Lawrence Livermore National Laboratory

Facilities Standard

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Circuit Numbering and Labeling for Electrical Equipment

Revision	**9**
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Summary	This standard describes requirements for numbering and labeling of real property electrical distribution equipment, circuits, and site lighting at Lawrence Livermore National Laboratory.
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Note to Non-LLNL Architects/Engineers:
This is an internal LLNL standard meant to guide the design of new facilities, facility modifications, and maintenance. Wherever this standard mentions to confer with departments within LLNL, direct your inquiries to the Subcontract Technical Representative.

Change History

Revision	Date	Description of Changes
5	6/3/2021	Electrical Equipment and Circuit Numbering and Labeling
5	6/3/2021	Revised in whole.
6	5/25/2022	Technical and Professional Service Manager
6	6/15/2022	Temporary equipment labels
6	6/3/2022	Subject Matter Expert: Anthony Nguyen
6	6/3/2022	Approver: Anthony Nguyen *IEOD Engineering Services Division Lead*
7	3/15/2023	Added section 2.10 Site Lighting Numbering
8	3/18/2024	Added sections 2.5.2 & 2.5.3. Revised existing 2.5.2 & 2.5.3 to 2.5.4 & 2.5.5. Added Figures 11 & 12 to correspond to sections 2.5.2 & 2.5.3. Removed previous section 2.8 and Figure 13. Replaced section 2.8 and added Figures 15, 16, 17, and 18. Revised section 2.10 to align with CMSG. Revised remaining Figure numbering accordingly.
9	6/17/2024	Added section 2.11 for EVCS.

Table of Contents

1 General 5
1.1 Purpose 5
1.2 Definitions and Abbreviations 5
1.3 References 5
2 Equipment Numbering 6
2.1 General 6
2.2 Illustration of Numbering 7
2.3 Illustration of Numbering for Modifications/Changes to Existing Systems 10
2.4 Transformer Numbering 14
2.5 Panelboard Circuit Breaker Numbering 15
2.6 Load Center 20
2.7 Motor Control Center Numbering 20
2.8 Distribution Panelboard, Switchboard, and Switchgear Numbering 22
2.9 Plug-In Bus Duct Numbering 27
2.10 Site Lighting Numbering 27
2.11 Electric Vehicle Charging Station (EVCS) Numbering 28
3 Equipment Labeling 29
3.1 General 29
3.2 Switchgear, Switchboards, Panelboards, Motor Control Centers, Distribution Panels, and Emergency Power Panels: 29
3.3 Low-Voltage Transformers 31
3.4 High-Voltage Transformers 31
3.5 Receptacles, switches, and outlets 32
3.6 Utilization Equipment 32
3.7 Mechanical Equipment 32
3.8 Electrical hazard (arc flash and shock) Warning Labels 32
3.9 Clear Working Space Labels 33
4 Scheduling 34
4.1 General 34
4.2 Schedule Changes 35
4.3 Schedule Implementation 36

Table of Figures

Figure 1. Process for numbering and labeling equipment. 7
Figure 2. Typical one-line diagram with labels. 8
Figure 3. Substation one-line diagram. 9
Figure 4. One-line diagram for multiple panels fed from a single transformer. 11

Figure 5. Transformer addition without a bus tie. 12
Figure 6. Limited power supply 13
Figure 7. Unlimited power supply 14
Figure 8. Numbering scheme for 1-, 2-, and 3-pole breakers (sample). *2-pole breaker in 2-pole frame. Position of handle is dependent on circuit breaker manufacturer. Indicate circuit number wherever handle appears. **2-pole breaker in 3-pole frame. Position of handle is similarly dependent on circuit manufacturer. 16
Figure 9. Existing condition with skipped circuit numbers (non-standard). 17
Figure 10. New numbers when replacing 3-pole breaker with three 1-pole breakers (non-standard). 17
Figure 11: Multi-section Panelboards 18
Figure 13. 10-circuit load center schedule. 20
Figure 14. Motor control center 21
Figure 20. Site lighting label (horizontal label above, vertical option shown at right). Horizonal label is 1/2-inch-high yellow letters on a 2-inch-high by 7-inch-wide black background (example is approximately 1/2 scale). 28
Figure 21. Distribution panel with main power source entry plate/label; 7/8-inch-high yellow letters on 4-inch high by 7-inch-wide black background (figure is approximately 1/2 scale) 30
Figure 22. Distribution panel with main emergency power source entry plate/label; 7/8-inch-high black letters on 4-inch-high by 7-inch-wide yellow background (figure is approximately 1/2 scale) 30
Figure 23. Load center panel plate/label with 1/2-inch-high yellow letters on a 2-inch-high by 7-inch-wide black background (figure is approximately 1/2 scale). 30
Figure 24. Distribution panel providing emergency uninterruptable power source (UPS) entry plate/label; 7/8-inch-high white letters on 4-inch-high by 7-inch-wide blue background (figure is approximately 1/2 scale) 31
Figure 25. Transformer plate/label; 7/8-inch-high yellow letters on 4-inch high by 9-inch-wide black background (figure is approximately 1/2 scale). I&O is responsible for labeling high-voltage transformers (TH). 31
Figure 26. High-voltage transformer label. 32
Figure 27. Arc flash and shock risk warning label. 33
Figure 28. Electrical panel clearance label. 33
Figure 29. Completed panelboard schedule, typical. 35

1 GENERAL

1.1 Purpose

Lawrence Livermore National Laboratory (LLNL) has a standardized system for numbering and labeling electrical equipment and circuits. This system establishes a unique identification number for each item, which avoids confusion and permits computerized processing of inventory, preventive maintenance, and operational data.

Follow this standard for all electrical equipment.

1.2 Definitions and Abbreviations

1.2.1 Abbreviations

BEAHJ: Building Electrical Authority Having Jurisdiction

CMSG: Configuration Management Service Group, I&O directorate (see also 1.2.2 Definitions)

TAP: Technical and Professional Services group, O&B Project Management Office

EVCS: electric vehicle charging station

FPOC: facility point of contact

I&O: Infrastructure and Operations directorate, Operations & Business

1.2.2 Definitions

I&O Electric Shop: Infrastructure and Operations directorate, Infrastructure Maintenance and Utilities Department (IMUD), Maintenance Production division.

configuration management: Infrastructure and Operations directorate, Infrastructure Engineering and Operations Department (IEOD), Technical Asset Management division, Configuration Management Service group.

primary side: The winding on the energy input side of the equipment.

secondary side: The energy output side of the equipment.

1.3 References

1.3.1 Lawrence Livermore National Laboratory (LLNL)

Environment, Safety, & Health Manual, Document 16.1, “Electrical Safety Program,” https://esh-int.llnl.gov/man/16.1.pdf

PMO.DT-ST-04, *LLNL Facilities Standards*, PEL-M-230550, “Equipment Numbering,” https://doellnl.sharepoint.com/teams/OBPMOEDMS/_layouts/15/DocIdRedir.aspx?ID=OBPMOEDMS-3110600-271

1.3.2 National Fire Protection Association (NFPA), NFPA 70, *National Electrical Code* (NEC)

2 EQUIPMENT NUMBERING

2.1 General

2.1.1 The LLNL system for numbering circuits designates a unique number that becomes the prime number for panelboard and circuit identification. This is supplemental to the requirements of NFPA 70, *National Electrical Code* (refer to "Identification" in the NFPA 70 index).

2.1.2 The Infrastructure and Operations directorate, Infrastructure Engineering & Operations department, principal low-voltage systems engineer is the building electrical authority having jurisdiction (BEAHJ) for the content of this standard. Contact the BEAHJ for guidance and questions at (925) 423-9294.

2.1.3 The Configuration Management Service Group (CMSG) assigns transformer and unit substation numbers. Refer to paragraph 2.4 Transformer Numbering for information on the numbering scheme.

2.1.4 The CMSG manages three areas of electrical system documentation on the secondary (energy output) side of transformers and unit substations: (1) electrical one-line diagrams, (2) electrical panel location drawings, and (3) electrical panel schedules. Changes to documentation, whether through projects or maintenance work, follow the process shown in figure 1.

(a) The initiating organization (IO) may be any group at LLNL that is engaged in site or facility construction projects, equipment maintenance, or facility management; or it may be an external subcontractor executing a project. If the IO is external, the subcontract technical representative (STR) collects and distributes documents to CMSG on behalf of the IO.

(b) CMSG field coordinators physically verify the correctness of equipment and electrical panel locations, confirm database information, and place the appropriate labels and tags.

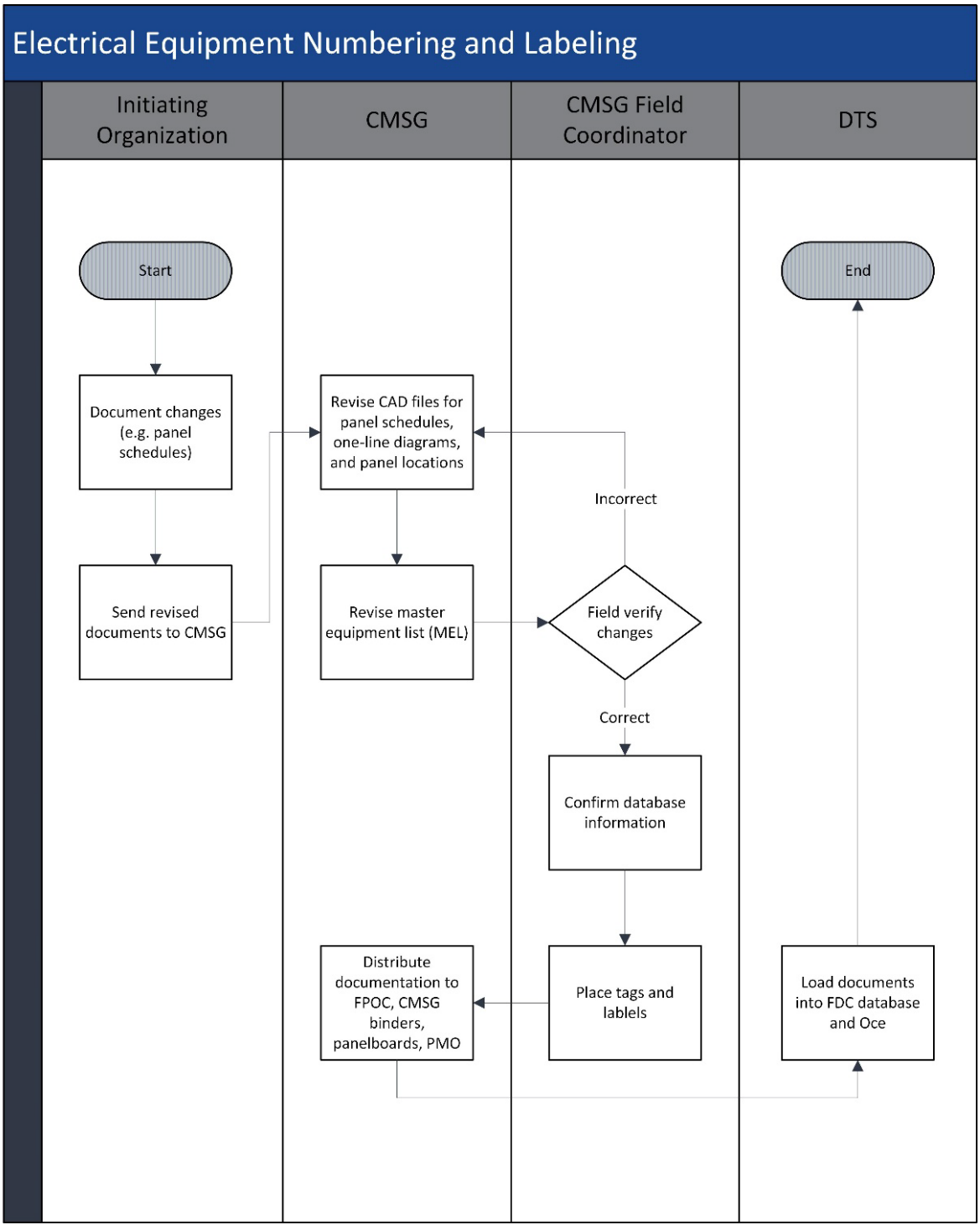


Figure 1. Process for numbering and labeling equipment.

2.2 Illustration of Numbering

2.2.1 The one-line diagram shown in figure 2 is a typical distribution configuration found in LLNL facilities and illustrates the numbering system. The following paragraphs describe the configuration.

(a) A 13.8 kV-480/277 V transformer (labeled T0065) supplies power to a main panel (labeled 65A). Circuit breaker 3 in panel 65A services distribution transformer T0066 (480-208/120 V) and panel 66A.

(b) Circuit 9 in panel 65A feeds a single panel. This panel is labeled 65A9.

