.01 FOR CIRCUIT NUMBERS TO BE METERED.
2. MOUNT METERS IN ROOM 1160.

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

1 E6.02 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

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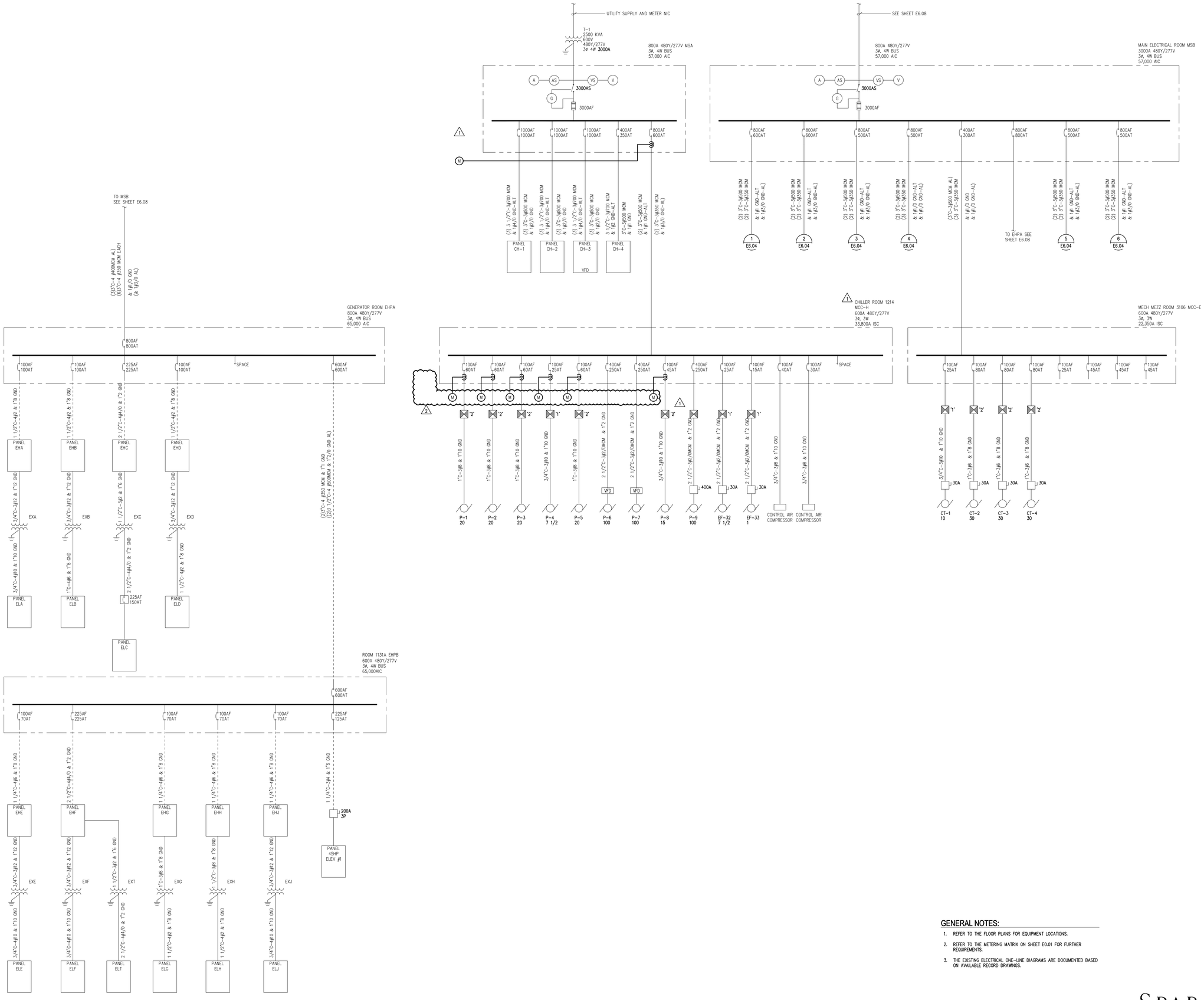
SHEET:
E6.02

N:\B17190\CADD08\E602 Mar 30, 2012 3:05 PM By:DBOTEFF



GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

1 E6.03 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

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1 ADD #2 03.07.12
2 ADD #4 04.02.12

