Cloud Based Electrical Power Management System

EcoStruxure™ Energy One Hub

Introduction

This guide specification is written in accordance with the Construction Specifications Institute (CSI) Master Format. This section must be carefully reviewed and edited by the architect or the engineer to meet the requirements of the project. Coordinate this section with other specification sections within the Contract Documents and Drawings.

To properly use / edit this document, show formatting and hidden text by selecting "¶" on the menu or by typing (Ctrl+*) simultaneously. Except for these introductory and closing paragraphs, green hidden text will not print. Text in red is optional. Red text in [brackets] denotes multiple options where one or more should be chosen. All red text should be edited and changed to black for final project conformation. In addition, these introductory paragraphs should be deleted or changed to hidden text.

SECTION A: GENERAL

1.1 SUMMARY

A. Scope: PROVIDE LABOR, MATERIAL, EQUIPMENT, RELATED SERVICES, AND SUPERVISION REQUIRED, INCLUDING, BUT NOT LIMITED TO, MANUFACTURING, FABRICATION, CONFIGURATION AND INSTALLATION FOR A CLOUD BASED ELECTRICAL POWER MANAGEMENT SYSTEM (also identified as EPMS, EMS, PEMS, Energy Management System, Electrical Power Monitoring System, Power and Energy Monitoring System or Energy and Power Management System) AS REQUIRED FOR THE COMPLETE PERFORMANCE OF THE WORK, AS SHOWN ON THE DRAWINGS AND AS HEREIN SPECIFIED.

B. The Work specified in this Section includes but shall not be limited to the following:

1. Hardware—such as device communication interface hardware; servers; mobile or workstation devices; and ancillary equipment.
2. Software—such as on premise installed software and cloud based software-as-a-service (SaaS) applications.
3. Services, support, and training.

C. The cloud based EPMS shall be provided by a qualified cloud based EPMS system supplier. The Contractor shall ultimately be responsible for the cloud based EPMS and shall supplement the system supplier's Work as necessary to provide a complete and operable system. The Contractor shall coordinate the equipment and systems provided by others that interface with the cloud based EPMS to ensure necessary interconnections and compatibility are provided for the required functionality of the cloud based EPMS.

D. Related Sections: Related sections include, but shall not be limited to, the following:

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

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2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.
3. Refer to the following specifications of system connected devices for additional requirements:
   a. Section 26 09 17 – Protective Relays and Controllers
   b. Section 26 27 13.13 – Power and Energy Meters
   c. Section 26 27 13.16 – Power Quality Meters
   d. Section 26 28 11.11 – Molded Case Circuit Breakers
   e. Section 26 28 11.12 – Insulated Case Circuit Breakers
   f. Section 26 28 11.13 – Power Circuit Breakers
   g. Section 26 35 26 – Active Harmonic Filters
   h. Section 26 35 33.16 – Power Factor Correction
   i. Section 26 35 33.19 – Active Harmonic Filters with Power Factor Correction
   j. Section 26 35 53 – Voltage Regulation Equipment
4. Refer to the following specifications of system connected equipment for additional requirements:
   a. Section 26 13 23 – Medium Voltage Metal-Enclosed Switchgear
   b. Section 26 13 26 – Medium Voltage Metal-Clad Switchgear
   c. Section 26 13 29 – Medium Voltage Compartmentalized Switchgear
   d. Section 26 18 39.13 – Medium Voltage Motor Controllers
   e. Section 26 23 00 – Low Voltage Switchgear
   f. Section 26 24 13.11 – Switchboards
   g. Section 26 24 13.33 – Switchboards - Integrated
   h. Section 26 24 16.11 – Panelboards – Lighting & Appliance
   i. Section 26 24 16.13 – Panelboards - Isolated
   j. Section 26 24 16.16 – Panelboards – Intelligent
   k. Section 26 24 16.23 – Panelboards - Power
   l. Section 26 24 16.33 – Panelboards – Integrated
   m. Section 26 24 19 – Motor Control Centers
   n. Section 26 36 00 – Automatic Transfer Switches
5. Refer to the following specifications for additional requirements related to the integration and interface with the Electrical Power Management System:
   a. Section 26 09 13.83 – Condition Monitoring Service
   b. Section 25 51 00 – Building Management System
   c. Section 40 60 10 - Process Instrumentation and Control System

