SECTION 26 24 13
SWITCHBOARDS *[LEED]*

PART 1 - GENERAL

1.1 SCOPE - **This specification covers all 4 types of SIEMENS switchboards. They are SB (standard), Generator Ready, Integrated Power System and Commercial Multi-Metering SMM/MMS. Use the parts of this spec that relate to the type of board you are specifying. If there are no notes and the text is black, then it can be applied to all 4 types.** ***[Bold, blue, italacs and bracketed]*** **words are options.**

A. The contractor shall provide and install dead-front ***[service entrance] [distribution] [integrated]*** switchboards as herein specified and as shown on related electrical drawings.

1.2 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section.

B. ***[Related sections include the following:***
1. ***Section 26 28 16 – Molded Case Breakers***
2. ***Section 26 43 13 – Surge Protection Devices***
3. ***Section 26 09 13 – Electrical Power Monitoring and Control***
4. ***Section 26 24 16 – Panelboards***
5. ***Section 26 22 13 – Low-Voltage Distribution Transformers]***

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data.

B. Drawings: Submit shop drawings for approval. Include components, materials, finishes, detailed plan and elevation views, required conduit rough-in openings, anchors and accessories.

1.4 RELATED STANDARDS

A. The switchboard shall be designed, manufactured and tested according to the latest applicable version of the following standards:
1. ANSI
2. NEMA PB2 – Deadfront Distribution Switchboards
3. UL 891 – Deadfront Switchboards
4. ***[NEC702 - Generator Ready Option]*** - **[Spec for Generator Ready Switchboards]**
5. ***[Florida Building Code Section 420.4.2.9.7]*** - **[Spec for Generator Ready Switchboards]**

B. ***[Manufacturer Seismic Qualification: The low voltage switchboard(s) shall meet and be certified to seismic requirements specified in the [IBC 2015 International Building Code] [CBC 2016 California Building Code] [ASCE American Society of Civil Engineers 7-10].***
1. ***The low voltage switchboard(s) shall be compliant with IBC 2015 parameters:***
   a. ***Building Occupancy Category (as defined in Table 1.1 from ASCE 7-10): [I] [II] [III] [IV]***
   b. ***Seismic Design Category: [A] [B] [C] [D] [E] [F]***
   c. ***Site Class: [A – Hard Rock] [B - Rock] [C – Very dense soil and soft rock] [D – Stiff soil profile] [E – Soft Soil Profile] [F – Soil vulnerable to potential failure or collapse under seismic loading] as defined in IBC 2006 Table 1613.5.2 Site Class Definitions***
   d. ***Ip – Importance Factor: [1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV)] [1.0 – Non-essential buildings. Function not life critical. (Building Occupancy Code I and II)]***

e. ***Ss – Mapped Spectral Accelerations for Short Periods at 0.2 seconds – 239%g***

f. ***Sds – 5% Damped Design Spectral Response Accelerations for Short Periods at 0.2 seconds – [Floor 0, Sds=2.70g] [Floor 1, Sds=2.32g] [Floor 2, Sds=2.03g] [Floor 3, Sds=1.80g] [Floors 4-12, Sds=1.69g]***

g. ***z/h – Height factor ratio: [___] Note: Ratio is a calculated value equal to the floor the gear is installed on divided by 12. A 6th floor installation is a 0.5 value. A basement or ground floor installation is a 0.0 value.***

2. ***Equipment shall be designed to be located in a concrete and steel, moment-resisting frame building not exceeding 12 stories in height with a minimum story height of 10 feet.]***

1.5 QUALITY ASSURANCE

A. Manufacturer: For equipment required for the work of this section, provide product which is the responsibility of one manufacturer.

B. Performance Requirements: Provide switchboards manufactured in accordance with Article 408 of the latest National Electrical Code and applicable portions of the NEMA PB2, UL 891 and NFPA 70, the National Electrical Code.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide SIEMENS ***[SB] [Generator Ready] [Integrated Power System] [Commercial Multi-Metering SMM/MMS]*** switchboards and accessories by Siemens or pre-approved equal. Approved manufacturers are as follows:
1. SIEMENS
2. ***[ ]***

B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of ten (10) years.

D. Intent: In the following specifications, products of Siemens are used to provide a standard of quality and performance for the work of this section.