(c) Circuit 4 in panel 65A feeds emergency panels via an automatic transfer switch (ATS). When an outage occurs, the transfer switch allows the emergency generator to provide power to emergency panel E65A4.

(d) Circuit 10 in panel E65A4 feeds 480 V to the primary side of a dry-type transformer, TE0067. The secondary side supplies 208/120 V to the main breaker of panel E67A.

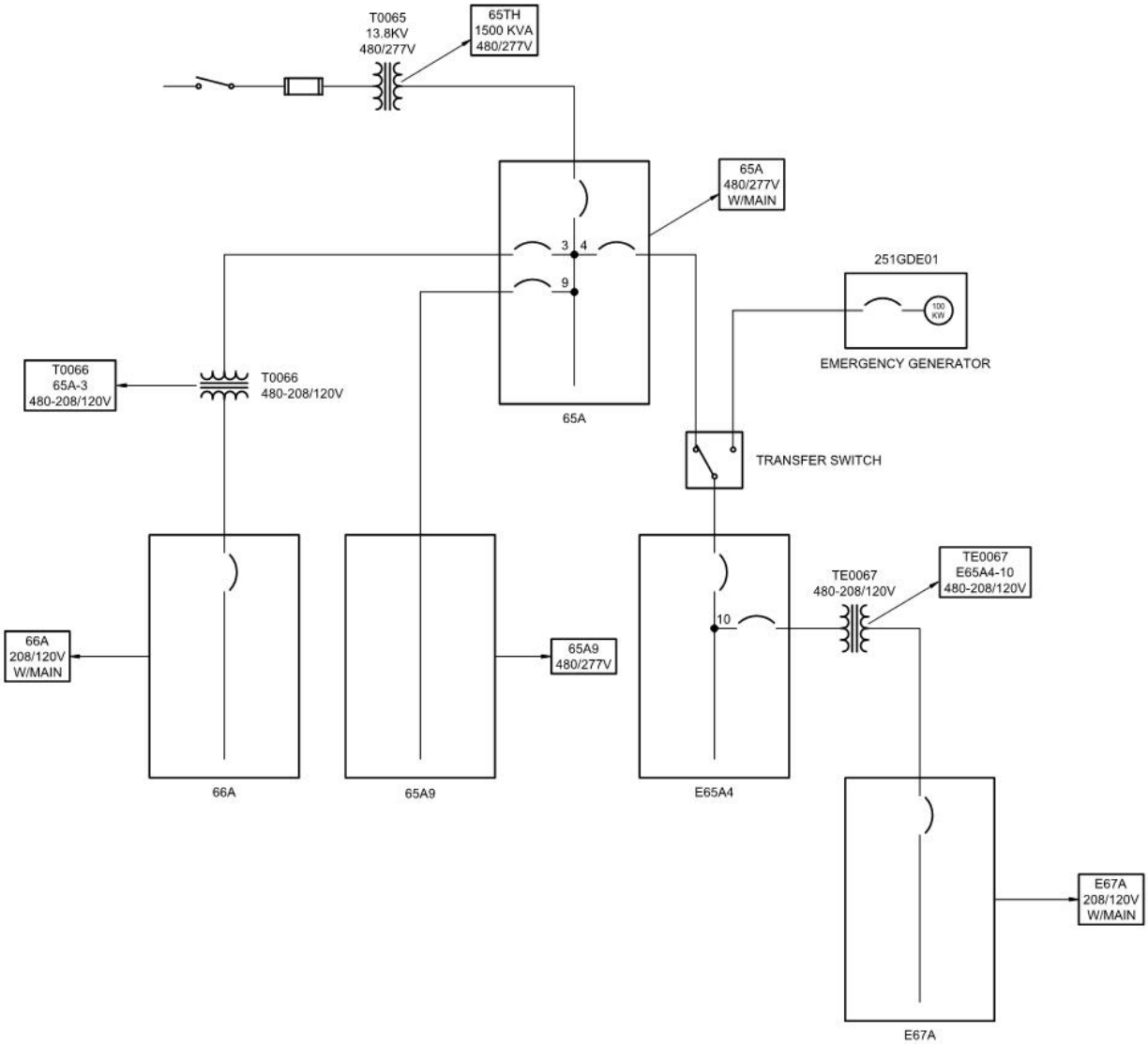


Figure 2. Typical one-line diagram with labels.

2.2.2 The one-line diagram shown in figure 3 is typical of a substation and illustrates the numbering system. The following paragraphs describe the configuration.

(a) Circuit 1 in panel 65A feeds loads of two separate locations in an area or increment of a building. Each panelboard is considered a main and takes the number switchgear appended by the feeder number and a sequential letter (e.g., A, B, C); in this case, 65A1A and 65A1B.

(b) Circuit 2 in panel 65A feeds a panel that serves both a step-down transformer and emergency panels (via an ATS). Each transformer bank is assigned an incremental number as shown in figure 3. These transformer numbers become the prime numbers for the 208/120 V panelboards, in this case 66A and E67A.

(c) Circuit 6 in panel 65A feeds a motor control center that serves a group of motors. The letters "MCC" preceding the motor control center number simplifies identification circuit checking.

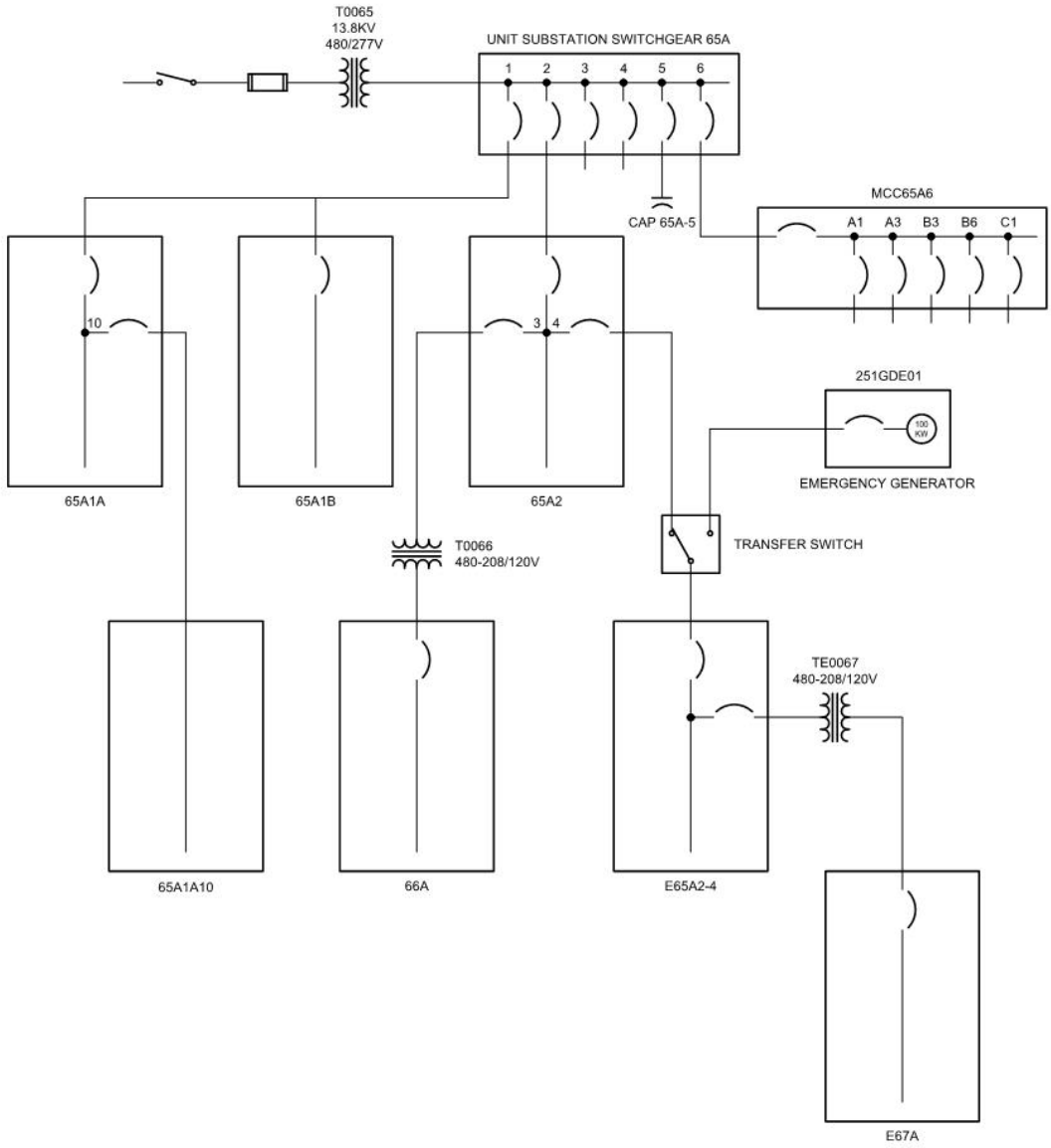


Figure 3. Substation one-line diagram.

2.2.3 Note that there is a different designation for a feeder to a panel than for a feeder to a final load, such as an outlet or a motor. The designation for a panel would be 65A2, while a circuit going to an end device would be designated 65A-2. The use of the dash mark designates the final load. Separate multiple alphabetical or numerical numbers by a dash to preserve identity (i.e., 65A2-3-25), even if serving a distribution panel.

2.3 Illustration of Numbering for Modifications/Changes to Existing Systems

2.3.1 Comply with this standard for equipment numbering and labeling changes that occur as a result of modifications. Replace panel labels to reflect connected load changes (i.e., air conditioning units, heaters, receptacles, and like items).

2.3.2 Projects involving additions and changes to the low voltage electrical system are responsible for identifying circuit changes downstream of the affected panels. This entails revising one-line diagrams, electrical location drawings, and panel schedules and sending the updated documents to the CMSG.

2.3.3 Figure 4 shows an example of two panels fed from a common transformer where one panel is replaced in the building. The following paragraphs describe the numbering logic.

(a) Panel 10A feeder is re-routed from the transformer and into panel 10B.

(b) All equipment associated with panel 10A is then relabeled to reflect the new panel number. As shown below, panel 10A becomes panel 10B4.

(c) The designator “B” will remain with panel 10B even though T0010 only feeds one panel. This is to prevent inconsistencies with the existing equipment labeling of existing panel 10B.

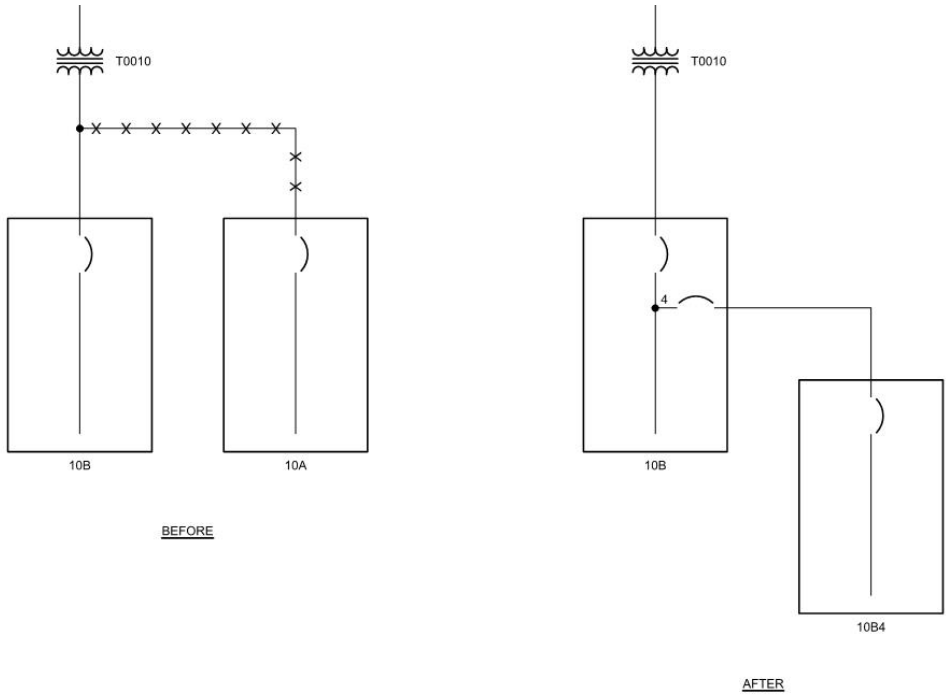


Figure 4. One-line diagram for multiple panels fed from a single transformer.

2.3.4 Reflect changes in a source transformer number in the downstream panel numbers and each load label to reflect. Reflect changes in a panelboard source (e.g., circuit breaker number) in downstream panelboards and associated load labels. See figure 5 for an illustration of labeling when adding a transformer. Numbers will not change if the transformer is replaced because the new transformer will take the old number. The labels may change, however, if the switchgear arrangement requires new numbers.