1.2 REFERENCES

A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

1. Canadian Standards Association (CSA)
   a. CSA C282, “Emergency Electrical Power Supply for Buildings”
   b. CSA Z32, “Electrical Safety and Essential Electrical Systems in Health Care Facilities”
2. European Engineering Standards (CSN EN):
   a. CSN EN 16247-1, “Energy Audits - Part 1: General Requirements”
   b. CSN EN 50160, “Voltage Characteristics in Public Distribution Systems”
3. Institute of Electrical and Electronics Engineers (IEEE)

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a. IEEE 519, “Recommended Practice and Requirements for Harmonic Control in Electric Power Systems”
b. IEEE 1159.3, “Recommended Practice for the Transfer of Power Quality Data”
c. IEEE 1588, “Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems”

4. International Electrotechnical Commission (IEC):
   a. IEC 60364-7-710, “Electrical installations of Buildings - Part 7-710: Requirements for Special Installations or Locations - Medical Locations”
   b. IEC 61000-4-30, “Electromagnetic Compatibility (EMC) - Part 4-30: Testing and Measurement Techniques - Power Quality Measurement Methods”
   c. IEC TS 62443-1-1, “Industrial communication networks - Network and system security - Part 1-1: Terminology, concepts and models”
   d. IEC 62443-2-1, “Industrial communication networks - Network and system security - Part 2-1: Establishing an industrial automation and control system security program”
   e. IEC TR 62443-2-3, “Security for industrial automation and control systems - Part 2-3: Patch management in the IACS environment”
   f. IEC 62443-2-4, “Security for industrial automation and control systems - Part 2-4: Security program requirements for IACS service providers”
   g. IEC PAS 62443-3, “Security for industrial process measurement and control - Network and system security”
   h. IEC TR 62443-3-1, “Industrial communication networks - Network and system security - Part 3-1: Security technologies for industrial automation and control systems”
   i. IEC 62443-3-3, “Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels”
   j. IEC 62443-4-1, “Security for industrial automation and control systems - Part 4-1: Secure product development lifecycle requirements”
5. International Organization for Standardization (ISO):
   a. ISO 9001, “Quality Management Systems - Requirements”
   b. ISO 50001, “Energy Management Systems”
6. National Fire Protection Agency (NFPA)
   a. NFPA 70, “National Electrical Code (NEC)”
   b. NFPA 99, “Health Care Facilities Code”
   c. NFPA 110, “Standard for Emergency and Standby Power Systems”

1.3 DEFINITIONS

A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

1. IoT: Internet of Things
2. PQ: Power Quality
3. Smart Mobile Device: Smart phone or tablet compatible with iOS or Android OS capable of running apps used for specified functionality
4. Zigbee: an open, global standard wireless technology that uses low-power digital radio signals

1.4 SUBMITTALS

A. Product Data: cloud based EPMS product catalog sheets and technical data sheets.

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1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of ten years.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.

B. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Process controllers, assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.6 DELIVERY, STORAGE AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.7 WARRANTY

A. General: Refer to [Section 01 77 00 - Closeout Procedures] [Section 01770 - Closeout Procedures].

B. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.8 SPECIAL TOOLS AND SPARE PARTS

A. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove, and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:

1. If available from manufacturer, provide PC-based configuration software tool and a minimum of [one] communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming. Vendor to provide the required number of cables to connect all devices.
2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.

B. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

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SECTION B: PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide EcoStruxure™ Power and supporting products and services by Schneider Electric.]

B. Acceptable Products and supporting services: The cloud based Electrical Power Management System (cloud based EPMS) specified herein shall be the products and supporting services of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified products, software and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:

1. EcoStruxure™ Energy One Hub and supporting products and services by Schneider Electric
2. [2nd manufacturer and model]
3. [3rd manufacturer and model]

2.2 GENERAL REQUIREMENTS

A. The cloud based EPMS shall provide data and analytics functionality for (a) energy awareness and sustainability metrics, and (b) power reliability and availability. Features like real-time monitoring, alarm notification and management, energy, power, and sustainability data analytics and visualization will facilitate the following functions at a high level:

1. Analyze energy usage and uncover savings opportunities.
2. Meet and exceed energy efficiency and sustainability standards and certifications.
3. Provide accurate documentation for regulatory compliance.
4. Receive alarm notifications and view equipment status

B. Data and analytics provided by the cloud based EPMS system for centralized or remote display, analysis, logging, alarming, event recording, and other cloud based EPMS operations shall be accessible from a support web browser on desktop or laptop computer, or tablet. In addition, a mobile app shall be available to provide alarming and display capabilities on a supported mobile device.

C. Access to Software Services. Right to use all cloud based EPMS software supplied as a standard part of system supplier's products for this project shall be granted to the Owner in accordance with the respective Terms & Conditions of the software and related subscription.