E. ***[For LEED switchboards, keep this Section 2.1.E. If not LEED, then delete Section 2.1.E. Provide switchboards and accessories by Siemens or pre-approved equal. The switchboard shall help to earn LEED credits. "EA Credit 5: Measurement and Verification" has the intent of providing ongoing accountability of building energy consumption over time. This switchboard shall log building energy consumption (VA) over a one year period of post-construction occupancy. The design shall include metering equipment to measure energy use on the mains and all feeders.]***

2.2 GENERAL REQUIREMENTS

A. Construction
1. Switchboard shall be of the modular type construction, constructed in accordance with the latest NEMA PB-2 and UL 891 standards, with the required number of vertical sections bolted together to form one metal enclosed rigid switchboard. The sides, top and rear shall be covered with removable screw-on code gauge steel plates. Switchboard shall include all protective devices and equipment as listed on drawings with necessary

interconnections, instrumentation and control wiring. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Service entrance switchboards shall be suitable only for use as service equipment and be labeled in accordance with UL requirements. System voltage, amperage and interrupting capacity shall be as indicated on the drawings. Enclosure construction shall be ***[NEMA 1 indoor] [NEMA 3R outdoor] [NEMA 3R outdoor supplied with a front trap door to maintain the switchboard rating with generator cables connected.] [This last option is for Generator Ready Switchboards only]***.

B. Bus Requirements

1. The bus shall ***be [of sufficient size to limit the temperature rise to 65 degree C, based on UL tests] [750A / sq-in for aluminum] [1000A / sq-in for copper]*** and ***[shall be tapered per UL standards] [shall be fully rated the entire length of the switchboard]***. The bus shall be braced and supported to withstand mechanical forces exerted during a short circuit from a power source having the available short circuit current as indicated on the drawings. Provide a full capacity neutral where a neutral is indicated on the drawings. The through bus on the end section shall be extended and pre-drilled to allow the addition of future sections. Ground bus and grounding conductor lug shall be furnished. Ground bus shall extend the entire length of the switchboard and shall be firmly secured to each vertical section. Bus Material shall be ***[tin plated aluminum] [silver-plated copper]***.

C. Incoming Service

1. ***[Underground Service:***
   a. ***To isolate incoming underground service conductors, an underground cable pull or auxiliary section shall be used when shown on the drawings. This section shall be of the [non-bussed] [bussed] type and shall be sealable per local utility requirements, when required.]***
2. ***[Overhead Service:***
   a. ***[Cable entry: Where necessary, provide top cable pull box and provide construction that shall be sealable per local utility requirements, when required.]***
   b. ***[Busway Entry: Integrated switchboard to be fed by Siemens Sentron [_____] ampere [copper] [aluminum] busway, as detailed on drawings [and other sections of this specification]. The integrated switchboard manufacturer shall be responsible for coordination, proper phasing and internal bussing to the incoming busway.]]***
3. ***Service Section:***
   a. ***The service section shall be designed for the system parameters indicated and shall have [a metering compartment per utility requirements] [user metering as indicated] and shall have a main protective device as indicated.***
4. ***Lugs:***
   a. ***[Screw-type mechanical lugs] [Compression lugs] to terminate [aluminum] [copper] cable shall be provided as detailed on the drawings.***

D. ***[Fire Pump Tap***

1. ***The fire pump tap section shall be on the line side of the main disconnect(s) and contain only through bus and tap lugs to feed the fire pump.]***

E. ***[Utility Metering***

1. ***The utility metering section shall be built in accordance with requirements and codes of the local utility.]***

F. ***[Main Lugs Only*** **[Select either this Main Lugs Only section or Main Protective Device section below. Delete the sections that do not apply in their entirety.]**

1. ***The switchboard shall be main lugs only. Switchboards used for service entrance shall be limited to six disconnects.]***