2.3.5 UPS-Supplied Equipment With Limited (Uninterruptible) Power Supply: An uninterruptible power supply (UPS) battery system provides continuous power through an outage for a limited amount of time, until the UPS batteries are discharged. Limited UPS power supply panels, circuits, and equipment are denoted with the prefix “LU” as shown in figure 6.

2.3.6 Unlimited (Uninterruptible) Power Supply: An emergency generator provides backup to a limited (UPS) power source which provides continuous power through an outage indefinitely. The circuit number will indicate "unlimited" (EU instead of LU). Similarly, transformers being fed from this system will be designated “TEU” as shown in figure 7.

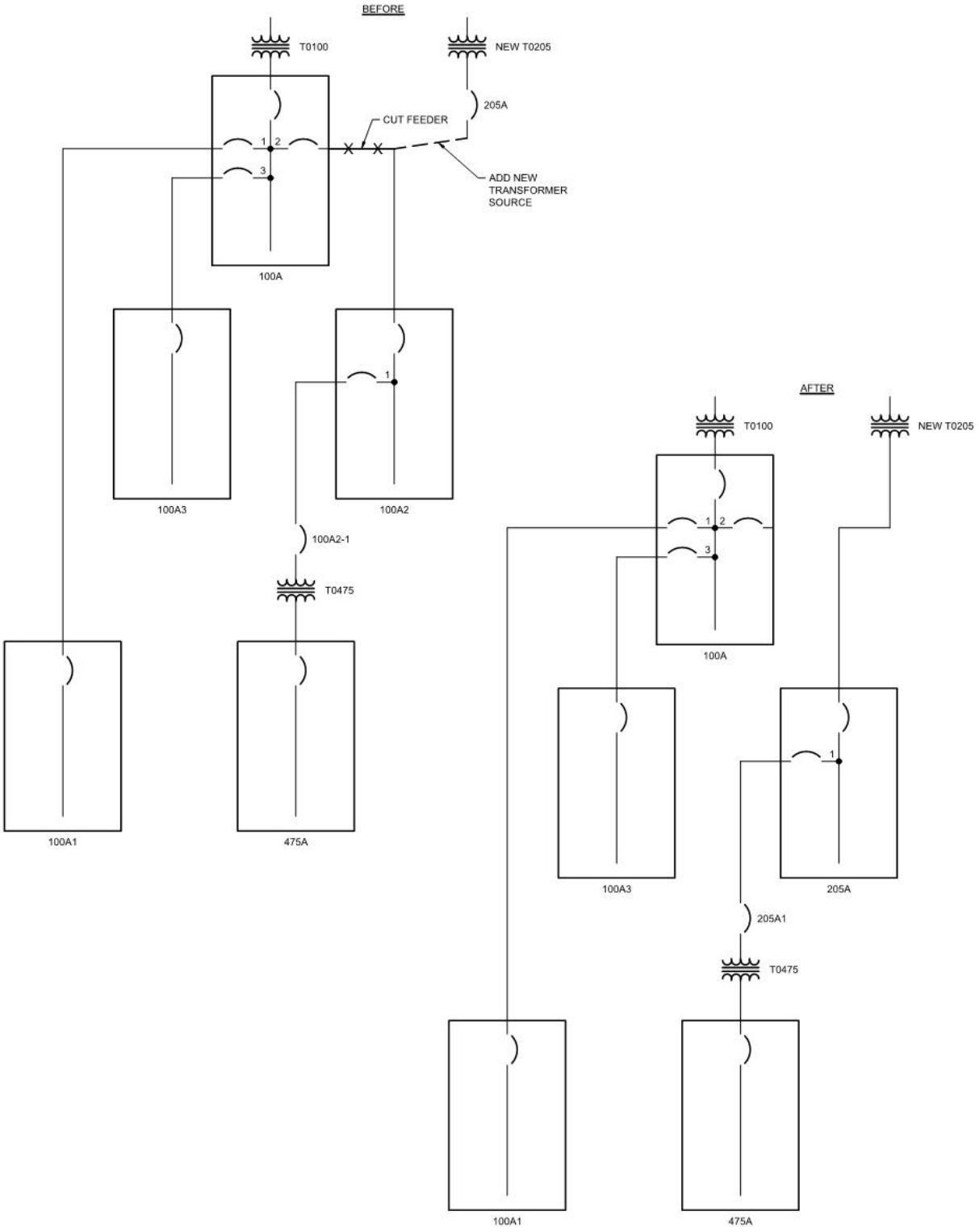


Figure 5. Transformer addition without a bus tie.

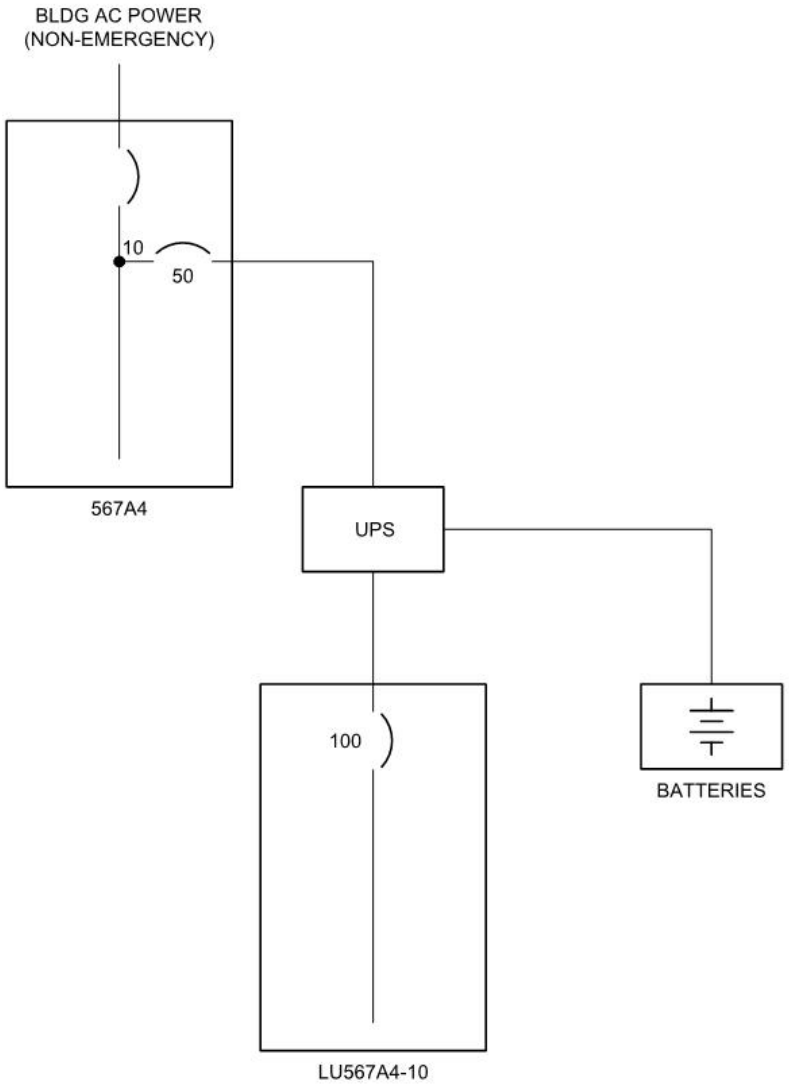


Figure 6. Limited power supply

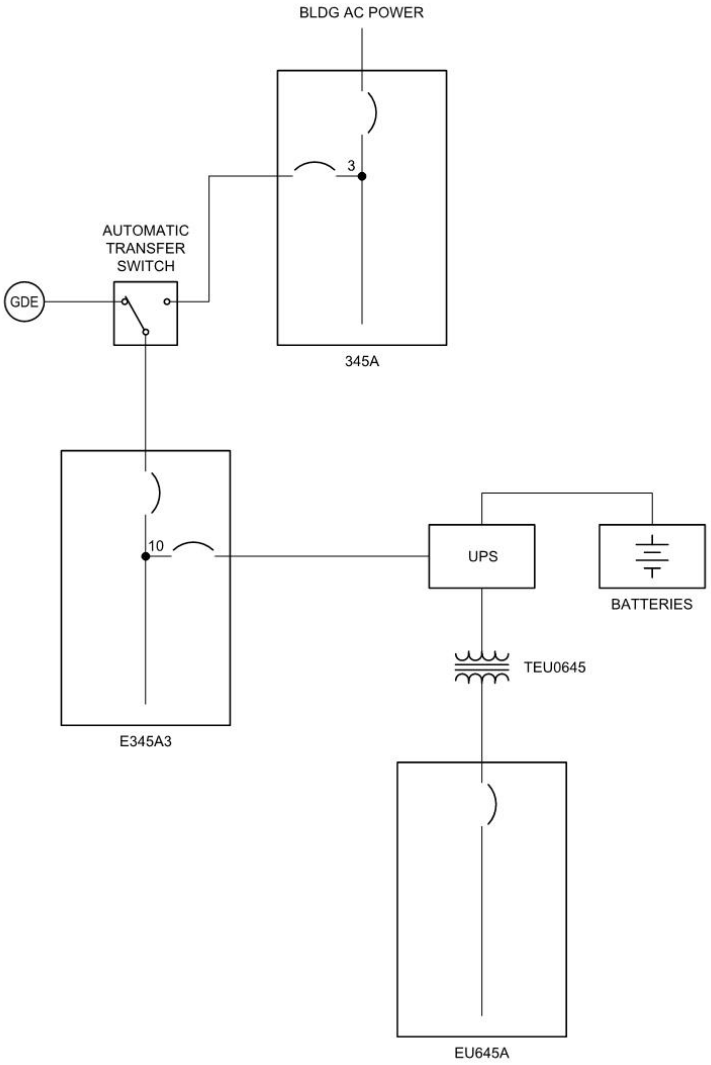


Figure 7. Unlimited power supply

2.4 Transformer Numbering

2.4.1 The CMSG field coordinators assign both high-voltage (HV) and low-voltage (LV) transformer numbers for site 200 and 300.

2.4.2 Low-voltage transformer numbers consist of a four-digit number (assigned by CMSG) preceded by one of the following letter designations:

T	=	Transformer
TE	=	Transformer, Emergency
TER	=	Transformer, Emergency Regulated Power
TEU	=	Transformer, Emergency Uninterruptible Power Supply (UPS)
TLU	=	Transformer, Limited Uninterruptible Power Supply (UPS)

2.4.3 High voltage transformers (12 kV and 13.8 kV) consist of a four-digit number (assigned by CMSG) followed by "TH."

Note: Some older transformers do not comply with this standard. Consult with CMSG for further information.

2.5 Panelboard Circuit Breaker Numbering

2.5.1 Assign a number to unit spaces in the panelboard based on the smallest single-pole breaker that may be used in that panelboard. This permits circuitry changes within the panelboard affecting only the numbering of the circuit breakers occupying the unit spaces involved. Refer to figure 8. For 3-pole breakers, the middle unit space becomes the breaker number. With 2-pole breakers, the top unit space becomes the breaker number for breakers mounted on the left side of the panelboard, and the bottom unit space becomes the breaker number for breakers mounted on the right side of the panelboard. Some 2-pole models use a 3-pole space frame with no circuit in the middle space. The operating handle, however, is in the middle and is labeled with that space number. Number designation is from left to right and top to bottom, odd on the left, even numbers on the right. In main breaker panels do not number the main breaker.

2.5.2 Where multi-section panelboards are used, label panels alphabetically. For example, a two-section panelboard served from T9999 would be labeled as 9999A and 9999B. Start circuit numbering at 1 for each panel section. See Figure 11 for example of multi-section panelboard on a one-line diagram. Multi-section or feed-through panelboards are panels where one panel has a main overcurrent protection device and one or more downstream panels that are connected in series and effectively protected by the main overcurrent protection device.

2.5.3 Where sub-feed circuit breakers are used, label these circuit breakers alphabetically with the next character in sequence. For example, a sub-feed breaker in panel 9999A would be labeled as 9999B. Sub-feed circuit breakers are circuit breakers located within a panelboard that are not located in a branch circuit breaker slot and are not the main circuit breaker. See Figure 13 for an example of a panel schedule with a sub-feed circuit breaker. Legacy examples of sub-feed circuit breakers may have used circuit 99.