D. Computer hardware (e.g. Client workstations, mobile devices) required to access the cloud based software shall be provided by the Owner. Authorized users access the cloud based EPMS software via standard web browser.

2.3 ELECTRICAL DISTRIBUTION MONITORING & ALARMING

A. The cloud based EPMS in conjunction with compatible connected devices shall provide dashboards or graphics displays with real-time data from the electrical infrastructure, such as incoming utility feeds, medium voltage, and low voltage distribution. Relevant real-time data from energy meters shall be displayed from the connected devices. Real-time data shall also be organized and displayed along with other analytics functions of the cloud based EPMS software to provide logical views for the health of the system and to support cloud based EPMS applications specified herein.

B. Electrical single line diagrams: The cloud based EPMS shall provide graphical screens showing the electrical single line diagram for each facility. The following minimum functionality shall be provided.

1. Display of real-time electrical parameters for equipment components on the single line (such as MV switchgear, MV transformers, generators, unit substations, LV switchboards, panelboards, UPS, isolated panel system, etc.).
2. Link to power equipment details screens.

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C. Equipment details: The cloud based EPMS shall include a set of screens showing equipment details including:
   1. Details pertaining to each piece of equipment. This includes a picture of the equipment (if provided to cloud based EPMS supplier), local single line (if applicable), information for each electrical section (for example, breaker and disconnect switch), and all alarm points.
   2. Measured peak demand and loading of equipment (e.g., breakers, UPSs, transformers, generators, motors)
   3. Ability to drill down to display details of each meter/protection device that apply to the piece of equipment.

D. Status: The cloud based EPMS shall include a summary status screen for alarm indication for major power equipment components of the electrical distribution system.

E. Alarms: Abnormal electrical conditions, events and group related incidents shall be organized in descending timestamp order for quick and easily situational awareness and actionable intelligence. The cloud based EPMS shall also notify appropriate staff members of alarms through a mobile app.

2.4 ENERGY USAGE MONITORING AND BENCHMARKING

A. The cloud based EPMS in conjunction with compatible connected power and energy monitoring devices shall provide energy analysis and benchmarking features to isolate the factors contributing to energy usage, analyze energy usage patterns, and implement energy conservation measures. The features must support common analysis and benchmarking activities such as
   1. Categorize energy usage by load types such as HVAC, Lighting, and Plug Loads to identify where to focus energy conservation initiatives
   2. Aggregate energy usage data by site, building, floor, area, or zones.
   3. Compare and rank top contributors to energy usage across multiple sites, buildings, floors, areas, zones, equipment, or devices.
   4. Monitor and report on energy usage in accordance with ASHRAE 90.1, IECC, LEED, California Title 24

B. The following functionality shall be provided at a minimum.
   1. Ability to generate energy report(s) on demand.
   2. Ability to display relevant energy parameters in dashboard screens.

C. The cloud based EPMS shall provide the following reports to support benchmarking initiatives to drive improved energy efficiency.
   1. Energy Ranking report to display and compare the top 5 largest consumers of energy, by site, by building, and by load type.
   2. Energy usage report to display monthly, daily, or hourly energy usage, by site, building, floor, area, or by equipment

2.5 CONNECTED DEVICES

A. Connected Devices shall be connected to the local EPMS network for power monitoring, equipment status, alarms, etc. and to provide the required functionality of the cloud based EPMS. Connected Devices shall be integrated with the EPMS network and system as required to support the specified cloud based EPMS applications.

B. METERS
   1. Utility Revenue: The revenue grade metering device used to monitor incoming utility medium voltage mains shall be a Utility Revenue Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
   2. Transfer Switches: The metering device used to monitor transfer switches shall be a Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
   3. Generators: The metering device used to monitor shall be an Advanced Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
   4. MV Mains: The metering device used to monitor the medium voltage mains shall be an Advanced Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.

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5. MV Feeders: The metering device used to monitor the medium voltage feeders shall be a Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
6. LV Mains: The metering device used to monitor the low voltage mains shall be a Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters.
7. LV Feeders: The metering device used to monitor the low voltage feeders shall be a [Power Meter as specified in Section 26 27 13.13 Power and Energy Meters] [Power Quality Meter as specified in Section 26 27 13.16 Power Quality Meters].
8. LV Sub Metering Individual Circuits: The metering device used to monitor circuits shall be [an Energy Meter as specified in Section 26 27 13.13 Power and Energy Meters] [a Power Meter as specified in Section 26 27 13.13 Power and Energy Meters].
9. LV Sub Metering Multiple Circuits: The metering device used to monitor branch circuits shall be [a Multi-Circuit Meter as specified in Section 26 27 13.13 Power and Energy Meters][an Integrated Panelboard Multi-Circuit Meter as specified in Section 26 27 13.13 Power and Energy Meters].
10. Additional application requirements and modifications to existing equipment for connected devices such as protective relays, circuit breakers, active harmonic filters, power factor correction equipment, voltage regulation equipment, RTUs and controllers, power event recorders, etc. can be specified here.