G. *[Main Protective Device* – **[Select one of the 8 main devices from the list below. Delete the others.]**

1. **[Molded Case Circuit Breaker]** *[Molded case circuit breaker shall be of the quick-make, quick-break, trip-free, [thermal magnetic] [solid state] type. When solid state breakers are used, the continuous current rating shall be adjustable from 20 to 100% without the need for a rating plug. Thermal magnetic breakers shall be Siemens Sensitrip IV, 3VA5 or equivalent design. Breaker ratings shall be as shown on the drawings.]*
2. **[Solid State, Molded Case Circuit Breaker]** *[Molded case circuit breaker shall be of the quick-make, quick-break, trip-free, solid state type. The solid state breakers continuous current rating shall be adjustable from 20 to 100% without the need for a rating plug. Solid state breakers shall be Siemens Sensitrip IV, 3VA6 or equivalent design. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous [short time pickup and delay,] [ground fault pickup and delay,] [zone selective interlocking for short time and ground fault]. Breaker ratings shall be as shown on the drawings.]*
   a. *[The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker will allow the installer to set two different short time and instantaneous settings into one breaker. One set of settings will be set for standard operating mode and the second settings, with instantaneous protection shall be set for arc flash mode.] [The breakers with frames rated 1200 amps or larger shall be equipped with [Sm@rt Dynamic Arc Flash Sentry] [Sentron Sensitrip IV Advanced trip unit] to comply with NEC 2014 240.87.]]*
3. **[Fusible Switch]** *[Fusible switch shall be of the quick-make, quick-break, trip-free type. Switch shall be Siemens Vacu-break design or equivalent. Switch ratings and options shall be shown on the drawings.]*
4. **[High Contact Pressure Switch]** *[High contact pressure switch shall be quick-make, quick-break, trip-free type. Switch shall be Siemens HCP type or equivalent. Switch ratings and options shall be as shown on the drawings. [Switch shall include ground fault protection and indication.]]*
5. **[Bolted Pressure Switch]** *[The bolted pressure switch shall be true bolted contact load break type with provisions for Class L fuses. Switches shall have an interrupting rating of 12 times the continuous rating and capable of carrying 100% of rated current. High pressure contact switches do not meet the intent of this requirement. [Switch shall include ground fault protection and indication.]]*
6. **[Low Voltage Power Circuit Breaker]** *[The low voltage power circuit breaker shall be provided with a drawout frame and current rating as shown on the drawings. It shall be [manually] [electrically] operated power circuit breaker with a solid-state trip device providing adjustments for long time pick up and delay, [short time pickup and delay,] [instantaneous,] [ground fault pickup and delay,] [and zone selective interlocking for short time and ground fault]. Breaker shall be Siemens Type WL design or equivalent.]*
7. **[WL Insulated Case Breaker, Fixed Mount Main]**
   a. *Circuit breakers shall comply with the requirements of UL. Breakers shall be three-pole, 100% rated type or approved equal.*
      1.) *Circuit breaker element shall have spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed.*
      2.) *Provide interlocks to prevent racking the circuit breaker unless the breaker is open.*
   b. *Ratings: Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.*
   c. *Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:*

1.) *Normal Closing Speed: independent of both control and operator*
2.) *[Electrical operator, field installable with manual charging]*
3.) *[Operations counter]*

d. *Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:*
   1.) *Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.*
   2.) *Functions: Long time, short time and extended instantaneous protection function (EIP) shall be provided to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I2t ramp. [I4t to improve coordination with fuses or inverse relays.]*
   3.) *A software program shall be made available free of charge to support system coordination studies. The software will allow time current curves to be generated for the chosen settings.*
   4.) *Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition.*
   5.) *Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system [ModBus] [Profibus] [Ethernet].*
   6.) *Current Adjustability shall be accomplished by use of dial settings and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.*
   7.) *Pickup Points: 10 Long Time Settings.*
   8.) *[Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I2t ramp. Arrange to provide protection for [three-wire] [four-wire] service.]*
   9.) *[Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit breaker closest to the fault trips for short time and ground fault conditions.]*
   10.) *[Field Installable Communications and metering functions shall be provided per schedule]*
   11.) *[A LCD display shall be available to simplify settings & viewing data locally.]*
   12.) *The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.*
   13.) *Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.*
   14.) *[Waveform capture and display shall be accomplished on the trip units LCD display.* **ETU776 only.** *]*

e. *Terminal Block Connections, shall be front mounted and utilize [Screw Type Terminals], [Ring Tongue Terminals], [Tension Spring Terminals]*

f. *[Control Switch: One for each electrically operated circuit breaker.]*

g. *[Key Interlocks: Mountings and hardware are included where future installation of key-interlock devices is indicated.] A total of 14 different interlocking devices shall be available.*
h. *[Undervoltage Trip – field installable]: [Instantaneous] [Adjustable time-delay.]*
i. *[Shunt-Trip – field installable]*
j. *[Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.]*
k. *[Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer's personnel to retrofit accessories.]*
l. *Accessories shall be front mounted.*
m. *Field interchangeable accessories shall include CT's, trip units, racking mechanism and all internal & external accessories.*
n. *[The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, similar to the Siemens WL breakers ETU776 trip unit. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a [Siguard motion sensor set to the arc flash boundary] [keyed switch] [light curtain shall be installed behind the gear to sense open doors on the back of the panel.] [The breakers with frames rated 1200 amps or higher shall be equipped with Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.]]*