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SUBMITTAL: CONSTRUCTION DOCUMENTS
DATE: FEB. 15,2012

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EXISTING ELECTRICAL ONE-LINE DIAGRAM

SHEET:
E6.03

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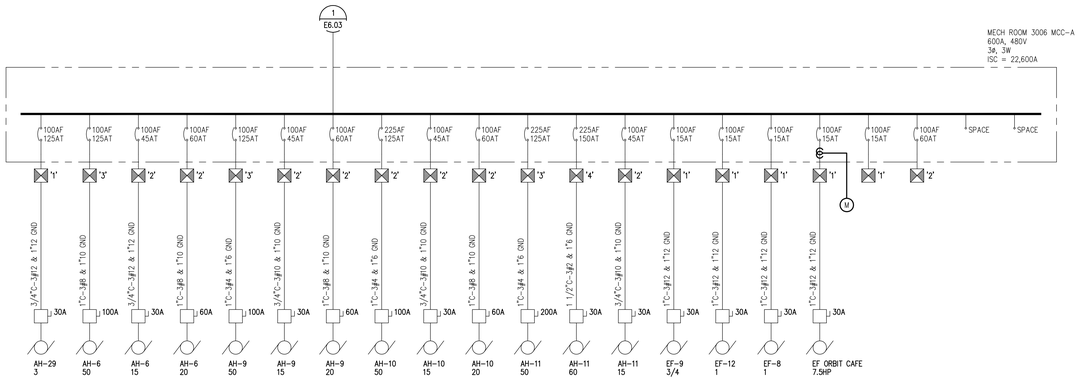
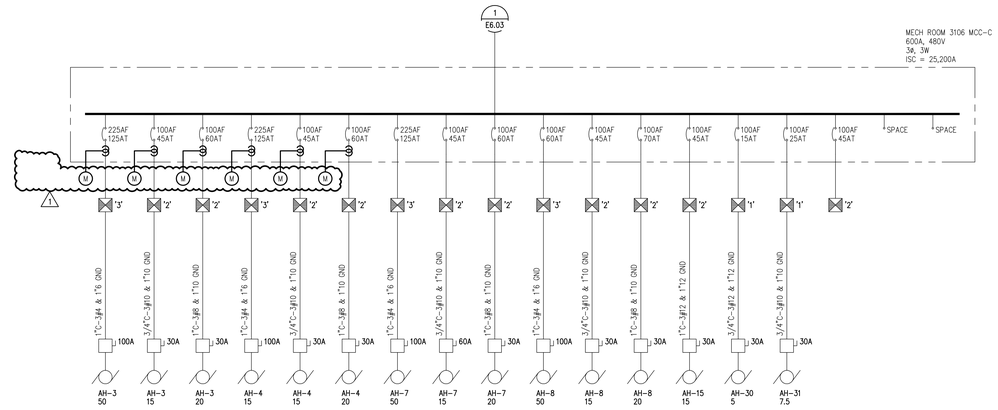
Addedendum #4

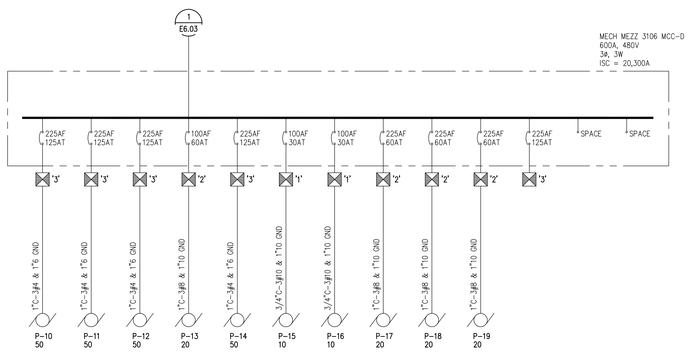
N:\B17190\CADD08\E603 Mar 30, 2012 3:05 PM By:DBOTIEFF