2.6 CONNECTED EQUIPMENT

A. Connected Equipment shall contain one or more Connected Devices (e.g., meters, circuit breakers, gateways, sensors, etc.). Connected equipment shall include an internal inter-wired communications network for a singular connection to the local EPMS network backbone for power monitoring, equipment status and alarms. Additional Connected Equipment shall be integrated with the cloud based EPMS as shown on drawings or as specified within the device's specification.

B. Connected Equipment (e.g. switchgear, motor control centers, motor controllers, switchboards, panelboards, automatic transfer switches, multi-meter enclosures, etc.) shall be integrated with a local IoT edge server device which shall connect to the cloud based EPMS software as required to support the specified cloud based EPMS applications.

C. Internet access by means of a wired ethernet connection shall be supplied to each local IoT edge server to facilitate data sharing with the cloud based EPMS. This internet access shall be provided by the owner, including any related telecommunication / ISP (Internet Service Provider) fees associated with this access.

2.7 CLOUD BASED EPMS SOFTWARE

A. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date: EcoStruxure™ Energy One Hub by Schneider Electric, [2nd manufacturer] or [3rd manufacturer].

B. General:

1. Furnish access to a cloud-hosted software platform (The Software Platform) purpose-built to be the operational interface of an EPMS to manage safe, reliable, and efficient power within buildings and facilities. The Software Platform shall have specialized data acquisition, visualization, analysis, and reporting tools specifically designed for power management applications such as:
   a. Electrical Distribution System Monitoring and Alarming.
   b. Energy Usage Analysis and Energy Benchmarking.
2. The Software Platform shall natively support (without additional installation or configuration) multiple types of devices specifically designed for energy management and electrical system monitoring, including power meters, branch circuit meters, multi-circuit meters, energy meters, and smart LV electrical panels with communicating circuit breakers. Native device support shall include:
   a. All registers pre-mapped to standard measurement names without requiring additional register mapping.
   b. A comprehensive set of data display screens without requiring additional graphics creation or installation.
   c. Fully factory-tested support.

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3. The Software Platform shall be designed in accordance with Secure Development Lifecycle practices.

C. Configuration and Setup:

1. The cloud based software application shall be able to be setup though a self-service onboarding without intervention.
2. Basic configuration including adding devices and user accounts to the software shall be able to be performed
   a. Remotely
   b. Without an active subscription or license
3. Devices and cloud-connected gateways shall be able to be added by scanning a compatible QR code through the cloud based EPMS mobile app.
4. Devices that are networked to cloud-connected gateways shall be automatically discovered by the software upon connection of the gateway.
5. Device context including name and topology information shall be automatically imported to the software to avoid duplicate data entry and configuration steps.
6. Other gateways and devices that have been purchased as part of the same been connected to the cloud shall be automatically discovered by the software once the first one has been added.
7. Energy usage of connected devices shall be able to be configured using a graphical drag-and-drop interface through a web browser.
8. Sites shall be able to be identified by address, with automatic address validation based on user input and displayed on a map.
9. The software shall automatically create default dashboards and navigation based on the devices and contextualization added by the user.
10. The software allows new users to be invited by email address. User access shall be limited by role-based access down to site level.

D. Alarm Management and Notification:

1. The Software Platform shall support acquiring and displaying specialized, on-board alarms from power distribution equipment.
2. The software platform shall provide displays of alarms filtered by location or asset, with ability to drill down to see detailed information about individual alarm occurrences such as start time and priority.
3. The software shall allow authorized users to acknowledge alarms.
4. The software platform shall provide a native mobile app on iOS and Android for receiving alarm notifications remotely. Users shall be able to specify which alarms they wish receive alarm notifications about.
5. The mobile app shall allow users to receive alarm notifications, to view historical alarms, and to remotely acknowledge alarms directly on their mobile device.