8. **[WL Insulated Case Breaker, Drawout]**
a. *Circuit breakers shall comply with the requirements of UL489 and UL1066. Breakers shall be three-pole, 100% rated type or approved equal.*
1.) *Circuit breaker element shall have connected, test and disconnected position indicators, spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed. It shall be possible to rack the circuit breaker element from the connected to the disconnected position with the compartment door closed, otherwise known as "through the door drawout".*
2.) *Provide interlocks to prevent racking the circuit breaker unless the breaker is open.*
b. *Ratings: Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.*
c. *Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:*
1.) *Normal Closing Speed: independent of both control and operator*
2.) *[Electrical operator, field installable with manual charging]*
3.) *[Operations counter]*
d. *Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of high accuracy (<1%) Rogowski coil sensors on each phase, a release mechanism and the following features:*
1.) *Field Installable and interchangeable front mounted trip units. Trip units can be upgraded for future expansion in functionality, such as communication.*

2.) *Functions: Long time, short time and extended instantaneous protection function shall be provided (EIP) to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I2t ramp and optionally I4t to improve coordination with fuses or inverse relays.*

3.) *A software program shall be made available free of charge to support system coordination studies. The software will allow time current curves to be generated for the chosen settings.*

4.) *Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition.*

5.) *Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system [ModBus] [Profibus] [Ethernet].*

6.) *Current Adjustability shall be accomplished by use of dial setting and rating plugs on trip units. The rating plug shall be front mounted and upgradeable. Upgrades to the rating plugs shall not require changes to the CT.*

7.) *Pickup Points: 10 Long Time Settings.*

8.) *[Field Installable Ground-fault protection with at least three time-delay bands and an adjustable current pickup and an I2t ramp. Arrange to provide protection for [three-wire] [four-wire] service.]*

9.) *[Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit breaker closest to the fault trips for short time and ground fault conditions.]*

10.) *[Field Installable Communications and metering functions shall be provided per schedule.]*

11.) *[A LCD display shall be available to simplify settings & viewing data locally.]*

12.) *The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.*

13.) *Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.*

14.) *[Waveform capture and display shall be accomplished on the trip units LCD display.* **ETU776 only.***]*

15.) *A visible pin shall indicate wear. [In addition to the visible pin indicator, estimated contact wear shall be calculated in the trip unit and be [capable of being] communicated remotely.]*

e. *[Include a MOC (Mechanism Operated Cell switch) operated by the circuit breaker operating mechanism.]*

f. *Terminal Block Connections, shall be front mounted and utilize [Screw Type Terminals], [Ring Tongue Terminals], [Tension Spring Terminals]*

g. *Padlocking Provisions shall be included to install at least three padlocks on each circuit breaker to prevent movement of the drawout mechanism.*

h. *Operating Handle shall be an integral part of the breaker. No external tools shall be required to rack the breaker.*

i. *[Control Switch: One for each electrically operated circuit breaker.]*

j. *[Key Interlocks: Mountings and hardware are included where future installation of key-interlock devices is indicated.] A total of 14 different interlocking devices shall be available.*

k. *[Undervoltage Trip – field installable]: [Instantaneous] [Adjustable time-delay.]*
l. *[Shunt-Trip – field installable]*
m. *[Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.]*
n. *[Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer's personnel to retrofit accessories.]*
o. *Accessories shall be front mounted. Modular communications and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer's personnel to retrofit accessories.*
p. *Portable lifting yoke for drawout circuit breakers.*
q. *Field interchangeable accessories shall include CT's, trip units, racking mechanism and all internal & external accessories.*
r. *[The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, similar to the Siemens WL breakers ETU776 trip unit. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a [Siguard motion sensor set to the arc flash boundary] [keyed switch]. [A light curtain shall be installed behind the gear to sense open doors on the back of the panel.]]*

H. Distribution Sections
1. **[[Panel-Mounted, Front Accessible]** *Individual sections shall be front accessible, not less than 20" deep and the rear of all sections shall align. Incoming line termination, main device connection and all bolts used to join current-carrying parts shall be installed so as to permit servicing from the front only so that no rear access is required. The branch devices shall be front removable and panel mounted with line and load side connections front accessible. The interior shall be capable of accepting panel mounted molded case circuit breakers or fusible switches up to 1200 A rating. Construction shall be Siemens SB type, or approved equal.]*
2. **[[Individually Mounted, Rear Accessible (Insulated Case Breakers)]** *All sections shall be aligned front and rear. Insulated case breakers shall be individually mounted in their own compartments. Barriers shall be provided at the sides and rear of each compartment and a horizontal barrier between breakers in the same vertical section. Breaker shall be accessible through a hinged metal door on each breaker compartment. The insulated case circuit breaker shall be equal to Siemens WL Encased Systems Type and shall be self-contained to permit quick replacement, maintenance or inspection of breakers without de-energizing the entire switchboard. Construction shall be Siemens RCS type, or approved equal. Not Available in* **Integrated Power System Switchboards***]*
   a. *[Barriers shall be provided between the bus and cable compartment and between vertical sections].* **Not Available in Integrated Power System Switchboards**
   b. *[Feeder device load terminal bus extensions shall be insulated].* **Not Available in Integrated Power System Switchboards**
   c. *[Provide traveling type breaker lifting hoist and track mounted on top of switchboard].* **Not Available in Integrated Power System Switchboards**
   d. *[Provide portable lifting device].* **Not Available in Integrated Power System Switchboards**

