	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 24.04 Panelboards
		Date: 2/21/2020
		Author: Office of Facilities
CC: Project Folder		

Change History


Date	Description of Change	Pages / Sections Modified	Change Approver Initials
2/21/20	Added standard NFPA 70. Updated section E with indoor and outdoor requirements.	Section C – added standard Section E – added requirements 5,6	JR
9/26/17	Updated section on System Design and Performance Requirements <i>and</i> Manufacturers	2 – B. 6 (paragraph added); 2>3 – D.	SO
8/01/17	Updated section on Panelboard Designation Format <i>and</i> Identification requirements.	4 – 1. c. 4.; e. Remove f. 2. a	SO
6/15/16	Updated division section from 16422 to 26 24.04, removed references to other section numbers	-	mgl44
11/21/14	Add paragraph #2 to clarify power separation; sequence subparagraph numbering. Add text to paragraph #9 to clarify minimum rating.	15 – 16442 B. #2. (Panelboards; System Design and Performance Requirements)	SO
10/17/14	Add paragraphs #9. & #10. for clarification.	15 - 16442, B. #9 & #10., (Panelboards; System Design and Performance Requirements)	SO
10/17/14	Add text to subparagraph 2. a. for clarification.	18 – 16442. F. #2. a. Panelboards; Installation Guidelines; Identification Requirements)	SO

A. Summary

This section contains design criteria for panelboards, including distribution panels and branch circuit panels.

B. System Design and Performance Requirements

- Where possible, provide separate panelboards to serve each of the following load classifications:
 - Lighting
 - Motors and general-use receptacles
 - Equipment requiring clean power
- Where there is one feeder that goes to multiple panels, there shall be a disconnect switch that is separately mounted and placed before each panelboard or switchboard, on that feeder circuit.
- Panelboards must be surface-mounted in electrical closets, where electrical closets are available. Where electrical closets are not available, locate panelboards in mechanical rooms or similar unfinished areas where surface mounting is

	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 24.04 Panelboards
		Date: 2/21/2020
		Author: Office of Facilities
CC: Project Folder		

permissible. Door hinges must be piano type, double hinged, with a lockable latch.


4. Where electrical closets, mechanical rooms, or similar unfinished areas are not available and panelboards must be located in finished areas, flush-mount the panels in walls with all branch circuit conduits concealed within the walls. Provide spare two-inch conduit to a spare 12-inch by 12-inch junction box mounted in an accessible, concealed location.
5. The nameplate ampacity of panelboards must be a minimum of 140 percent of the connected load at nominal system voltage.
6. For coordination reasons, all main circuit breakers over 200 amps shall be equipped with long time, short time settings with time delays. There shall be an instantaneous setting on this breaker as well.
7. Panelboards rated at 100 amperes must contain space for 30, single-pole circuits. Panelboards rated at 225 amperes must contain space for 42, single-pole circuits. At a minimum, panelboards must contain space for 125 percent of the active poles. Where necessary, provide double panels to conform to this requirement.
8. Include in each panelboard a minimum of one spare, 20-ampere, 1-pole circuit breaker for every 750 square feet of floor area served by such panelboard. Certain occupancies, such as laboratories, must be provided with more spares as directed by the Yale University ProjectManager.
9. Ensure that panelboard schedules shown on construction documents include type designations, size of breaker ratings, and descriptions.
10. Panelboards shall be fully rated for the short circuit current available at the main terminals. Minimum rating shall be 22 KAIC including breakers.
11. All panelboards associated with emergency / alternate electrical systems shall be separated be a wall with a minimum of a 2 hour fire rating. All emergency / alternate panelboards, transformers, etc. shall be in a separate room from the normal power system.