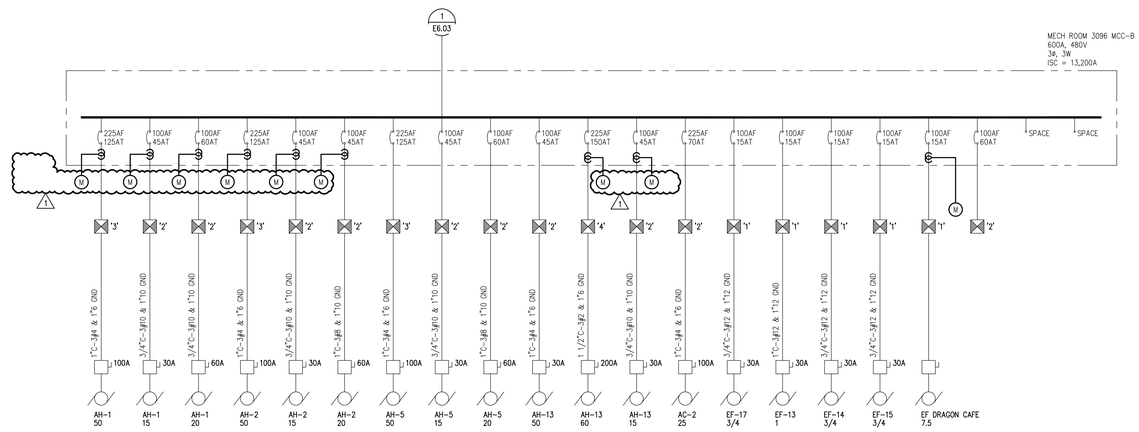
1 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE



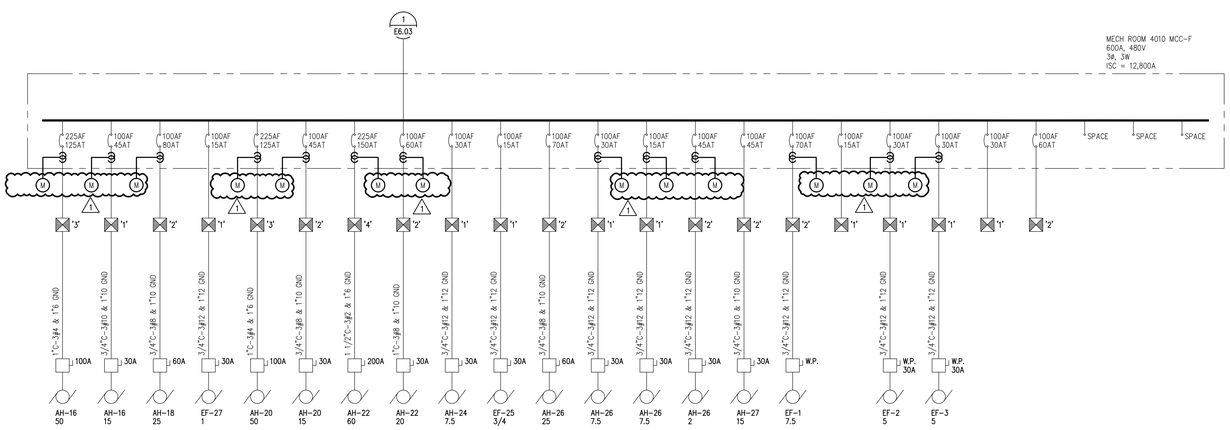
2 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE



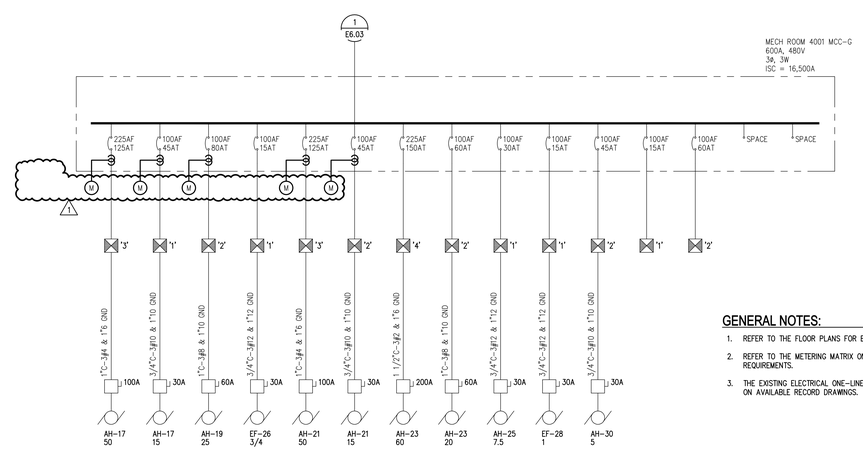
3 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE



4 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE



5 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE



6 E6.04 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

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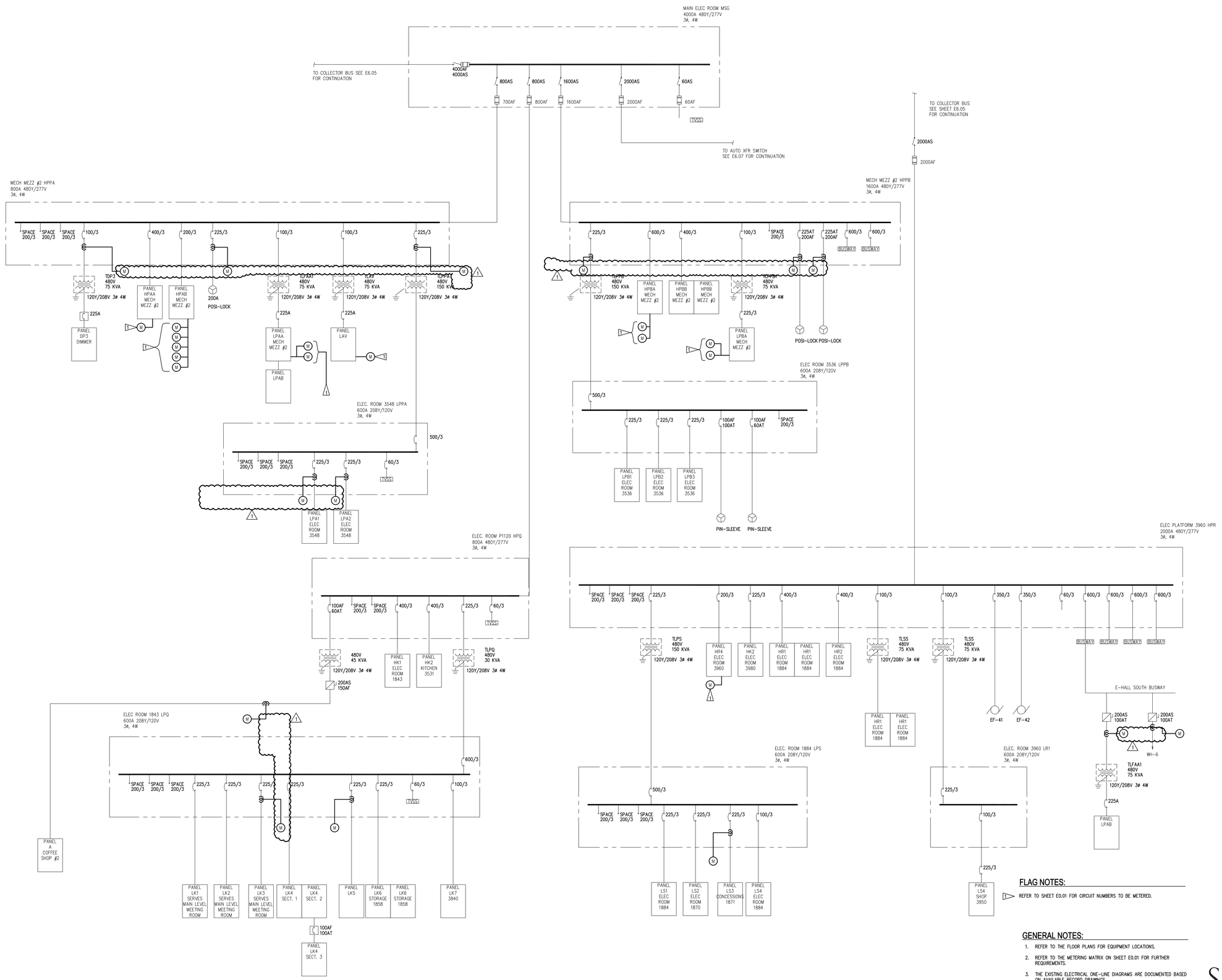
SHEET:
E6.04

N:\91790\CAD008\E604 Mar 30, 2012 3:05 PM By:DBOTEFF



FLAG NOTES:

1. REFER TO SHEET E0.01 FOR CIRCUIT NUMBERS TO BE METERED.

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

1 E6.06 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

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TITLE:
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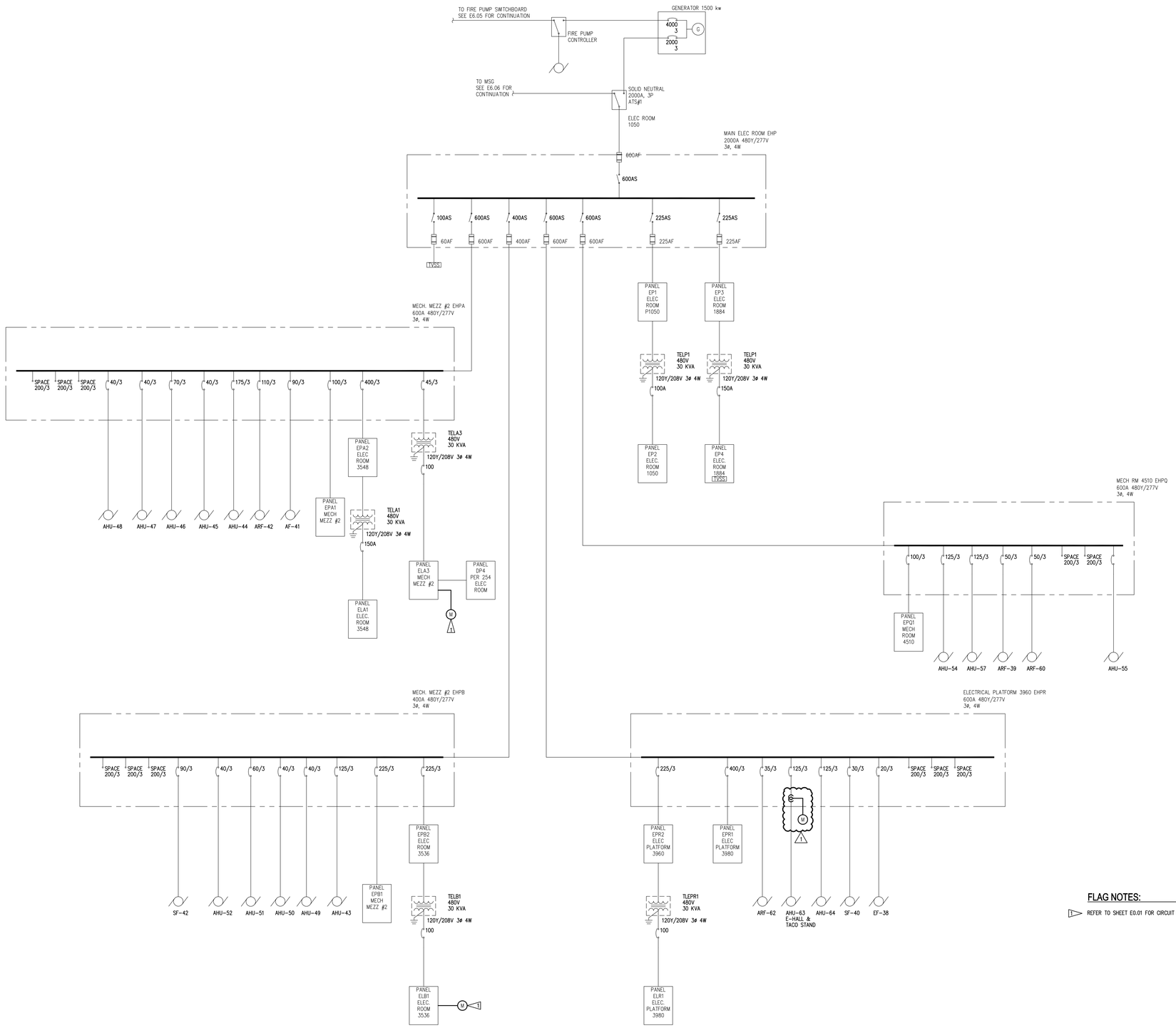
SHEET:
E6.06

N:\B17190\CADD08\E606 Mar 30, 2012 3:06 PM By:DBOTTEFF



FLAG NOTES:

1. REFER TO SHEET E0.01 FOR CIRCUIT NUMBERS TO BE METERED.

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
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1 E6.07 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

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EXISTING ELECTRICAL ONE-LINE DIAGRAM