e. ***[Provide Dynamic Arc Flash Sentry for [all feeder breakers.] [feeder breakers as noted on the single line diagram.] [all feeder breakers that can be rated 1200 amps or higher].*** **Not Available in Integrated Power System Switchboards]**

3. **[Four High Mounted, Front Accessible (Insulated Case Breakers)]** ***Individual sections shall be front accessible, not less than 38" deep and the rear of all sections shall align. Incoming line termination and all bolts used to join current-carrying parts shall be installed so as to permit servicing from the front only so that no rear access is required. Breaker shall be accessible through a metal door on each breaker compartment. The insulated case circuit breaker shall be equal to Siemens WL Encased Systems Type. The construction shall allow up to 4 2000A drawout WL circuit breakers in a single section. An additional section shall be used for a wireway using run overs. The wireway width shall be [20"] [25"] [32"] [38"] [46"]. All load side connections in wireway shall be front accessible.***
   a. ***[Provide static type breaker lifting hoist and track mounted on top of switchboard.]***
   b. ***[Provide portable lifting device.]***
   c. ***[Provide Dynamic Arc Flash Sentry for [all feeder breakers.] [feeder breakers as noted on the single line diagram.] [all feeder breakers that can be rated 1200 amps or higher.]]***

I. Distribution Section Branch Protective Device **[Select branch device(s) from the list below]** All molded case circuit breakers, fusible switches, insulated case circuit breakers, bolted pressure switches or low voltage power circuit breakers used as a protective device in a branch circuit shall meet the requirements of the appropriate paragraph below. ***[Provide Dynamic Arc Flash Sentry for [all feeder breakers.] [feeder breakers as noted on the single line diagram.] [all feeder breakers that can be rated 1200 amps or higher.]]***

1. **[Molded Case Circuit Breakers]** ***[MCCB's shall be of quick-make, quick-break, trip-free [thermal magnetic] [solid-state – 150 amp frame, 30 amp trip and above] [solid-state - 400 amp frame and above for Integrated Switchboards]*** type with frame, trip and voltage ratings, as indicated on the drawings. The switchboard shall have space or fully equipped provisions for future units as shown on the drawings.]
2. **[Fusible Switches]** ***[Fusible switch shall be of the quick-make, quick-break, trip-free type. Switch shall be Siemens Vacu-break design or equivalent. Switch ratings and options shall be shown on the drawings.]***
3. **[High contact pressure switch]** ***[High contact pressure switch shall be quick-make, quick-break, trip-free type. Switch shall be Siemens HCP type or equivalent. Switch ratings and options shall be shown on the drawings.]***
4. **[Bolted Pressure Switches]** ***[Bolted pressure switch shall be the quick-make, quick-break type, equipped with Class L fuses suitable for application on a system with available fault current as shown on the drawings. Ampere ratings shall be as shown on the drawings.]***
5. **[Insulated Case Circuit Breakers]** ***[Each insulated case circuit breaker shall be [drawout] [stationary] frame, stored energy type, trip free, [manually operated] [electrically operated] with solid-state trip device. Frame sizes and trip ratings to be as shown on the drawings. All breakers to have an interrupting capacity as indicated on the drawings. Breakers shall be Siemens Type WL Breaker design or equivalent.]***

J. Ground Fault Protection
1. Furnish and install in the service equipment and/or switchboard ground fault protection and indication equipment as shown on drawings in accordance with NEC 230-95. All parts of the systems specified shall be UL Listed. All new ground fault protection and indication equipment shall be factory installed, wired and tested by the switchboard manufacturer.

K. Metering Equipment

1. ***[Provide a multi-function, high accuracy digital power metering instrumentation module equipped with LCD display.*** **NOTE: This is standard all meters except SEM3. For SEM3 a display is optional.*]*** The power metering module shall provide simultaneous measurements for current, voltage and power parameters. Power meter shall be Siemens type ***[PAC 3100] [PAC 3200] [SEM3] [PAC4200] [9410] [9510] [9510 ADR/RTU] [9610] [9810]*** equipped with a communications port for standard RS-485 connection. **[NOTE TO SPEC WRITER: If LEED, select a meter, above, that will log building energy consumption (VA) over a one year period of post-construction occupancy. The design shall include metering equipment to measure energy use on the mains and all feeders.]**

L. Finish
1. The complete switchboard shall be phosphatized and finished with ANSI 61 light gray polyester powder paint.

M. Markings
1. Each switchboard section shall have a label permanently affixed to it, listing the following information: Name of manufacturer, system voltage, ampacity, type, manufacturer's shop order number and date.
2. Each section of switchboard shall bear a UL listing mark, where qualified and a short circuit rating label.
3. Front, side, rear and top of each switchboard section will have a DANGER label in accordance with NEMA Standard PB-2.

