SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. **NEW PANELBOARDS ARE NOT REQUIRED. SPECIFICATION APPLIES TO THE MODIFICATION OF EXISTING PANELBOARDS.**
B. Provide panelboards as shown, scheduled and as specified herein.
C. The types of panelboards include:
   1. Panelboards.
   2. Power distribution panelboards.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.
B. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
C. UL 67 - Panelboards.
D. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
E. UL 943 - Ground Fault Circuit Interrupters
F. NEMA PB 1 - Panelboards
G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
H. NEMA, ABI, Molded Car Circuit Breakers and Molded Case Switches
I. Federal Spec W-P 115, Rev C, Panel, Power Distribution
J. NEMA KSI, Enclosed and Miscellaneous Distribution Equipment Switches (600V)

1.3 SUBMITTALS

A. Shop drawings shall include, but not be limited to:
   1. Cutsheets of all enclosures, circuit breakers, fusible switches, bussing, rating, schedules and all accessories clearly labeled.

1.4 REGULATORY REQUIREMENTS

A. WORK IN ACCORDANCE WITH:
   1. NFPA 70
   2. Local, municipal, or state codes that have jurisdiction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide one of the following manufacturers:
   1. General Electric Company/ABB
   2. Square D Company
   3. Siemens
   4. Eaton
B. All panelboards shall be designed, factory-manufactured, factory-assembled, and factory-tested by a single manufacturer listed above. The manufacturer shall be fully

responsible for the complete panelboard assembly, including enclosures, bus, overcurrent devices, controls, metering (as applicable) and all internal wiring.

C. Panelboards assembled by third-party panel shops, system integrators, or channel partners not owned or operated by the listed manufacturer are strictly prohibited.

2.2 MATERIALS AND COMPONENTS

A. General
   1. Provide power distribution and panelboards as indicated in the panelboard schedule and as shown on the plans. Power distribution panelboards shall be equipped with fusible switches or circuit breakers as shown on the schedule. Panelboards shall be equipped with thermal-magnetic, molded case circuit breakers of frame and trip ratings as shown on the schedule.

B. Busing Assembly and Temperature Rise
   1. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 65°C. rise above 40°C ambient. Heat rise test shall be conducted in accordance with Underwriters Laboratories Standard UL 67. The use of conductor dimensions will not be accepted in lieu of actual heat tests. All current carrying parts of the bus shall be tin or silver plated copper.
   2. Bus structure shall be isolated. Bus bar connections to the branch circuit breakers shall be distributed phase or phase sequence type and shall accept bolt-on circuit breakers for lighting and appliance panelboards.
   3. The lugs for terminating conductors shall be rated at 75°C on all panel boards and circuit breakers.
   4. Provide a non-insulated bare copper ground bus. Provide an isolated ground copper bus in each panel serving isolated ground circuits as indicated on panel schedule or one-line diagram. Provide a full size copper neutral bus in each panelboard enclosure. Provide a 200% neutral buss when served by a harmonic mitigating transformer and any K4 or higher rated transformers.

C. Distribution Panelboards
   1. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large, permanent, individual circuit numbers shall be affixed to each breaker in a uniform position. Tripped indication shall be clearly shown by the breaker handle taking a position between “ON” and “OFF”. Provisions for additional breakers shall be such that no additional connectors will be required to add breakers. Circuit breakers shall be of the frame size, trip setting and interrupting capacity as indicated on the drawings. Circuit breakers shall be rated 65,000 AIC unless otherwise noted on plans.
   2. All fusible switches shall be quick-make, quick-break with visible blades and dual horsepower ratings. Switch handles shall physically indicate “ON” and “OFF” positions. Switches shall be lockable only in the “OFF” position and accept three industrial type heavy duty padlocks. Switch covers and handles shall be interlocked to prevent opening in the “ON” position. A means shall be provided to permit authorized personnel to release the interlock for inspection purposes. Switches shall include positive pressure rejection type fuse clips for use with UL Class R fuses or Class J fuses and be UL labeled for 200,000 AIC.