E. Data Analytics and Visualization:

1. The Software Platform shall include an interactive, web-based Dashboard application supporting all devices in the system.
2. The software platform shall be able to support the visualization of multiple sites in a single view.
3. The software shall support the ability to display geographically distributed sites in a map view.
4. The software shall be able to display different views for physical location of assets, location of energy usage.
5. The software shall be able to model and display electrical devices in a graphical single-line diagram for each site.
6. The software shall provide graphical views of the system that allow users to pan and zoom and shall support dynamic display of the level of detail of the data shown on the screen depending on the zoom level.

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7. The software shall provide a means to generate reports.
8. The software shall provide the ability to download data in csv format.

F. Technical Infrastructure:

1. The Software Platform shall be completely hosted and supported by the software developer.
2. The operation of the underlying software platform shall be monitored and maintained by the software developer, including ongoing cybersecurity and threat monitoring, disaster recovery and backup processes, and software patches and upgrades.
3. The Software Platform shall automatically acquire on-board data (including events, trends, and waveforms) from natively supported device types through supported IoT edge servers without additional software configuration or data upload scheduling. Onboard, high resolution timestamps (1ms) shall be retrieved without degradation or modification even for devices that support clock synchronization via GPS, IRIG-B, NTP or PTP (Precision Time Protocol).
4. The Software Platform shall support real-time and historical data aggregation within defined hierarchy views (e.g. Buildings/Floors/Rooms) with the following capabilities:
   a. Web-based, end user interface.
   b. Automatic, intelligent data aggregation across all nodes in the hierarchy for data visualization.
5. The Software Platform shall remain online during all system administration functions (including communications, logging, and alarming) and not require an operator to take the system offline.

G. Cyber Security and Data Privacy

1. The cloud based EPMS shall follow best practices for cyber security and provide technical features to reduce risk to people, assets, and processes.
   a. Developed in accordance with Secure Development Lifecycle 2.0 procedures
   b. Substantially developed in a location which has been certified to IEC62443
   c. Role-based user access
   d. Compliance with GDPR
   e. Use of HTTPS for communication between edge and cloud
   f. Encryption of data in transit and at rest
   g. Authenticate genuineness of all devices connected to the cloud

2.8 COMMUNICATIONS AND INTERFACES

A. Interface with Equipment: Unless specified or shown otherwise, the cloud based EPMS shall communicate to equipment through a compatible IoT edge server.

B. The cloud based EPMS shall allow any number of compatible IoT edge servers to be connected to the customer account to support the desired system architecture. The IoT edge servers may be installed at the same site, or multiple geographically distributed sites.

C. The IoT edge server shall communicate to devices using Modbus TCP Ethernet protocol or other supported protocols.

D. The IoT edge server shall have the ability to log data from connected devices for a minimum of 14 days in order to avoid data loss due to interruption of the cloud connection.

E. The IoT edge server shall support connectivity to at least 150 energy meters, or at least 50 branch-circuit meters.

F. The IoT edge server shall be certified to IEC-62443 standards for cybersecurity.

G. The Contractor shall coordinate the provision and supply of AC or DC power provided to the IoT edge server as appropriate according to the project design.

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H. The Contractor shall coordinate between suppliers to ensure compatibility between software, computer systems, network, communications gateways, connected equipment and devices, IoT edge servers, and any other components necessary for the specified functionality of the cloud based EPMS. The supplier of equipment to be connected to the cloud based EPMS shall provide the necessary compatible interface to the cloud based EPMS system's IoT edge servers. Any required gateways, transceivers, converters, etc. for this interface shall be integral to the supplied equipment.

SECTION C: EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of Specification Section [26 00 10] [16010] and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

D. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

E. Install equipment in accordance with reviewed product data, final shop drawings, single-lines, panel schedules, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

F. Functional testing, commissioning, and first parameter adjusting shall be carried out by the Contractor.

G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

3.2 SYSTEM COMMISSIONING

A. Commissioning shall include testing and demonstration of the system under normal operating conditions.

3.3 TRAINING

A. The cloud based EPMS system supplier shall provide an orientation session on usage and configuration of the cloud based EPMS system. This session may be recorded for operator training purposes.

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DISCLAIMER STATEMENT

This guide specification has been written and is intended to be used by a professionally qualified specifier and/or design professional. The use of this guide specification requires the professional judgment and expertise of the qualified specifier and/or design professional to adapt or revise the information to the specific needs for the Project and is not intended to be used verbatim as a project specification section without appropriate modifications for the specific use intended. The guide specification must be used and coordinated in accordance with the procedures of each design firm, and the requirements of the specific project. This guide specification is subject to change without written notice by the manufacturer and the manufacturer expressly disclaims any warranty, expressed or implied.

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