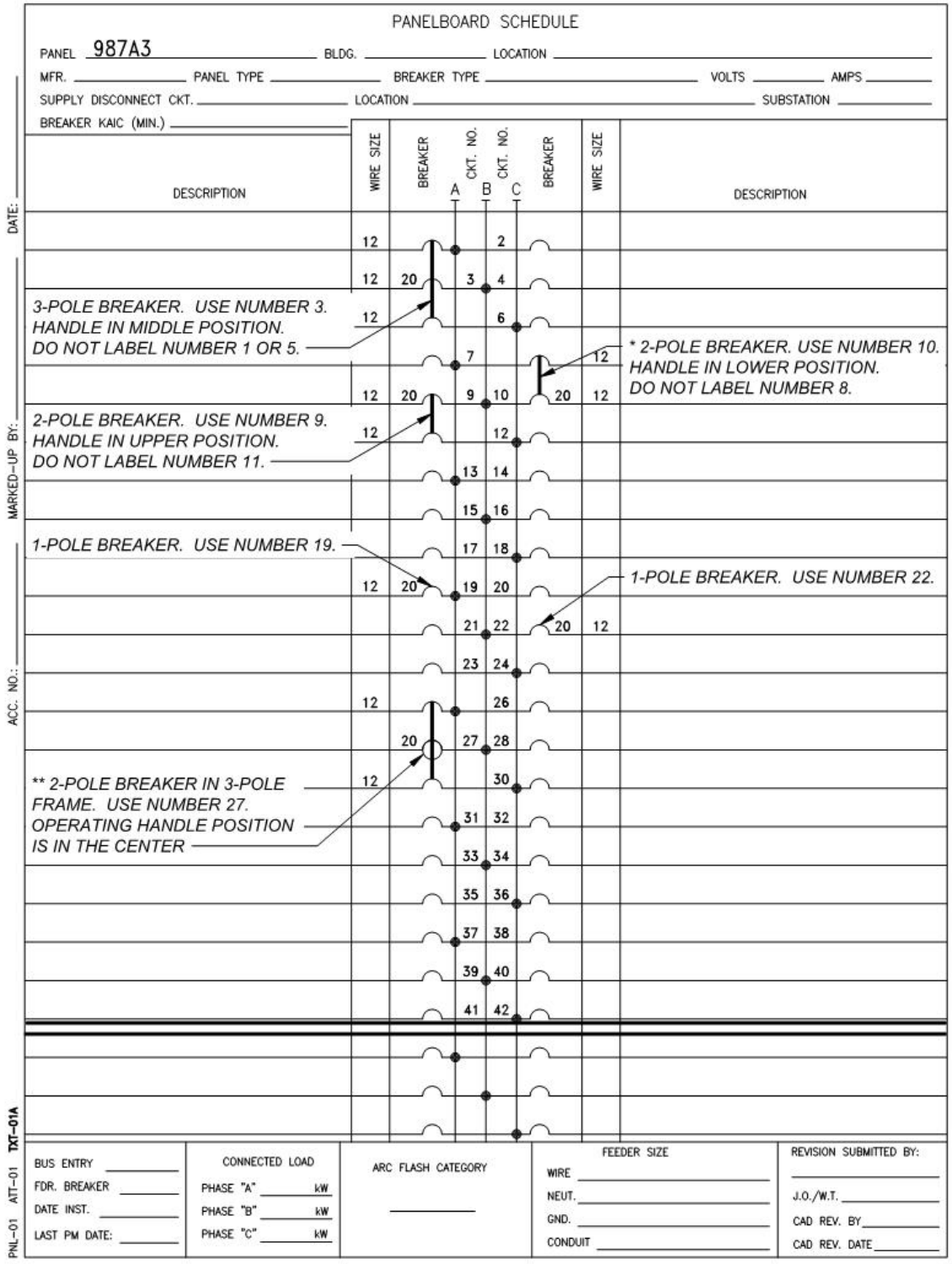


*Figure 8. Numbering scheme for 1-, 2-, and 3-pole breakers (sample). *2-pole breaker in 2-pole frame. Position of handle is dependent on circuit breaker manufacturer. Indicate circuit number wherever handle appears. **2-pole breaker in 3-pole frame. Position of handle is similarly dependent on circuit manufacturer.*

2.5.4 See figure 9 for an example of a legacy panelboard schedule with skipped circuit numbers.

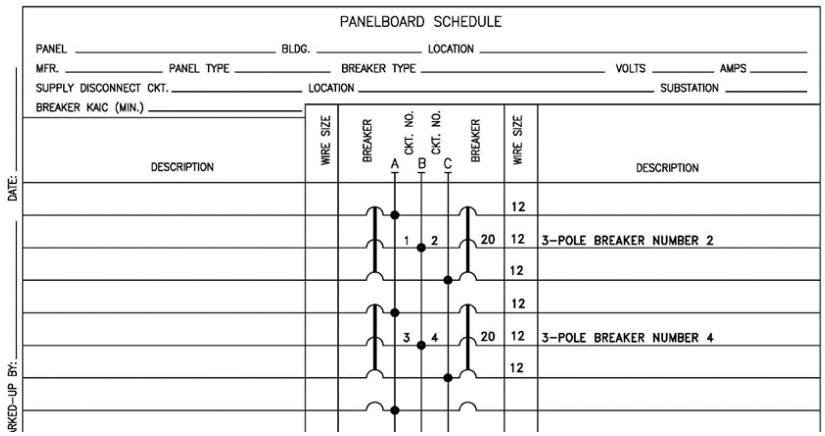


Figure 9. Existing condition with skipped circuit numbers (non-standard).

2.5.5 Where 3-pole breakers are replaced with three 1-pole breakers and only one number was previously assigned (in error), maintain that circuit number with “A”, “B”, and “C” suffixes. Refer to figure 10. Do not follow this direction when three numbers have been previously assigned (correct procedure).

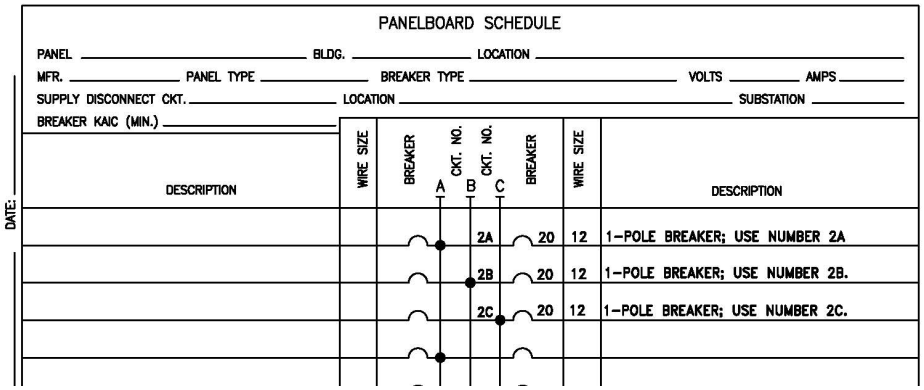


Figure 10. New numbers when replacing 3-pole breaker with three 1-pole breakers (non-standard).

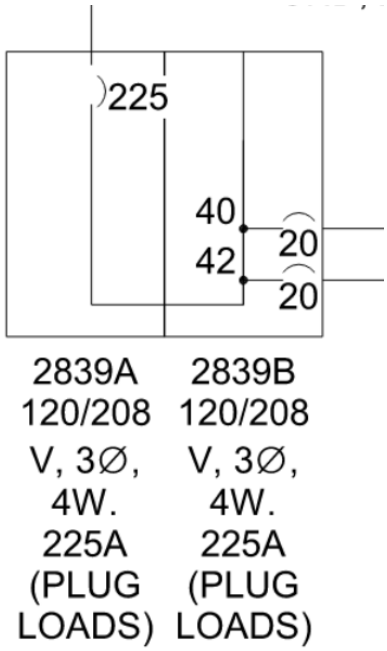
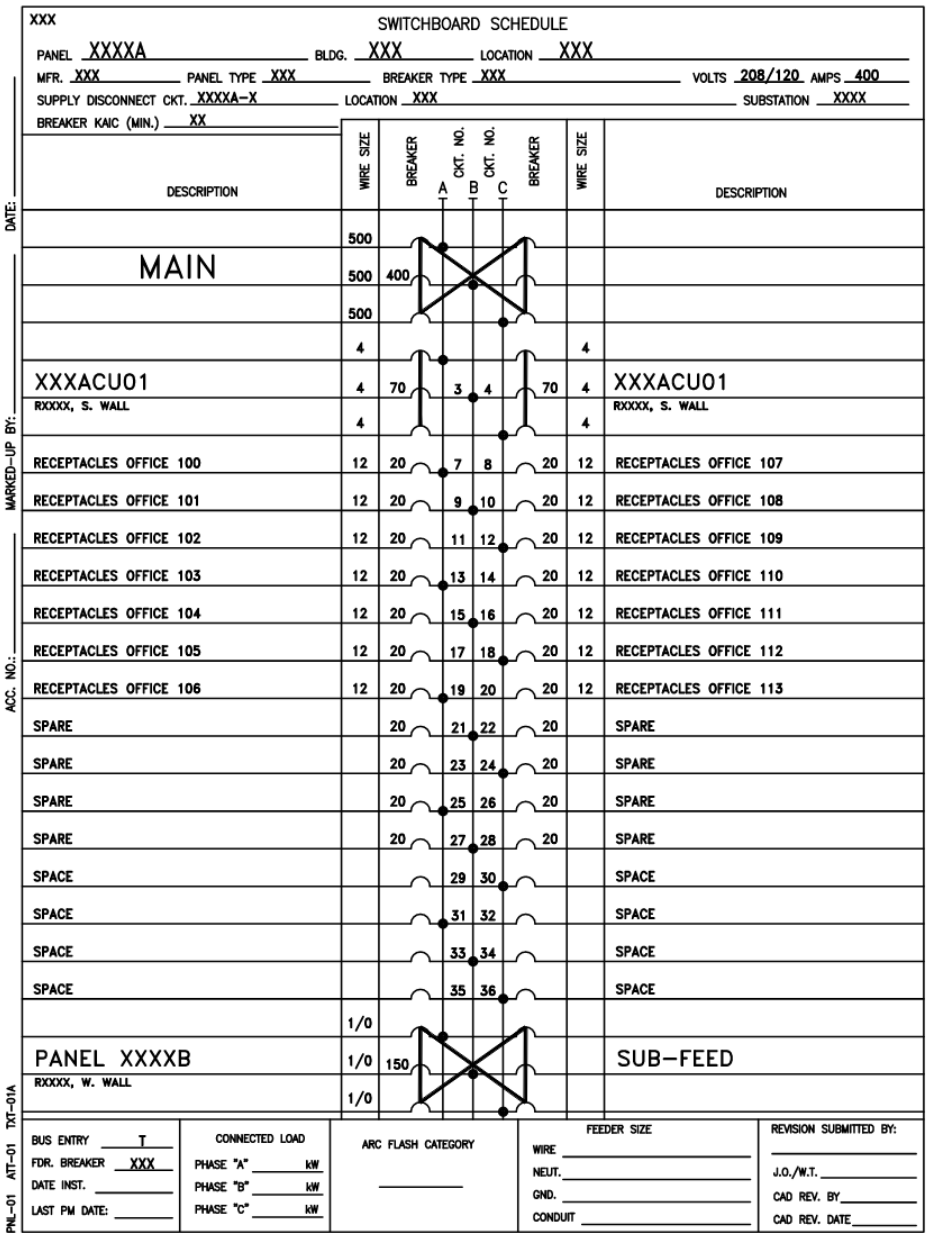


Figure 11: Multi-section Panelboards



XXX

SWITCHBOARD SCHEDULE

PANEL XXXXA BLDG. XXX LOCATION XXX

MFR. XXX PANEL TYPE XXX BREAKER TYPE XXX VOLTS 208/120 AMPS 400

SUPPLY DISCONNECT CKT. XXXXA–X LOCATION XXX SUBSTATION XXXX

BREAKER KAIC (MIN.) XX

DATE: MARKED–UP BY: ACC. NO.: PNL–01 ATT–01 TXT–01A

DESCRIPTION	WIRE SIZE	BREAKER	CKT. NO. A	CKT. NO. B	CKT. NO. C	BREAKER	WIRE SIZE	DESCRIPTION
	500							
MAIN	500	400						
	500							
	4						4	
XXXACU01	4	70	3		4	70	4	XXXACU01
RXXXX, S. WALL	4						4	RXXXX, S. WALL
RECEPTACLES OFFICE 100	12	20	7		8	20	12	RECEPTACLES OFFICE 107
RECEPTACLES OFFICE 101	12	20	9		10	20	12	RECEPTACLES OFFICE 108
RECEPTACLES OFFICE 102	12	20	11		12	20	12	RECEPTACLES OFFICE 109
RECEPTACLES OFFICE 103	12	20	13		14	20	12	RECEPTACLES OFFICE 110
RECEPTACLES OFFICE 104	12	20	15		16	20	12	RECEPTACLES OFFICE 111
RECEPTACLES OFFICE 105	12	20	17		18	20	12	RECEPTACLES OFFICE 112
RECEPTACLES OFFICE 106	12	20	19		20	20	12	RECEPTACLES OFFICE 113
SPARE		20	21		22	20		SPARE
SPARE		20	23		24	20		SPARE
SPARE		20	25		26	20		SPARE
SPARE		20	27		28	20		SPARE
SPACE			29		30			SPACE
SPACE			31		32			SPACE
SPACE			33		34			SPACE
SPACE			35		36			SPACE
	1/0							
PANEL XXXXB	1/0	150						SUB–FEED
RXXXX, W. WALL	1/0							

BUS ENTRY T
FDR. BREAKER XXX
DATE INST.
LAST PM DATE:

CONNECTED LOAD
PHASE "A" kW
PHASE "B" kW
PHASE "C" kW

ARC FLASH CATEGORY

FEEDER SIZE
WIRE
NEUT.
GND.
CONDUIT

REVISION SUBMITTED BY:
J.O./W.T.
CAD REV. BY
CAD REV. DATE

Figure 12: Panelboard with Sub-Feed Circuit Breaker

2.6 Load Center

2.6.1 See Figure 13 for proper method of numbering circuits in a load center. Begin load center number with “LC” designator.