D. 240 Volt Panelboards
   1. Main breakers shall be vertically mounted. Branch mounted main breakers are not acceptable. Provide electronic trip mains with long term, short term and instantaneous trips as indicated on drawings and required for selective coordination.
   2. Circuit breakers shall be bolt-on thermal-magnetic, molded case circuit breakers. Breakers shall be 1, 2, or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers. Breakers shall have an overcenter, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have "ON", "OFF" and "TRIPPED" positions.
   3. Circuit breakers shall be UL listed in accordance with UL 489 and shall be rated 240 volts ac maximum with continuous current rating as noted on the plans.
   4. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip settings of the breaker to prevent repeated arcing short resulting from frayed appliance cords. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" at 120V ac and carry the SWD marking.
   5. UL Class A 5mA ground fault circuit protection shall be provided on all receptacle circuits serving wet areas and on all 120V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional circuit breaker.
   6. UL Class B 30mA ground fault circuit protection (GFEP) shall be provided on all equipment circuits requiring ground fault protection. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring.
   7. Provide Shunt Trip Breakers including control power for circuits under cooking hoods and other equipment having this requirement.
   8. Provide Breakers with Switched Neutral circuits with common trip for gasoline pumps and other equipment having this requirement.
   9. Circuit breakers shall be rated 10,000 AIC at 240V unless otherwise noted on plans or served by transformers greater than 150 kVA.
   10. Provide 200% sized neutral bus with panels served from a non-linear transformer and any K4 or higher rated transformers. This shall be a UL approved assembly.
   11. Provide circuit breakers with lock-on devices for applications where dedicated branch circuits are serving battery-equipped emergency lighting fixtures, exit signs or fire alarm equipment per Article 700 of NFPA 70.

E. Cabinets and Fronts
   1. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL 50 for cabinets. Wiring gutter space shall be in accordance with UL 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. All NEMA-1 panels shall have hinged front covers. The front cover shall have a door with hinges, latch and a lock. The piano hinged front covers door-in-door shall allow full access to the circuit

breaker gutter area without having to remove the entire front cover. All panelboard lock shall be keyed alike. Circuit breaker and fusible distribution panels shall have four-piece trims. A welded circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Provide NEMA 1 enclosure where installed indoors unless otherwise noted. Provide NEMA 3R enclosure where installed outside or in a sprinkled area.

F. Safety Barrier
   1. The distribution panelboard interior assembly shall be dead front with panelboard cover removed. Main lugs or main breakers shall have a barrier. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

G. Integrated Equipment Short Circuit Rating
   1. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the over-current devices mounted in the panelboard. The short circuit tests on the over-current devices and on the panelboard structure shall be made simultaneously by connecting the fault to each over-current device with the panelboard connected to its rated voltage source. Method of testing shall be per UL 67. The source shall be capable of supplying the specified panelboard short circuit current or greater. Testing of panelboard over-current devices for short circuit rating only while individually mounted is not acceptable. Also, testing of the bus structure alone is not acceptable. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install panelboards, including electrical connections, in accordance with manufacturers written instructions, NFPA 70 and recognized industry practices.

B. All panels shall be mounted to unistrut. Unistrut shall be securely mounted to the floor and structural ceiling. Toggle bolts or anchor bolts attached to drywall is not acceptable.

C. Housekeeping Pads: Mount floor mounted panelboards on 4 inch high concrete housekeeping pads.

D. Fuses: Install fuses of the rating and class as shown in each fusible distribution panel scheduled on drawings.

E. Conduits: Stub up three one inch conduits to an accessible location above the ceiling for each recessed panelboard.

3.2 IDENTIFICATION

A. Nameplate: Each panelboard shall have an engraved bakelite nameplate. Nameplates shall be white with black letters and show panel designation. Nameplates shall be attached with stainless steel screws. Refer to Section 26 02 00, paragraph 2.8(C).

B. Directory Card: Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include location and name of each item of equipment served.

Spares and spaces shall be written in erasable pencil for future use. Circuit directory shall show the room served by each circuit. The final graphs/signage room numbers shall be used. Do not use Architectural numbering on plans.

C. Replacement Components: Nameplate shall identify replacement components.

3.3 INFRARED SCANNING

A. After Substantial Completion by not more than 2 months after Final Acceptance, perform an infrared scan of each panelboard. Remove fronts if not equipped with viewing ports to make joints and connections accessible to a portable scanner. Submit a copy the owner and engineer for review. If O&M manuals are submitted prior to performance of infrared scan, contractor shall submit a signed letter to verify the scan has been arranged. Letter shall indicate the scan provider and the date It will be performed.

END OF SECTION