SHEET:
E6.07

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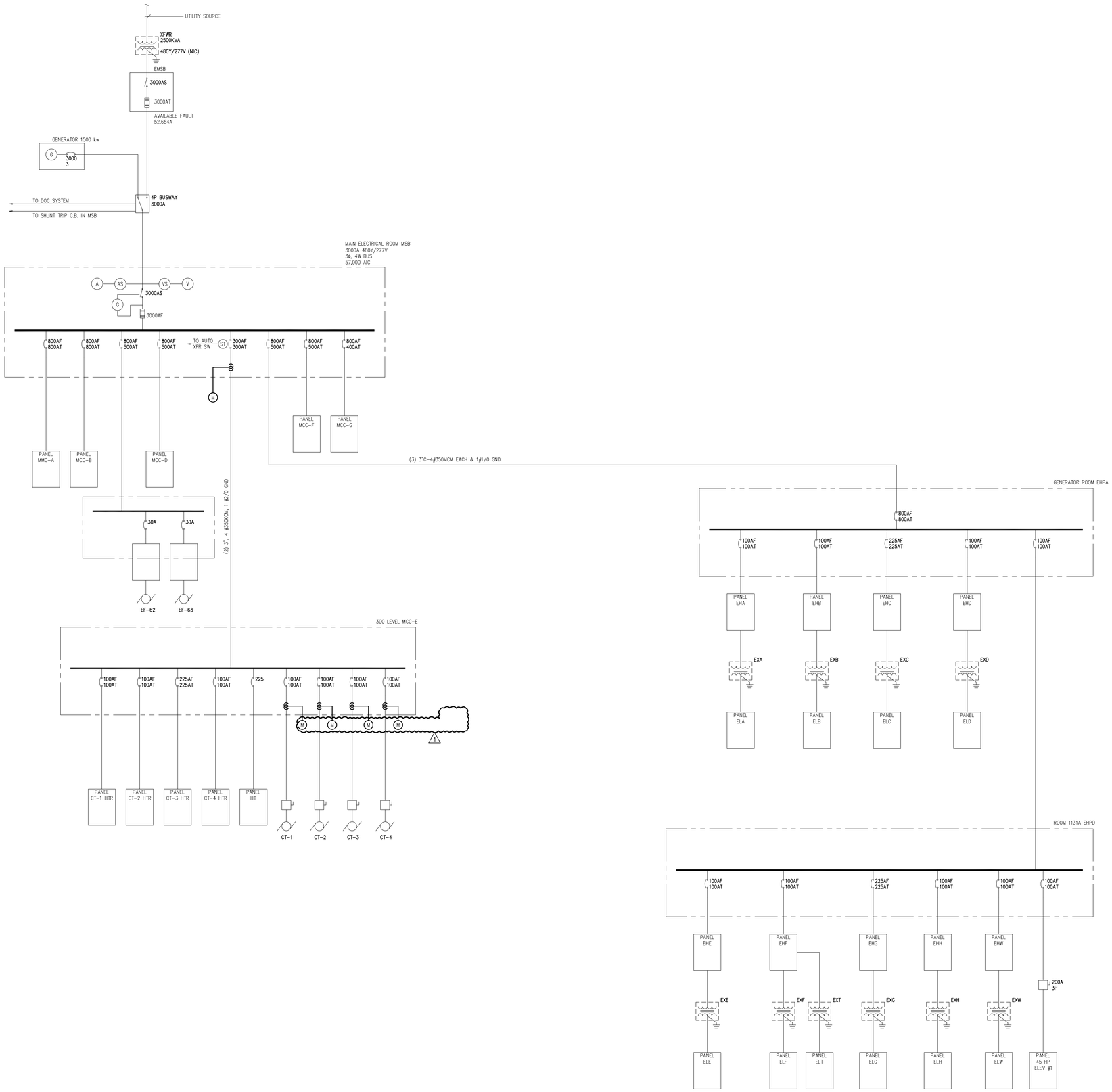

1 E6.08 EXISTING ELECTRICAL ONE-LINE DIAGRAM
SCALE: NONE

GENERAL NOTES:

1. REFER TO THE FLOOR PLANS FOR EQUIPMENT LOCATIONS.
2. REFER TO THE METERING MATRIX ON SHEET E0.01 FOR FURTHER REQUIREMENTS.
3. THE EXISTING ELECTRICAL ONE-LINE DIAGRAMS ARE DOCUMENTED BASED ON AVAILABLE RECORD DRAWINGS.

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SHEET: E6.08

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N:\B17190\CADD08\E608 Mar 30, 2012 3:07 PM By:DBOTEFF