N. **[Note to Editor: The next 3 sections pertain to Generator Ready, Integrated and SMM/MMS. If a standard switchboard is all you need, then delete the next 3 sections. If you are looking for one of the custom switchboards, then keep the parts that pertain to your needs.]**

1. **[Generator Ready]** ***The low voltage switchboard shall be gen-ready. The following features shall be included:***
   a. ***[600 volt maximum.]*** **- [Spec for Generator Ready Switchboards]**
   b. ***[4000 ampere maximum.]*** **- [Spec for Generator Ready Switchboards]**
   c. ***[All standard front connected features shall still apply.]*** **- [Spec for Generator Ready Switchboards]**
   d. ***[Install a Crouse-Hinds 4/0 400A Cam-lock, quick connect] [Install a plug-in connector by ____.]*** **- [Spec for Generator Ready Switchboards]**
   e. ***[Provide type W lugs for secondary connection method.]*** **- [Spec for Generator Ready Switchboards]**
   f. ***[Key interlock.]*** **- [Spec for Generator Ready Switchboards]**
   g. ***[Removable Screw cover shall be supplied over the quick connects.]*** **- [Spec for Generator Ready Switchboards]**
   h. ***[Quick connect plug-in shall be labeled with phasing and neutral.]*** **- [Spec for Generator Ready Switchboards]**
   i. ***[The Generator Ready section shall be installed as [a stand alone unit] [in a standard line-up.]*** **- [Spec for Generator Ready Switchboards]**

O. **[Integrated Power System Switchboards]**
1. **[Integrated Panelboard] - [Spec for Integrated Power System Switchboards]**
   a. ***[The panelboards indicated on the drawings shall be integrated into the integrated switchboard. The panelboard shall be Siemens Sentron P-series in compliance with specification section 16442.]*** **- [Spec for Integrated Power System Switchboards]**
   b. ***[Lighting Panelboards shall be supplied with a trim with hinged lockable door, securely fastened to switchboard frame. Door edges shall be free of all sharp edges.] [Lighting panelboards shall be supplied with a hinged deadfront complete with a hinged lockable door over panel. Screws used to***

secure hinged deadfront shall be captive. Trim door shall be free of all sharp edges.] - **[Spec for Integrated Power System Switchboards]**

c. *[Integrated panelboards shall be [pre-wired] [wired by contractor] from the associated feeder device located within the switchboard distribution section. Where pre-wiring is performed by the manufacturer, panelboards served by circuit protective devices within separate shipping splits shall have conductors terminated to the circuit protective device and coiled within the shipping split with the circuit protective device and secured for shipment. Adequate cable lengths and cable supports shall be provided for ease of installation by the installation contractor.]* - **[Spec for Integrated Power System Switchboards]**

d. *[Where compression wire connectors are used, the installation contractor shall be responsible for terminating compression wire connectors.]* - **[Spec for Integrated Power System Switchboards]**

e. *[Integral power conductors are installed within the integrated switchboard conductors shall be sized in accordance with the contract drawings, specifications and applicable UL and National Electrical Code requirements.]* - **[Spec for Integrated Power System Switchboards]**

f. *[Where the panelboard is served by an external source provide adequate pull and wire bending space and sufficient conduit openings for installation of external source conductors.]* - **[Spec for Integrated Power System Switchboards]**

g. *[Sections and/or panelboard compartments served by an externally supplied power source, internal transformer, or adjacent distribution section shall be isolated from adjacent sections and/or compartments by internal grounded metal barriers or insulated barriers.]* - **[Spec for Integrated Power System Switchboards]**

