SECTION 26 24 16 – panelboards

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
			2. SUMMARY
				1. This Section specifies the requirements for all panelboards including electronic grade panelboards.
			3. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

NEMA AB 1 – Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.

NEMA PB 1 - Panelboards.

NEMA PB 1.1 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

Federal Specification W-P-115C – Panel, Power Distribution.

W-C-375B – Circuit Breakers, Molded Case; Branch Circuit and Service.

National Fire Protection Association NFPA 70 – National Electrical Code.

NFPA 75 – Protection of Information Technology Equipment.

NFPA 780 – Installation of Lightning Protection Systems.

Underwriters Laboratories UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

UL 67 – Panelboards.

UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.

UL 943 - Ground-Fault Circuit-Interrupters.

UL 1283 – Electromagnetic Interference Filters.

UL 1449 - Surge Protective Devices.

The specified Electronic Grade Panelboards (EGP) shall be designed, manufactured, tested, and installed in compliance with the following standards, in additional to requirements listed above:

a. American National Standards Institute and The Institute of Electrical and Electronics Engineers ANSI/IEEE C62.41 - Guide for Surge Voltages in Low-Voltage AC Power Circuits.

b. ANSI/IEEE C62.45 - Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

c. Federal Information Processing Standards Publication 94 - Field Grounding and Shielding Application.

The EGP shall be UL 1449 listed as a Transient Voltage Surge Suppressor, and UL 67 listed as a Panelboard. Surge protective device shall be both UL 67 listed and UL 1449 listed. The panel mounted suppression/filter system shall be UL 1449 listed as a Transient Voltage Surge Suppression System.

* + - 1. SUBMITTALS
				1. Product Data:

Submit manufacturer’s product data for panelboards and circuit breakers.

* + - * 1. Record Documents:

Submit dimensioned Drawings showing size, circuit breaker and equipment arrangement and ratings, including but not limited to, voltage, single or three phase, main bus ampacity, circuit breaker short circuit ampere rating.

Equipment arrangement must include panelboard schedules. Panelboard schedules must be identical to the schedules in the project documents unless there is a technical reason for a deviation. Reasons for any deviation shall be included in the Submittal.

* + - 1. DELIVERY, STORAGE and HANDLING
				1. Deliver panelboards in factory-fabricated water-resistant wrapping.
				2. Handle panelboards carefully to avoid damage to material components, enclosure and finish.
				3. Store in a clean, dry space and protected from the weather.
1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
			2. MANUFACTURERS
				1. Panelboards:

Square D Company.

Eaton

* + - * 1. Electronic Grade Panelboards:

Current Technologies.

* + - 1. PANELBOARD CONSTRUCTION
				1. Provide deadfront circuit breaker type panelboards as scheduled.
				2. Enclosure shall be NEMA Type 1 unless otherwise indicated on the Contract Documents.
				3. Provide cabinet front with full-height hinged door. Cabinet front shall be cleaned and finished with ANSI 49 or ANSI 61 gray enamel over a rust-inhibiting phosphatized coating. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.
				4. Panelboard boxes (cans) shall be galvanized steel with all cut edges galvanized. Boxes shall not have pre-punched knockouts. All conduit knockouts shall be made in the field.
				5. Bus shall be tin-plated copper and braced for the maximum available fault current. Minimum bus ampacity shall be 100 amperes.
				6. Circuit breaker phase connector straps that connect the main bus to individual circuit breakers shall be tin-plated copper.
				7. Provide a 1 inch x ¼ inch tin-plated copper ground bus in all panelboards. The ground bus shall be drilled to accept lugs for all grounding conductors. Mount ground bus on brackets to allow easy installation of bolts, nuts and lockwashers used to attach ground lugs.
				8. Provide a tin-plated copper neutral bus with the same ampacity rating as the phase bus. Neutral bus shall be isolated from the ground bus.
				9. All lugs for phase, neutral and ground buses shall be copper or tin-plated copper.
				10. Provide compression connectors where conductors terminate directly to bus. (MLO panels).
				11. Panelboard electrical ratings and configurations are indicated in the Contract Documents.
				12. Circuit directory shall be typewritten and mounted behind clear, heat-resistant plastic in a metal frame, tack welded on the inside of each panel door. List the minimum circuit breaker ampere interrupting capacity on the circuit directory. List minimum panel required interrupting capacity.
				13. Load center type panelboards are not acceptable. Panelboards shall be full bussed, entire length of panel; 100 ampere panelboard minimum 30-circuits; 225 ampere panelboard minimum 42-circuits.
			2. SWITCHING AND OVERCURRENT PROTECTIVE DEVICES
				1. Provide molded case circuit breakers of manufacturer’s standard industrial construction, with integral inverse time delay thermal and instantaneous trip. Provide bolt-on circuit breakers for 208Y/120V, 120/240V panels and 480Y/277V panels.
				2. Circuit breakers shall be 125 VDC/240 AC rated for nominal 208Y/120V panels and 480Y/277V rated for nominal 480Y/277V panels. Minimum interrupting ratings shall be 10,000 amperes for 120/208V circuits and 14,000 amperes for 277/480V circuits, unless higher rating noted on the Contract Documents.
				3. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.
				4. Multi-pole breakers shall be two or three pole as specified. Handle ties are not permitted.
				5. Circuit breaker interrupting rating shall be greater than the available short circuit current listed for the panelboard in which the circuit breaker is installed.
				6. Panels shall be fully rated. All overcurrent devices shall be capable of interrupting the available fault current.
			3. ELECTRONIC GRADE PANELBOARD CONSTRUCTION
				1. Electronic grade panelboards shall be of same construction and quality as standard panelboards, but with transient voltage surge suppression installed in panelboard enclosure.
				2. See Section 26 43 13 for Transient Voltage Surge Suppression (TVSS) requirements.
				3. Storage Temperature: Storage temperature range shall be -40 degrees to +85 degrees C (-40 degrees to +185 degrees F).
				4. Operating Temperature: Operating temperature range shall be -40 degrees to +60 degrees C (-40 degrees to +140 degrees F).
				5. Relative Humidity: Operation shall be reliable in an environment with 5 percent to 95 percent non-condensing relative humidity.
				6. Operating Altitude: All EGP’s installed in the system shall be capable of operation in altitudes of up to 13,000 feet above sea level.
				7. Audible Noise: All EGP’s installed in the system shall not generate any audible noise.
				8. Magnetic Fields:

No appreciable magnetic fields shall be generated.

All EGP’s installed in the system shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

* + - * 1. The EGP shall be thoroughly factory-tested before shipment. Testing of each EGP shall include but shall not be limited to quality assurance checks, MCOV and clamping voltage verification tests.
				2. 200 percent Rated Copper Neutral Bus:

The EGP shall include a 200 percent rated tin-plated copper neutral bus designed for the peculiar current demands associated with non-linear loads.

The neutral bus shall include copper or tin-plated mechanical solderless-type lugs in sufficient quantity and wire size capacity as indicated on the Drawings.

* + - * 1. Ground Bus:

The EGP shall include a 1 inch x ¼ inch tin-plated copper ground bus with connection points equal to the number of branch breaker positions.

The ground bus shall include all copper or tin-plated mechanical solderless-type lugs in sufficient quantity and wire size capacity as indicated on the Drawings.

1. EXECUTION
	* + 1. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. All installation shall be in accordance with manufacturer’s published recommendations.
				3. Anchor enclosures firmly to metal framing (Unistrut). Metal framing shall be structurally secured to walls and structural surfaces, ensuring that they are permanently and mechanically secured.
				4. At the completion of the electrical system, check each phase of all panels under full load and arrange so that all phases shall carry the same load as near as possible.
				5. Stub 5 (five) empty ¾ inch conduits to an accessible location above the ceiling out of each recessed panelboard.
				6. Install panelboards such that the center of the circuit breaker in the highest position will not be more than 6-1/2 feet above the floor.
				7. Temporary Doors:

Protect panelboard cabinets by a temporary door until the panelboard is energized.

Temporary doors shall be ¼ inch thick plywood or equivalent rigid material.

Temporary doors shall be installed when the cabinet is installed and shall remain closed at all times except when work is being performed inside the panelboard.

* + - * 1. Permanent Doors and Trim:

Install permanent doors and trim immediately before panelboards are energized.

Maintain permanent doors and trim in factory condition after installation.

Doors shall remain closed at all times except when the panelboard is de-energized and work is taking place within the panelboard.

* + - * 1. Cabinets:

Maintain cabinet interiors “white glove” clean at all times.

Cabinet exteriors shall be maintained free of mud, spray-on insulation, paint spray and all substances not placed on the exterior surface by the panelboard manufacturer.

* + - * 1. Terminals and breakers:

Hardware for connections to interior terminals and breakers shall be installed and torqued per manufacturer’s published recommendations by hand tools. Electric or cordless drills/screwdrivers, which are suspected to be the main cause of the stripped out threads in the screw holes for terminal bars and bolt-on breakers, therefore are prohibited.

The use of prohibited tools observed and/or evidence of damaged parts regardless of the cause are subject to rejection and removal from the project immediately per the direction of Owner’s representative.

* + - * 1. Nameplates:

Label each panelboard with a black laminated rigid phenolic nameplate with white core, minimum 3/16 inch high engraved letters.

Identify panelboard name, voltage, amperage rating with main lugs only or main circuit breaker, and location of main feed.

Emergency panelboard nameplates shall be red with white letters. Identify panel board name, voltage, amperage rating with main lugs only or main circuit breaker, and name and location of emergency generator serving panelboard.

L. Panel cabinets shall not be used as raceways or pull boxes for adjacent equipment. Panel cabinets shall not contain wire splices. Panel wiring shall be installed in a neat and workmanlike manner with wire conforming to the contours of the cabinet. Wire bundles shall be wire tied and installed in a manner to protect wire insulation from cover screws and other sharp edges. All phase conductors shall be labeled with a circuit number, readily visible to the panelboard front without removing the dead front cover. All neutral conductors shall be labeled with the circuit number, which they are associated with, within three inches of their termination point.

END OF SECTION 26 24 16