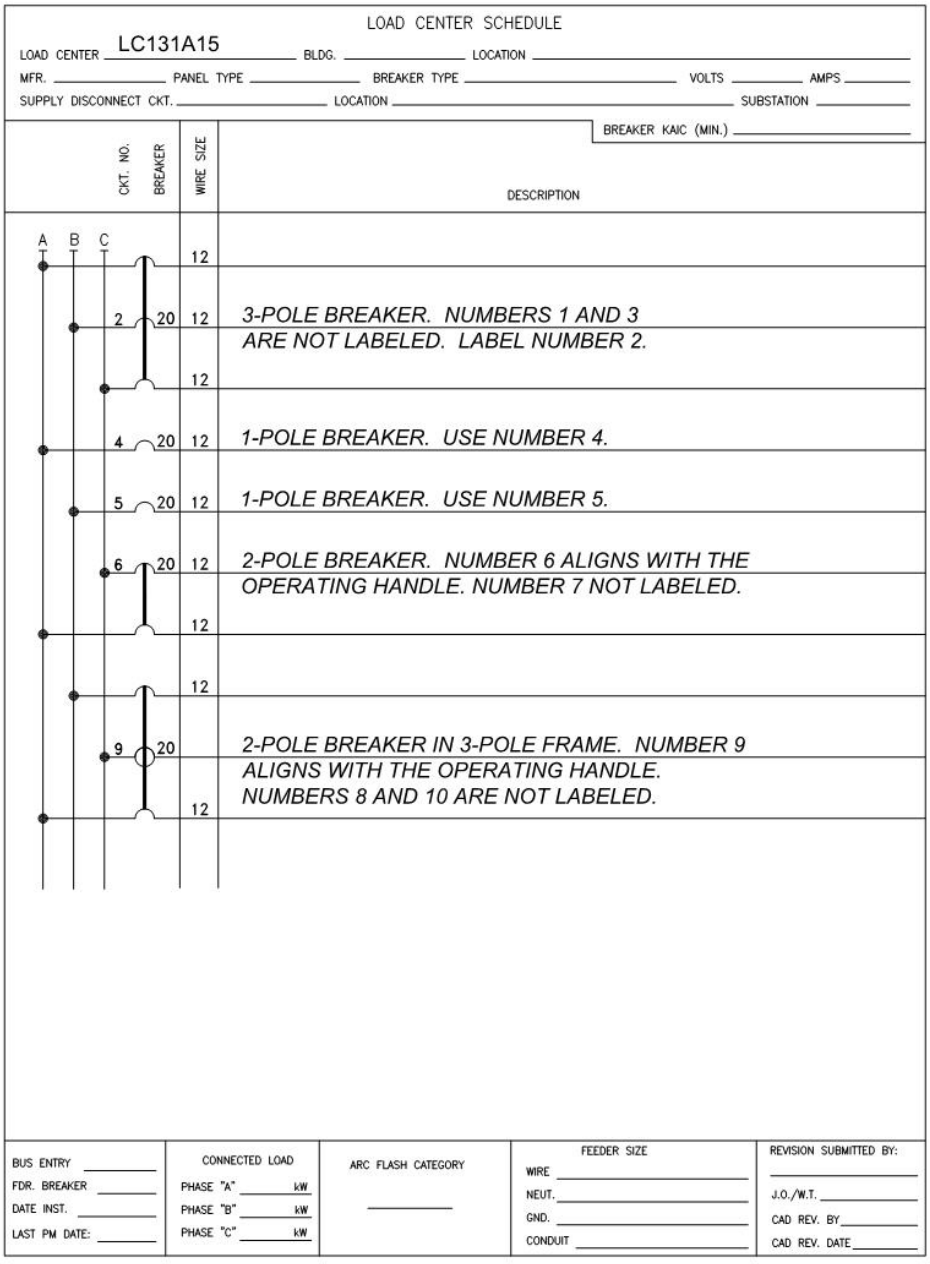


Figure 12. 10-circuit load center schedule.

2.7 Motor Control Center Numbering

Figure 14 shows the numbering of circuits for a motor control center. Vertical sections are assigned letters from left to right, regardless of where the power enters the MCC. Distribution bucket positions are assigned numbers from top to bottom based upon the smallest available bucket size. This

method results in a number/letter grid position for each possible bucket arrangement. In the example, the numbering in each vertical section is from one up, depending on compartment size. In actual practice, the number of minimum-sized compartments that would fit in a vertical section would govern the maximum number. Where two disconnects are mounted in a single bucket use the notation A and B for the left and right disconnects, respectively. For example, MCC780C1B would be the right disconnect in a bucket that contains two circuit breakers.

Label with “MCC” followed by the number.

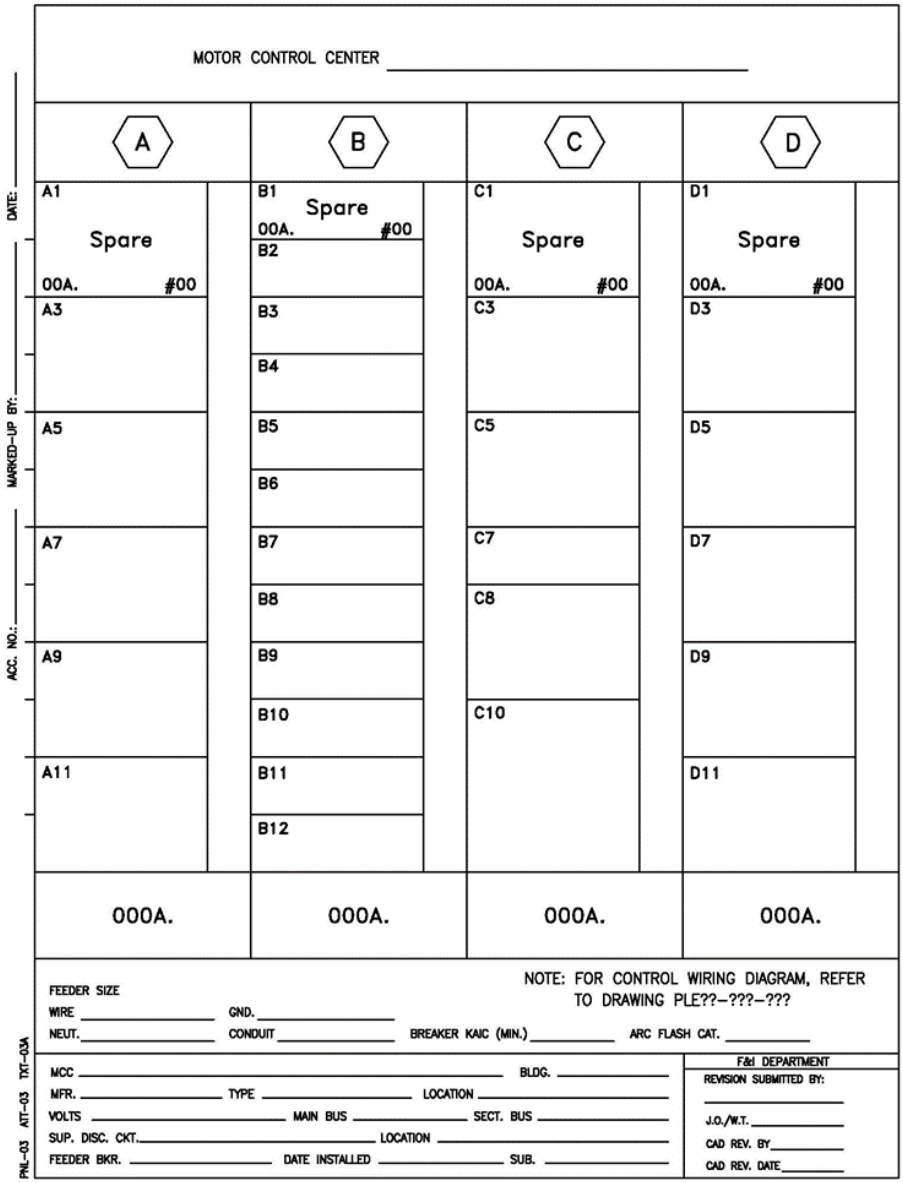


Figure 13. Motor control center

2.8 Distribution Panelboard, Switchboard, and Switchgear Numbering

Switchboards and switchgear can have draw-out mount circuit breakers, fixed mount circuit breakers, or a mix of either style. Distribution panelboards will only have fixed mount circuit breakers.

Draw-out circuit breakers are labeled numerically based on cubicle arrangement in the equipment. These cubicles will not have alphabetically labeling for sections like MCCs.

Fixed mount circuit breakers are oriented horizontally and are labeled similar to branch panelboards except that only 3-pole circuit breakers are taken into consideration for numbering. Figures 15, 16, & 17 illustrate an example of a switchboard with both draw-out and fixed mount circuit breakers.

Certain size frames for fixed mount circuit breakers may take up both sides of the equipment. In this case, the circuit breaker is to be numbered based on the load side of the circuit breaker. Figure 18 illustrates an example of a switchboard with only fixed mount circuit breakers. Spaces must be marked with the circuit breaker frame size that the space will accept. Indicate on spaces if there is no hardware.

Numbering prioritizes top to bottom and begins relative to main breaker position.

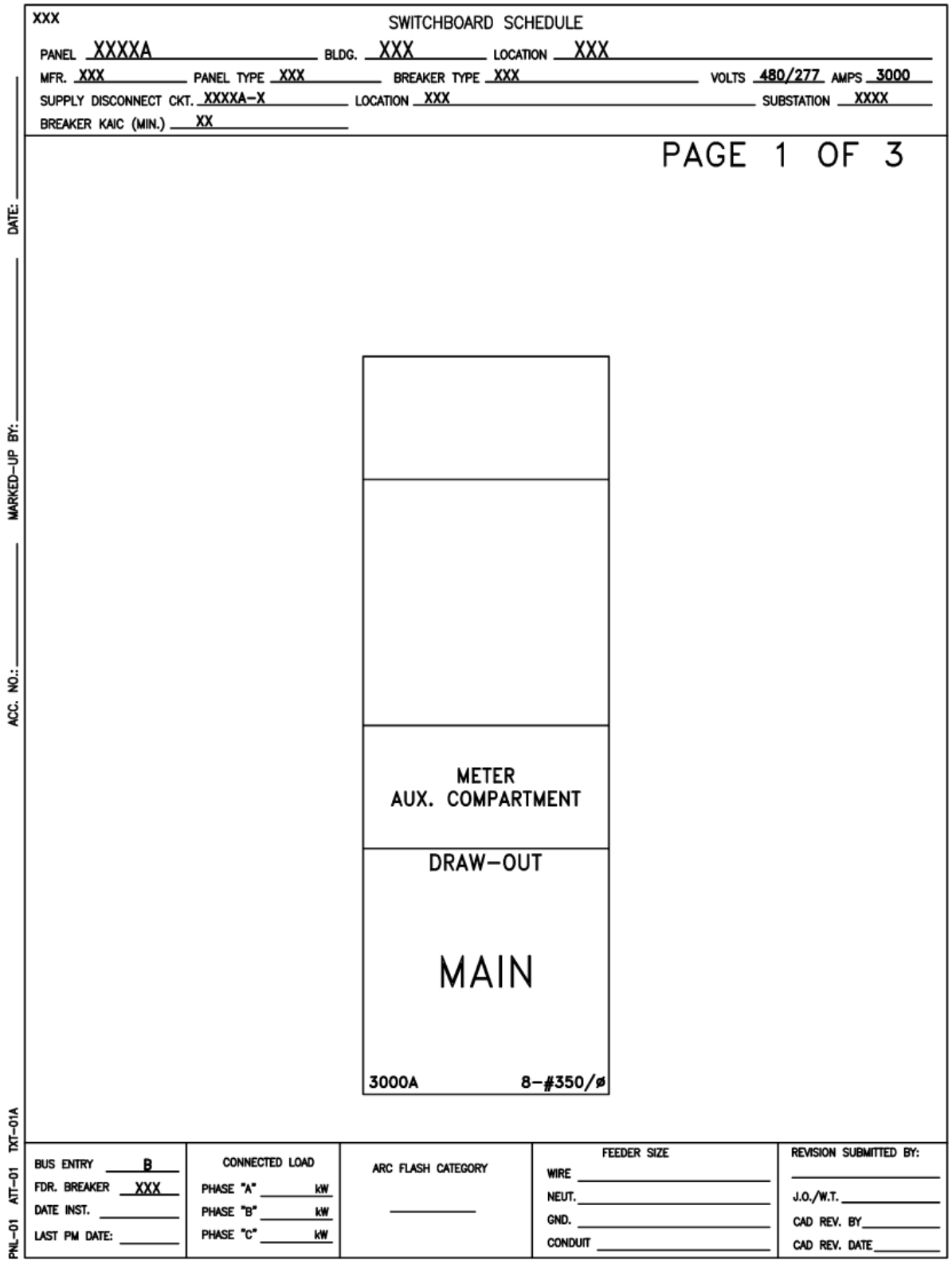


Figure 15: 3000A Main Switchboard Panel Schedule (Page 1)