2. **[Dry-Type Transformer] - [Spec for Integrated Power System Switchboards]**

a. *[The transformers indicated on the contract drawings shall be integrated into the switchboard. The transformers shall be Siemens Sentron series in compliance with specification section 16460. Installation of transformers shall in no way reduce the integrity of the vertical switchboard section.]* - **[Spec for Integrated Power System Switchboards]**

b. *[Adequate ventilation shall be provided such that the switchboard structural temperature is maintained per UL 891, section 31.]* - **[Spec for Integrated Power System Switchboards]**

c. *[The primary terminations of the integrated transformers shall be [pre-wired] [wired by contractor] from the associated feeder device located within the switchboard distribution section. Where pre-wiring is performed by the manufacturer, transformers served by circuit protective devices within separate shipping splits shall have conductors terminated to the circuit protective device and coiled within the shipping split with the circuit protective device and secured for shipment. Adequate cable lengths and cable supports shall be provided for ease of installation by the installation contractor. Transformers feed by an external source is the responsibility of the electrical contractor.]* - **[Spec for Integrated Power System Switchboards]**

d. *[The secondary terminations of the integrated transformers shall be [pre-wired] [wired by contractor] to the associated integrated load device or panelboard located within the integrated switchboard. Where pre-wiring is performed by the manufacturer, transformers served by circuit protective devices within separate shipping splits shall have conductors terminated to the transformer and coiled within the shipping split with the transformer and secured for shipment. Adequate cable lengths and cable supports shall be provided for ease of installation by the installation contractor. Secondary connections external to the integrated switchboard shall be the*

responsibility of the electrical contractor.] - **[Spec for Integrated Power System Switchboards]**

e. *[Where compression wire connectors are used, the installation contractor shall be responsible for terminating compression wire connectors.]* - **[Spec for Integrated Power System Switchboards]**

f. *[Integral power conductors installed within the integrated switchboard shall be sized in accordance with the contract drawings, specifications and applicable UL and National Electrical Code requirements.]* - **[Spec for Integrated Power System Switchboards]**

g. *[Where the transformer is served by an external source provide adequate pull and wire bending space and sufficient conduit openings for installation of external source conductors.]* - **[Spec for Integrated Power System Switchboards]**

h. *[Transformer sections and/or compartments shall be isolated from adjacent sections and/or compartments by internal grounded metal barriers or insulated barriers.]* - **[Spec for Integrated Power System Switchboards]**

3. **[Integrated Automatic Transfer Switches]**

a. *[Automatic Transfer switches shown on the contract drawings shall be integrated into the switchboard and shall be manufactured by ASCO, Russelectric or equal.]* - **[Spec for Integrated Power System Switchboards]**

b. *[Where indicated on the drawings, manufacturer shall provide inner connectivity to normal side of automatic transfer switch.]* - **[Spec for Integrated Power System Switchboards]**

c. *[Where indicated on the drawings, manufacturer shall provide inner connectivity to load side of automatic transfer switch.]* - **[Spec for Integrated Power System Switchboards]**

d. *[Emergency source connectivity, unless otherwise indicated on the drawings, shall be provided by the electrical contractor.]* - **[Spec for Integrated Power System Switchboards]**

4. **[Auxiliary Sections And/Or Compartments] - [Spec for Integrated Power System Switchboards]**

a. *[Auxiliary compartment shall be provided for auxiliary equipment designated on the drawings to either be factory installed or field installed within the integrated switchboard. Examples of possible auxiliary equipment are building automation panels, contactors, PLC's, metering, customer supplied equipment and/or others as designated. Factory drawings shall clearly denote all auxiliary equipment installed within the Integrated switchboard including interconnecting wiring.]* - **[Spec for Integrated Power System Switchboards]**

b. *[Hinged metal doors shall be installed on auxiliary compartments to allow working access to auxiliary equipment. Doors shall be lockable either with a built in tumbler and key or by padlocking provisions.]* - **[Spec for Integrated Power System Switchboards]**

c. *[Where auxiliary equipment is indicated on the drawings to be installed within the switchboard by the manufacturer, the equipment shall be installed to meet all applicable codes and standards while maintaining the UL listing of the switchboard.]* - **[Spec for Integrated Power System Switchboards]**

d. *[Equipment space designated for field installed equipment shall be provided with grounded metal back-plate for mounting auxiliary equipment.]* - **[Spec for Integrated Power System Switchboards]**

e. *[Auxiliary sections and/or compartments shall be isolated from adjacent sections and/or compartments and internal bussing by grounded metal barriers or insulated barriers.]* - **[Spec for Integrated Power System Switchboards]**

f. *[All factory installed auxiliary equipment shall be UL Listed and labeled.]* - **[Spec for Integrated Power System Switchboards]**

g. *[Where indicated on the drawings provide power outlets and lighting within auxiliary compartment.]* - **[Spec for Integrated Power System Switchboards]**