C. Product Standards

Ensure that all products conform to the following standards:

- NEMA PB1, Panelboards
- UL 50, Electrical Cabinets and Boxes
- UL 67, Electric PanelboardsNFPA 70 National Electric Code

D. Manufacturers

	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 24.04 Panelboards
		Date: 2/21/2020
		Author: Office of Facilities
CC: Project Folder		

Subject to compliance with the design requirements, provide products by one of the following manufacturers:

- ABB
- Eaton
- General Electric
- Square D

E. Equipment


1. Panelboards must include the following features:
 - a. A copper bus with a full-capacity neutral.
 - b. A ground bar. Panels on clean power systems shall include additional insulated/isolated ground bar.
 - c. A hinged cover with externally-accessible screws.
 - d. Bolt-on circuit breakers. Plugged-in type circuit breakers are not acceptable.
2. Where system expansion is anticipated, provide panelboards with feed-through lugs or sub-feed lugs.
3. Load centers are not acceptable.
4. Panelboards must be fully bussed with mounting brackets for all positions, including spares.
5. Panelboards located indoors shall be NEMA 1 or better, depending on environmental conditions and project requirements. Indoor panelboards shall adhere to the requirements in NFPA 70 Article 110.26(E)(1).
6. Panelboards located outdoors shall be NEMA 3R or better depending on environmental conditions and project requirements. Outdoor panelboards shall adhere to the requirements in NFPA 70 Article 110.26(E)(2).

F. Installation Guidelines

Where panelboards are flush-mounted in fire-rated walls, include installation details to maintain the fire resistance rating of the wall assembly.

1. Panelboard Designation Format

Panelboard designations must adhere to the following format, which provides identifiers for system type and panel location, separated by a slash (for example, HPP/3M1, ELP/B2, CP/1).

	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 24.04 Panelboards
		Date: 2/21/2020
		Author: Office of Facilities
CC: Project Folder		

- a. The first component of the system identifier must indicate the type of distribution system.
 - (1) For normal systems: no letter.
 - (2) For emergency/alternate systems, use the letter E.
- b. The second component of the system identifier must indicate the system voltage level.
 - (1) For systems of 120/208 and 240 volts and below: no letter.
 - (2) For systems of 480 volts, use the letter H.
- c. The third component of the system identifier must indicate the classification of loads served.
 - (1) For lighting, use the letters LP.
 - (2) For ordinary power, use the letters PP.
 - (3) For clean power, use the letters CP.
- d. The first component of the location identifier must indicate the floor on which the panel is located.
 - (1) For sub-basements: use the letters SB.
 - (2) For basements: use the letter B.
 - (3) For numbered floors: use the floor number (for example, 1).
 - (4) For mezzanines: use the number of the floor number from which access is gained followed by the letter M (for example, 2M).
 - (5) For attics: use the letter A.
 - (6) For penthouses: use the letter P.
- e. The second component of the location identifier will indicate the next count of same panel type on that floor.


For sections of multiple panels on same floor. Examples:

480/277 Lighting Panels: HLP1-1, HLP1-2

120/208 Lighting Panels: LP1-1, LP1-2

480/277 Power Panels: HPP1-1, HPP1-2

120/208 Power Panels: PP1-1, PP1-2
- f. The third component of the location identifier must indicate supplementary information, when applicable (for example, sections of multiple panels or the

	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: Electrical Standards	Section: 26 24.04 Panelboards
		Date: 2/21/2020
		Author: Office of Facilities
CC: Project Folder		

sequence of sub-panels).

For sections of multiple panels at the same location. Examples:

120/208 Lighting Panels: LP1-1A, LP1-1B, LP1-1C

- g. The Identifier of MDP shall be used for the main incoming panel only.

For the main panel in a building, the identifier is HMDP for normal service and EHMDP for alternate service. (maximum of one per building for each service)

2. Identification Requirements

- a. For the panel front, provide an engraved, phenolic nameplate indicating the panel designation. Nameplate shall be black background with white letters and attached to the panel with stainless steel screws, no adhesive.
- b. The directory must be typewritten and indicate circuit designations assigned in the panel schedule.
- c. Number all circuit wiring with preprinted, adhesive identification labels.

G. Quality Control

With all connected loads energized, measure the current in each phase and neutral of the panel feeder, and submit the results to Yale University.

“END OF SECTION”