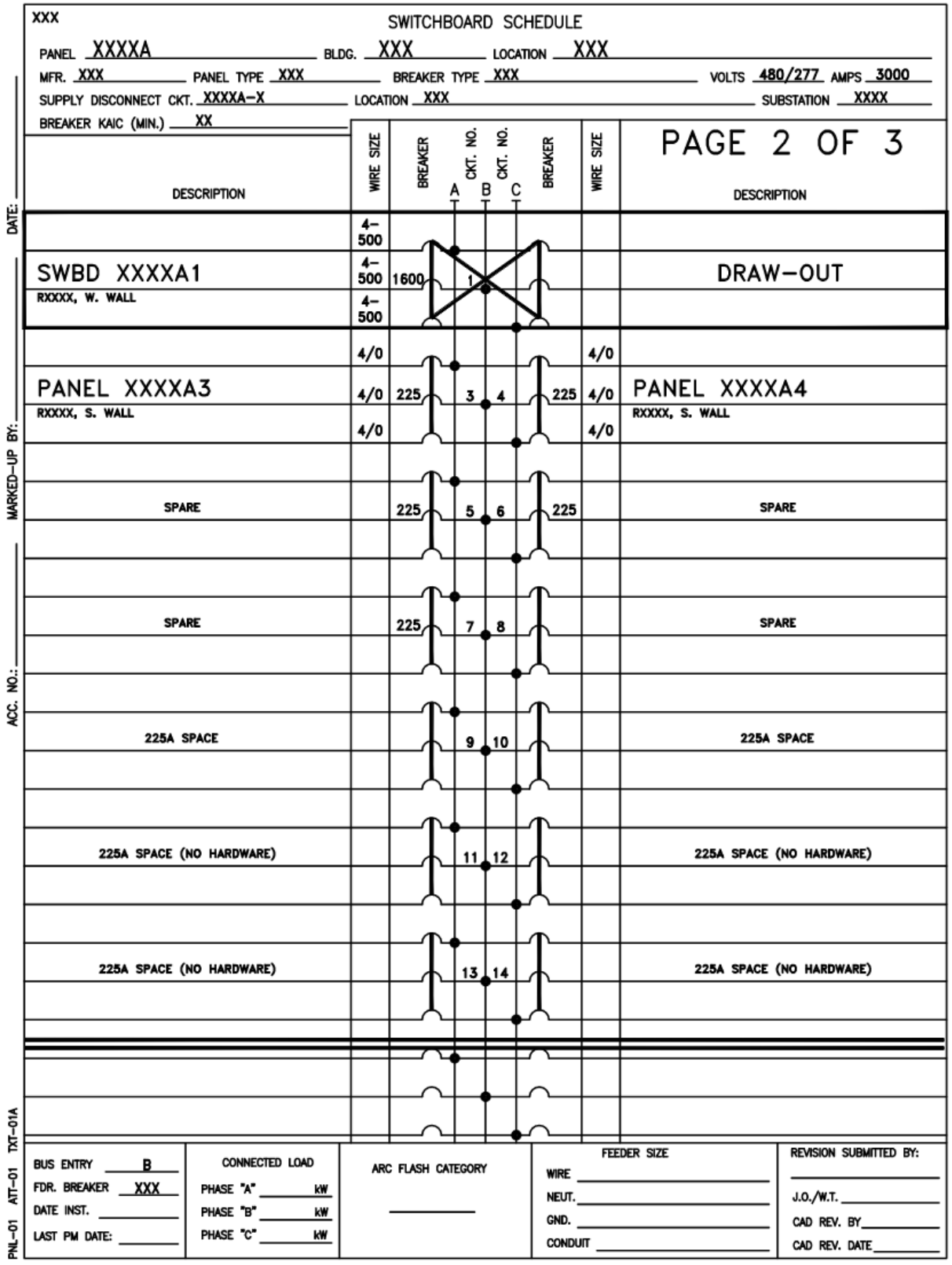


Figure 16: 3000A Main Switchboard Panel Schedule (Page 2)

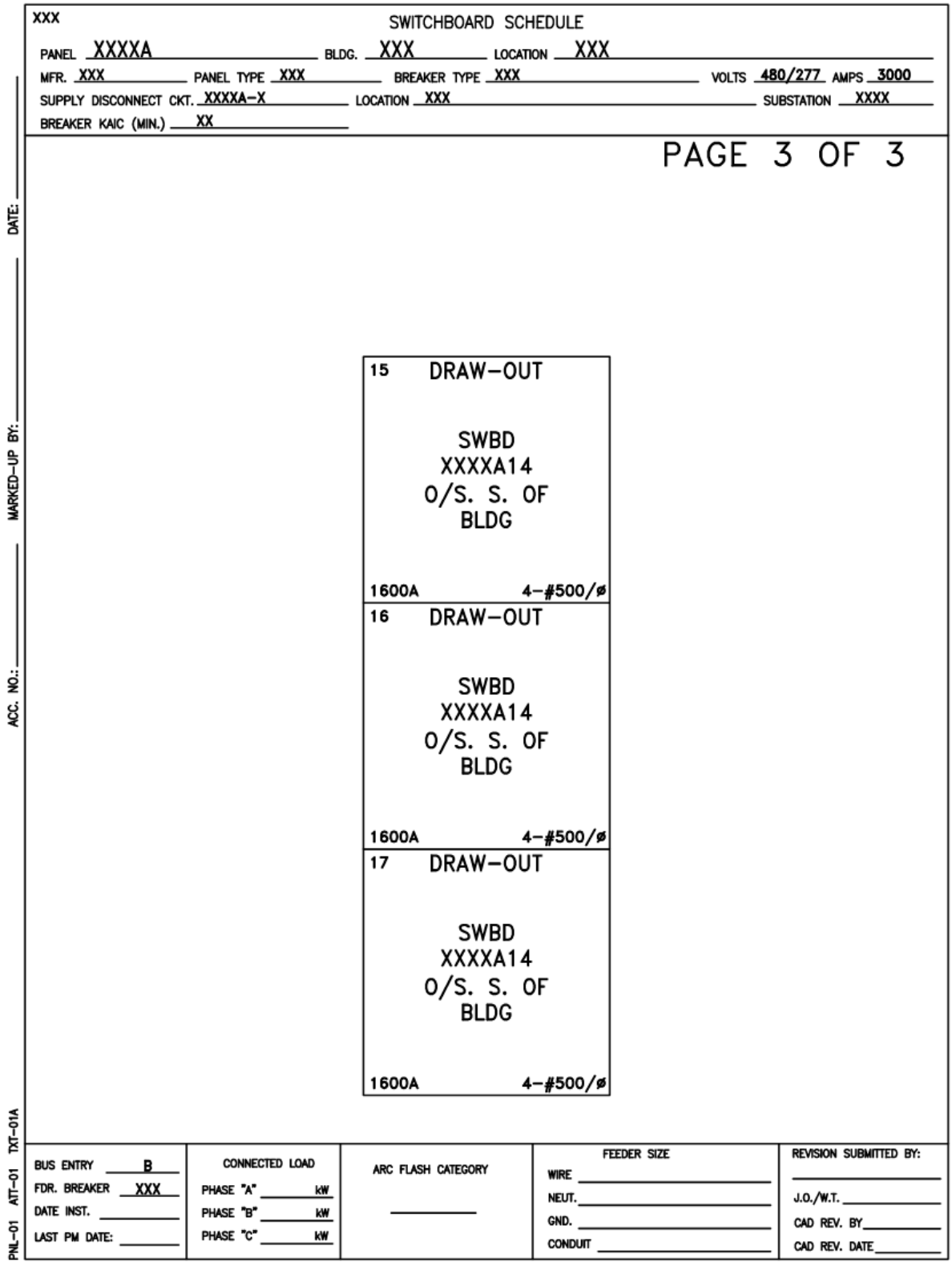


Figure 17: 3000A Main Switchboard Panel Schedule (Page 3)

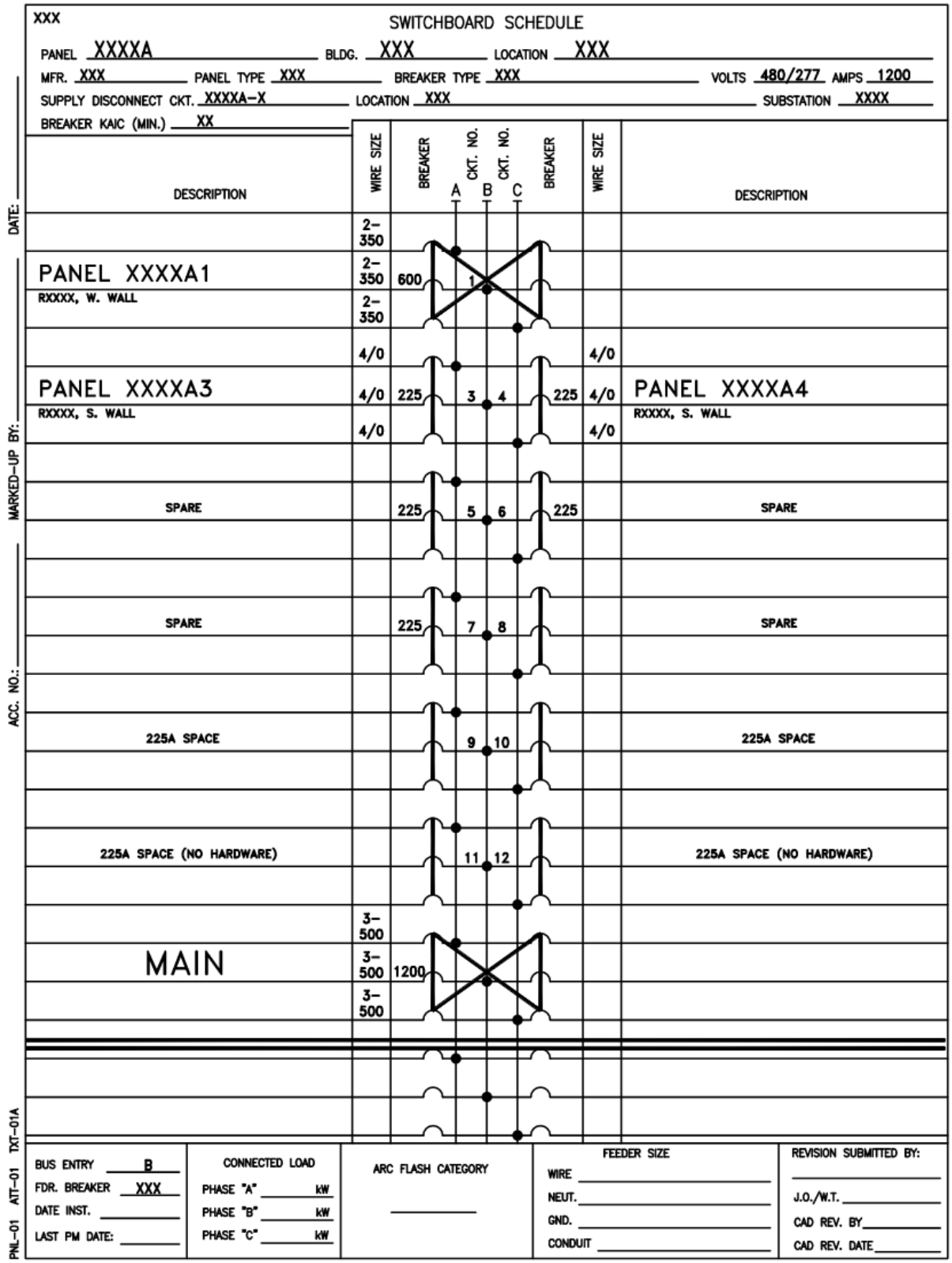


Figure 18: Switchboard panel schedule with only fixed mount circuit breakers

2.9 Plug-In Bus Duct Numbering

Bus duct plugs are numbered based upon their location relative to the power entry point on the bus. Figure 19 illustrates the proper method of numbering circuit breakers on a plug-in bus duct system. Where it is impractical to post schedules for a bus duct system, show all loads on the one-line drawings.