P. **[Multi-Metering Distribution Sections]**

1. *[Meter sockets shall be rated [100 amp] [200 amp] [320 amp] continuous duty.]* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
2. *[Meter sockets shall contain [test blocks] [lever type manual bypass]].* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
3. *[Meter cover design shall be [ring type] [ringless type]].* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
4. *[Metering shall be [hot sequence] [cold sequence]].* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
5. *[Load cables shall exit [top] [bottom]].* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
6. *[Multi-metering branch protective devices shall be [molded case circuit breakers] [fusible switches] [fusible pullouts for Class T fuses]].* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
7. *[Each meter and associated disconnect device shall be labeled to easily identify meter/disconnect combinations.]* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**
8. *[All meter sockets (including provisions) shall be pre-wired.]* - **[Spec for Commercial Multi-Metering SMM/MMS Switchboards]**

Q. *[Optional Items]*

1. *[Zone Selective Interlocking:*
   a. *Zone Selective Interlocking (ZSI) shall be provide for all insulated case breakers and solid state molded case breakers when the single line is marked "ZSI" and a time delay is shown.*
   b. *Siemens WL and 3VA6 with trip units ETU576, ETU555 or ETU 586 shall be the basis of design. The insulated case breakers and solid state molded case breakers shall include communications modules.*
   c. *The contractor shall be responsible to make final wiring connections in the field.]*
2. *[Provide Surge Protection Devices for Low-Voltage Electrical Power Circuits per specification Section [26 43 13.xx] [16289]].*
3. *[Provide Electrical Power Monitoring and Control per specification Section [26 09 13.xx] [16290]].*
4. *[Provide hinged wireway covers for front connected distribution sections.]*
5. *[Provide lighting panelboard interiors integral to the switchboard as shown on the drawings.]*
6. *[Provide key interlocks as indicated on associated electrical drawings.]*
7. *[All control wire shall be type SIS.]*
8. **NOTE: If this specification is for a NEMA 1 switchboard, then the space heater, humidistat and thermostat are all options. If this specification is for a NEMA 3R switchboard, then a space heater is included as standard. The thermostat or humidistat is optional. [Space heaters and a [thermostat] [humidistat] shall be included in the switchboard. Space heater shall be sized to prevent condensation. The 120- volt power shall be derived from [a factory supplied CPT of the appropriate size for the space heater] [a customer supplied source]].**

R. *[Arc Flash]* **[DELETE ONE OR BOTH OF THE FOLLOWING SENTENCES ON ARC FLASH]**

1. *[Apply in the field, the factory supplied arc flash warning label to all switchboards that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized to warn qualified persons of potential electrical arc flash hazards.]*

2. ***[Provide a complete arc flash study of the entire electrical system from the point of incoming service to all panelboards. Labels shall include the arc flash boundary in feet, hazard category and a list of appropriate PPE.]***

S. ***[Remote Racking]***

1. ***A remote racking device shall be supplied to allow qualified personnel to rack Siemens Type WL breakers into Connect, Test and Disconnect positions from up to 30 feet away from the breaker and outside the arc flash hazard boundary.***
2. ***The remote racking device shall support utilization on any Frame Size 2 or Frame Size 3 WL breaker (including fuse carriage on fused Frame Size 3 WL breaker).***
3. ***The remote racking device shall be portable and weigh less than 30 pounds (excluding cables and remote control panel).***
4. ***The remote racking device shall have integral torque overload sensing to prevent damage to the breaker racking mechanism.***
5. ***The remote racking device shall allow breaker to be racked to any position (disconnect, test, connect) regardless of the starting position of the breaker and without the need for user input as to the starting position.***
6. ***[The remote racking device shall support field retrofit on Type WL Low Voltage Switchboard.]***

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions in which units will be installed. Check for clearance that will be required before, during and after equipment installation. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Strictly comply with manufacturer's instructions and recommendations and NEMA PB 2.1. Coordinate installation with adjacent work to ensure proper sequence of construction, clearances and support.

C. Install units plumb, level and rigid without distortion to the switchboard cubicle(s).

D. ***[Where integral factory power wiring is provided, the division 16 contractor shall install power wiring connections between shipping splits per integrated switchboard manufacturer's drawings. Where interconnecting power wiring is required between devices and equipment within the integrated switchboard and is not indicated as provided by the switchboard manufacturer on the manufacturer's drawings, provide and install power wiring as indicated on the drawings and as required to provide a complete and operating system.]*** **- [Spec for Integrated Power System Switchboards]**

3.2 ADJUSTING AND CLEANING

A. Clean exposed surfaces using manufacturer recommended materials and methods.

B. Touch-up damaged coatings and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

3.3 TESTING

A. Perform factory and installation tests in accordance with applicable NEC, NEMA and UL requirements.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, or up to eighteen months from date of shipment.

END OF SECTION