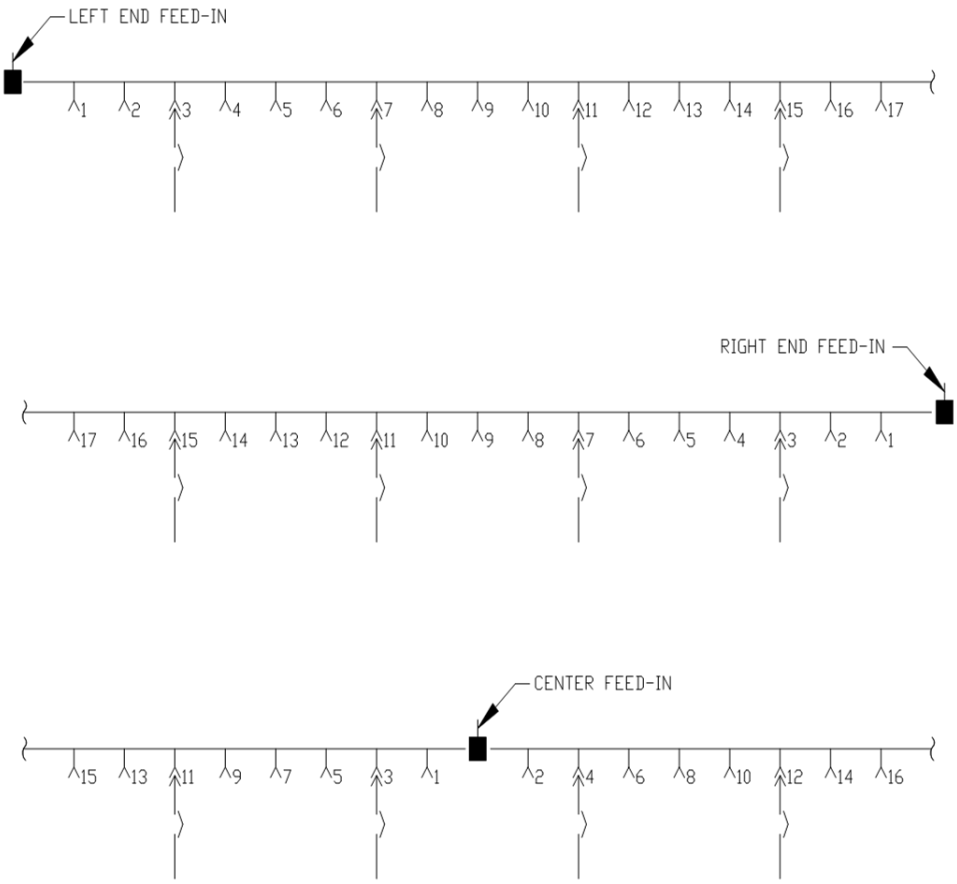


Figure 19. Plug-in bus duct

2.10 Site Lighting Numbering

Use the following numbering scheme for site lighting numbering and labels. Provide designations for all poles. Refer to Figure 14 for example labels.

ZZSTLLP### - Y

ZZ = **Site Designation**. Select the appropriate code from the two listed below.

02 = Site 200

15 = Site 300

STL = **Site Lighting**. Static identifier; do not change.

LP = **Light Pole**. Static identifier; do not change.

= **Lighting Group Number**. If adding on to an existing circuit, use the existing group number assigned. If using a new site lighting circuit, CMSG field coordinators will assign a new group number.

Y = **Unique Group Identifier**. Unique numeric identifier for the individual luminaires (pole lights count as one no matter the number of heads) per group. CMSG field coordinators will assign based on availability. Identifiers may be out of sequence.

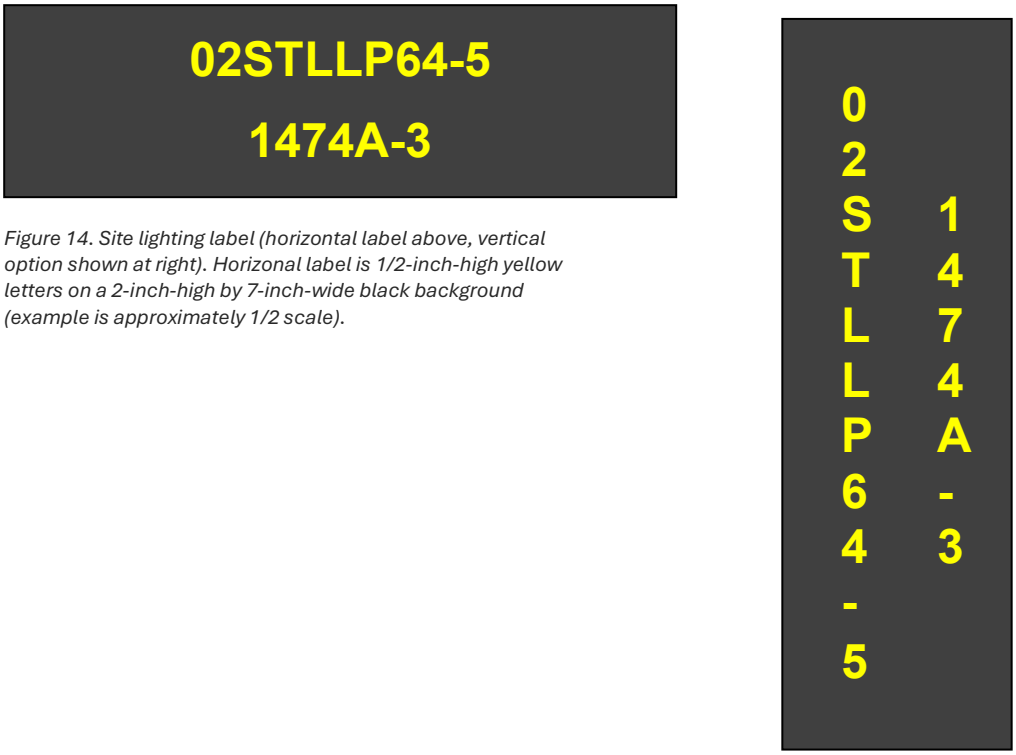


Figure 14. Site lighting label (horizontal label above, vertical option shown at right). Horizonal label is 1/2-inch-high yellow letters on a 2-inch-high by 7-inch-wide black background (example is approximately 1/2 scale).

2.11 Electric Vehicle Charging Station (EVCS) Numbering

Use the following numbering scheme for EVCS numbering and labels. Provide designations for all poles. Refer to Figure 14 above for example labels.

ZZEVCS### - Y

ZZ = **Site Designation**. Select the appropriate code from the two listed below.

02 = Site 200

15 = Site 300

EVCS = **Electric Vehicle Charging Station**. Static identifier; do not change.

= **EVCS Group Number**. If adding onto panelboard serving existing EVCS, use the existing group number assigned. If a new panelboard is installed for EVCS, CMSG field coordinators will assign a new group number.

Y = **Unique Group Identifier**. Unique numeric identifier for each EVCS per group. EVCS with multiple circuits will still have one identifier. CMSG field coordinators will assign based on availability. Identifiers may be out of sequence.

3 EQUIPMENT LABELING

3.1 General

3.1.1 Each device is assigned a unique identification number by LLNL CMSG to facilitate computerized processing of inventory, preventive maintenance, and operational data.

3.1.2 Work described in this standard that is not specifically called out to be done by a subcontractor will be done by CMSG.

3.1.3 Conspicuously locate identification.

(a) Use engraved two-layer laminated plastic plate or thermal-transfer labels with 7/8-inch-high minimum characters on colored background; see Figure 21.

(b) Use smaller labels only when the equipment is too small for the standard size labels.

3.1.4 Color Coding

(a) Normal power equipment is designated by yellow lettering on a black background.

(b) Emergency power equipment is designated by black lettering on a yellow background and the use of the prefix “E” in the device name.

(c) Limited and unlimited UPS powered equipment is designated by white lettering on a blue background and the use of the prefix “LU” or “EU” in the device name, respectively.

3.2 Switchgear, Switchboards, Panelboards, Motor Control Centers, Distribution Panels, and Emergency Power Panels:

3.2.1 Identify circuit number and voltage as shown on the drawings with a plate or thermal-transfer label (including “W/MAIN,” if it has one). Size label 4 inches high by 7 inches wide with 7/8-inch-high letters.

3.2.2 Exceptions and Pre-existing Conditions:

(a) Label new buildings and large remodeling projects that do not have previously labeled equipment in accordance with this standard.

(b) More than one numbering system is currently in use at LLNL. Existing panels with labels and circuit-breaker numbers that differ from the current standard scheme, but have connected equipment and circuit breakers labeled correctly, may continue to use the existing numbering as sanctioned by the BEAHJ. Refer to figure 9 above.

(c) Include documentation and correction of labels to either the established numbering system used in the area, approved by the CMSG or this standard, for partial upgrades

and retrofits that cause or discover a panel label or its connected equipment labels to conflict with each other.

Figures 15, 16, 17 and 18 illustrate the panel identification number, voltage, and if the panelboard has a main.

Figure 15. Distribution panel with main power source entry plate/label; 7/8-inch-high yellow letters on 4-inch high by 7-inch-wide black background (figure is approximately 1/2 scale)

Figure 16. Distribution panel with main emergency power source entry plate/label; 7/8-inch-high black letters on 4-inch-high by 7-inch-wide yellow background (figure is approximately 1/2 scale)

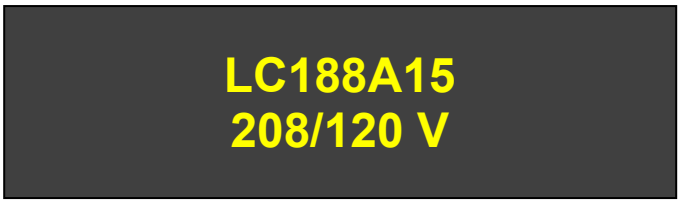


Figure 17. Load center panel plate/label with 1/2-inch-high yellow letters on a 2-inch-high by 7-inch-wide black background (figure is approximately 1/2 scale).

Figure 18. Distribution panel providing emergency uninterruptable power source (UPS) entry plate/label; 7/8-inch-high white letters on 4-inch-high by 7-inch-wide blue background (figure is approximately 1/2 scale)

3.3 Low-Voltage Transformers

3.3.1 Use a plate or thermal-transfer label sized 4 inches high with 7/8-inch-high letters as shown in Figure 19.

3.3.2 First line is transformer number shown on the drawings.

3.3.3 Second line is primary circuit number.

3.3.4 Third line is primary and secondary voltages.

Figure 19. Transformer plate/label; 7/8-inch-high yellow letters on 4-inch high by 9-inch-wide black background (figure is approximately 1/2 scale). I&O is responsible for labeling high-voltage transformers (TH).

3.4 High-Voltage Transformers

3.4.1 Use a plate or thermal-transfer label sized 4 inches high with 7/8-inch-high letters as shown in Figure 20

3.4.2 First line is transformer number shown on the drawings.

3.4.3 Second line is the base rating of the transformer.

3.4.4 Third line is secondary voltage.

Figure 20. High-voltage transformer label.

3.5 Receptacles, switches, and outlets

Identify by the circuit number shown on the drawings with thermal-transfer labels. Place the label on the plate cover if the device is wall-mounted; place on the device enclosure if it is not.

3.6 Utilization Equipment

Identify all drives, starters, disconnect switches, and control devices with a plate or thermal-transfer label. Match identification exactly to equipment legend noted on the drawings. Size label at least 2-1/4 inches high with 1/2-inch-high letters.

3.7 Mechanical Equipment

3.7.1 Prior to equipment being inspected and energized, provide and install temporary equipment labels that must be 7/8-inch letters, ***equipment numbering system*** must be as indicated in construction documents or original equipment replaced; plastic "Gravoply" laminate or thermal transfer labels must be Pink with Black characters for normal power and with white characters for emergency power until accepted and labeling corrected by I&O.

Refer to LLNL Facilities Standard PEL-M-230550, *Equipment Numbering*, for proper equipment numbering. Show the equipment number in the description section of the panel schedule for mechanical equipment.

3.8 Electrical hazard (arc flash and shock) Warning Labels

The I& O Systems and CMSG are responsible for labeling switchboards, switchgear, panelboards, industrial control panels, low voltage transformers, and motor control centers communicate electrical hazards to workers. Labels must be self-adhesive vinyl labels nominally four inches high and six inches high. The format for labels is per figure 21, below. A template (in SKM software) for this label is available from I&O Systems Engineering.

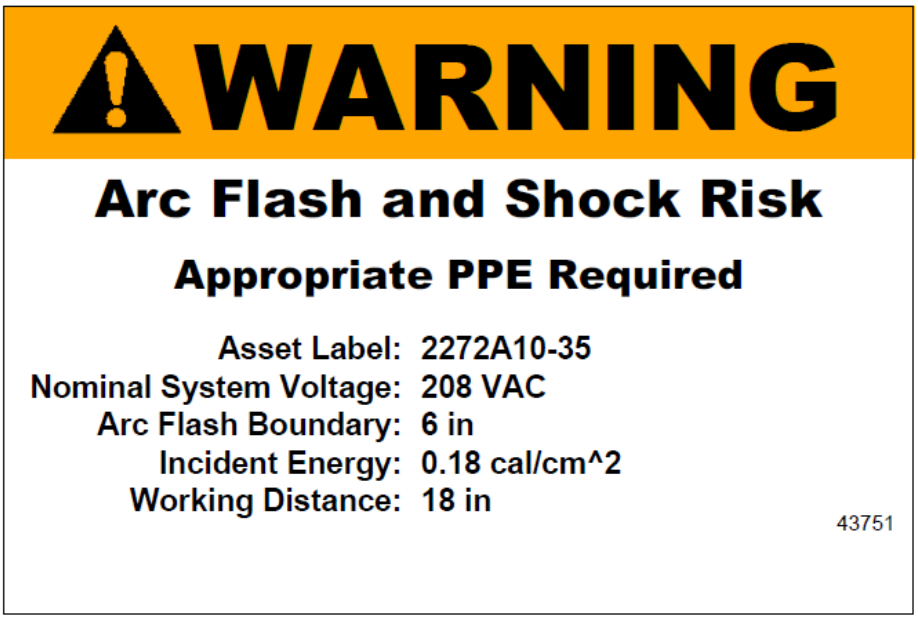


Figure 21. Arc flash and shock risk warning label.

3.9 Clear Working Space Labels

Using labels provided by CMSG, mark equipment likely to require examination, adjustment, servicing, or maintenance while energized reminding building occupants to maintain clear space as required by OSHA 1910.303. Use self-adhesive vinyl labels nominally four inches high and six inches high are used. The format for labels is per Figure 22, below.

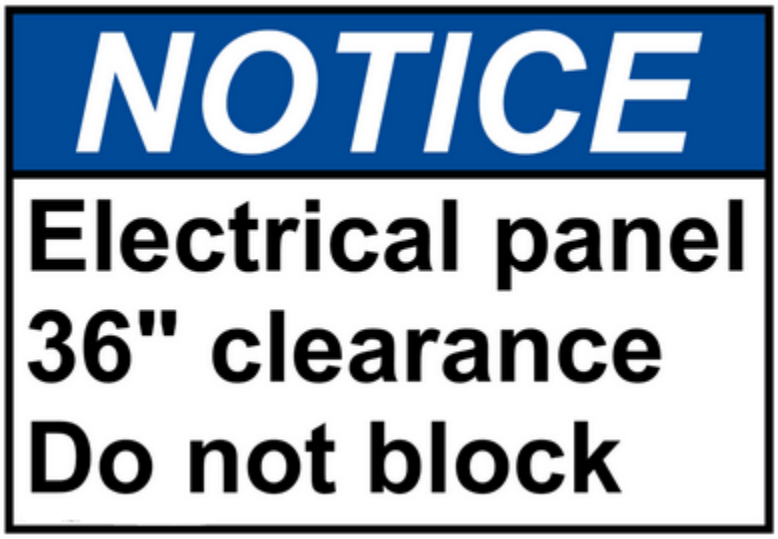


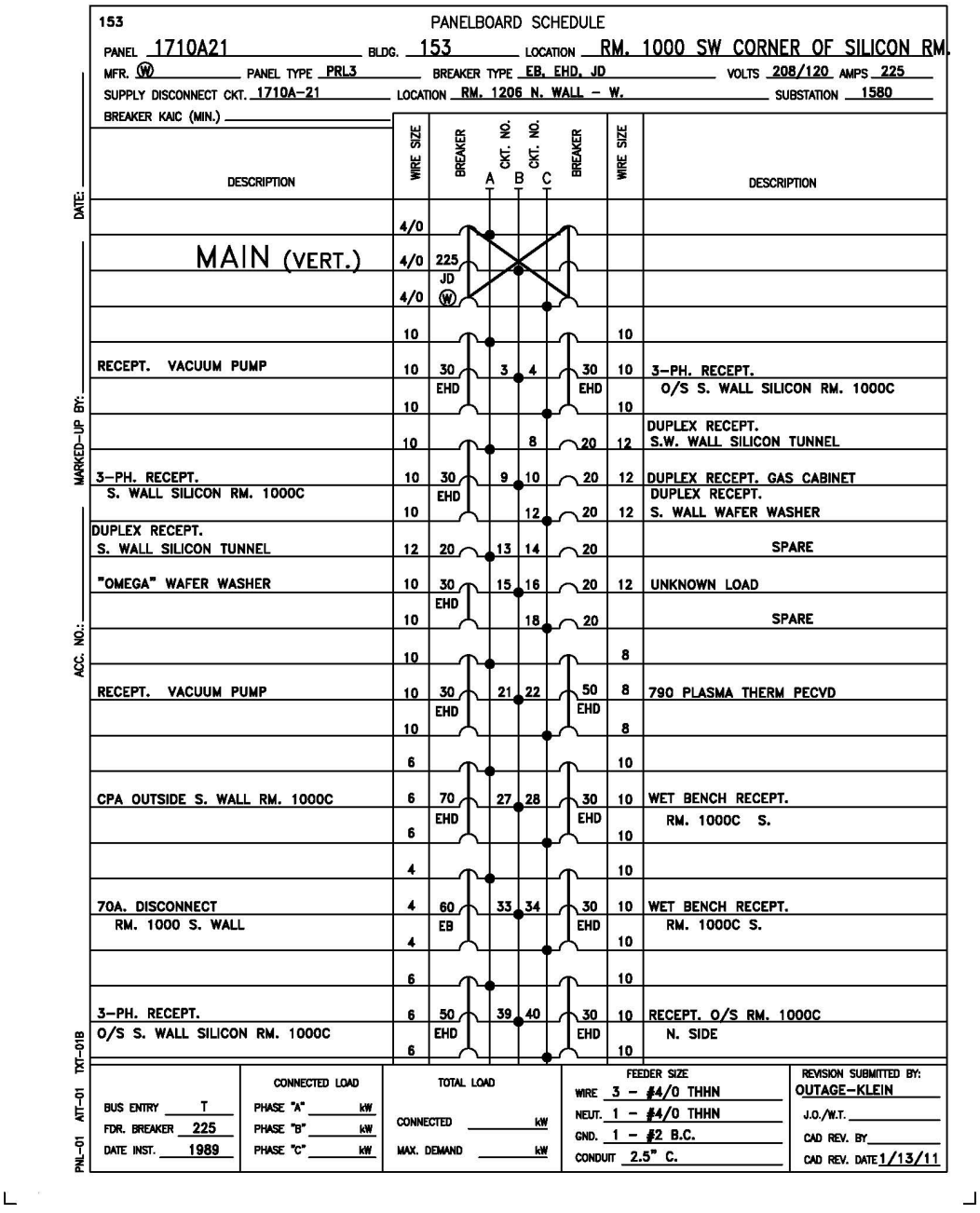
Figure 22. Electrical panel clearance label.

4 SCHEDULING

4.1 General

4.1.1 When completing panelboard schedules, keep the following points in mind (see Figure 23 below):

- → Completely fill the top and bottom portions of the schedule. Do not leave blank spaces.
- → After the heading “Breaker Type,” list the exact type of breaker used in the panel.
- → After listing all feeder breakers and spare breakers, show the remaining space available in the panelboard. Cross-out the portion of the schedule that exceeds the size of the panelboard.
- → Generate a deficiency tag to the I&O electric shop when broken hardware is encountered on existing panels. If the electrical panel is new, the project is responsible for acquiring replacement parts.



153 PANELBOARD SCHEDULE

PANEL 1710A21 BLDG. 153 LOCATION RM. 1000 SW CORNER OF SILICON RM.
MFR. Ⓦ PANEL TYPE PRL3 BREAKER TYPE EB, EHD, JD VOLTS 208/120 AMPS 225
SUPPLY DISCONNECT CKT. 1710A-21 LOCATION RM. 1206 N. WALL – W. SUBSTATION 1580
BREAKER KAIC (MIN.)

DATE: MARKED-UP BY: ACC. NO.: PNL-01 ATT-01 TXT-01B

DESCRIPTION	WIRE SIZE	BREAKER	CKT. NO. A	CKT. NO. B	CKT. NO. C	BREAKER	WIRE SIZE	DESCRIPTION
	4/0							
MAIN (VERT.)	4/0	225						
	4/0	JD Ⓦ						
	10						10	
RECEPT. VACUUM PUMP	10	30	3	4		30	10	3–PH. RECEPT.
	10	EHD				EHD	10	O/S S. WALL SILICON RM. 1000C
	10			8		20	12	DUPLEX RECEPT. S.W. WALL SILICON TUNNEL
3–PH. RECEPT.	10	30	9	10		20	12	DUPLEX RECEPT. GAS CABINET
S. WALL SILICON RM. 1000C	10	EHD		12		20	12	DUPLEX RECEPT. S. WALL WAFER WASHER
DUPLEX RECEPT. S. WALL SILICON TUNNEL	12	20	13	14		20		SPARE
"OMEGA" WAFER WASHER	10	30	15	16		20	12	UNKNOWN LOAD
	10	EHD		18		20		SPARE
	10						8	
RECEPT. VACUUM PUMP	10	30	21	22		50	8	790 PLASMA THERM PECVD
	10	EHD				EHD	8	
	6						10	
CPA OUTSIDE S. WALL RM. 1000C	6	70	27	28		30	10	WET BENCH RECEPT.
	6	EHD				EHD	10	RM. 1000C S.
	4						10	
70A. DISCONNECT	4	60	33	34		30	10	WET BENCH RECEPT.
RM. 1000 S. WALL	4	EB				EHD	10	RM. 1000C S.
	6						10	
3–PH. RECEPT.	6	50	39	40		30	10	RECEPT. O/S RM. 1000C
O/S S. WALL SILICON RM. 1000C	6	EHD				EHD	10	N. SIDE

	CONNECTED LOAD	TOTAL LOAD	FEEDER SIZE	REVISION SUBMITTED BY:
BUS ENTRY T	PHASE "A" kW	CONNECTED kW	WIRE 3 – #4/0 THHN	OUTAGE–KLEIN
FDR. BREAKER 225	PHASE "B" kW		NEUT. 1 – #4/0 THHN	J.O./W.T.
DATE INST. 1989	PHASE "C" kW	MAX. DEMAND kW	GND. 1 – #2 B.C.	CAD REV. BY
			CONDUIT 2.5" C.	CAD REV. DATE 1/13/11

Figure 23. Completed panelboard schedule, typical.

4.2 Schedule Changes

4.2.1 Revise, update, and archive schedules for projects requiring changes to an existing panel.

4.2.2 The installer is responsible for field updating the electrical panel schedule when modifying an electrical panel. Make three copies of the revised panel schedule, marking new entries in green and deletions in red. Leave two copies in the panel schedule holder and send one copy of the marked-up panel schedule to the CMSG.

4.2.3 CMSG will update and archive the panel schedule and post 2 copies in the field.

4.3 Schedule Implementation

4.3.1 Schedule Holder: Configuration Management Services Group provides the schedule holders if needed.

4.3.2 Work order installations (including I&O electricians, machine tool services, and supplemental labor):

(a) The designer or crafts person must comply with sections 3.1 through 4.2.

(b) The crafts will perform the work, put two copies of the revised panel schedule in the panel schedule holder, and send one copy to CMSG (mail code: L-602), with a valid work order number. Do not close out the work order until the panel schedule changes have been made and put back in the panel.

(c) CMSG will update the original, and stamp and distribute the following copies:

No. of Copies	Distribution
2	"Panel Copy" to the power panel
1	"FPOC" to the Facility Point of Contact
1	Electrical panelboard repository (CMSG)

(d) CMSG will update the one-line diagram and panel location drawings and send an electronic copy to the PMO Documentation and Technical Services PMO-TAP@llnl.gov for distribution and archive.

4.3.3 Purchase Order

(a) The designer must comply with section 4.2, paragraphs 4.2.1 and 4.2.2, and include the panel schedule copies with the purchase order. The copies will be removed from the package by LLNL Supply Chain Management department and sent to the Project Management Office (PMO).

(b) PMO holds panel schedules until final acceptance.

End of Standard