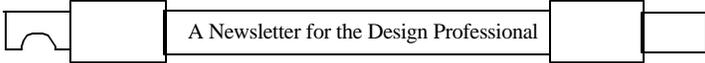


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Tech Spec

A Newsletter for the Design Professional

Introduction:

Panelboards represent the heart of the distribution system, and thus, proper compliance with the requirements of the National Electrical Code® is imperative. Article 384 of the NEC® covers proper application of panelboards.

General Requirements and Classifications:

NEC Section 384-13 requires all panelboards to have an ampacity rating not less than the minimum feeder capacity required for the computed load as calculated in Article 220. Proper marking of the voltage, ampere, and number of phases is required. In addition, all circuits shall be properly identified with the load served.

NEC Section 384-14 describes the two different types of panelboards. A lighting and appliance panelboard has more than 10% of the overcurrent devices protecting lighting and appliance branch-circuits. A lighting and appliance branch-circuit is classified as a branch-circuit with a connection to the neutral of the panelboard and which has overcurrent protection of 30 amperes or less in one or more of the conductors. A power panel is then, a panelboard with 10% or less of its overcurrent devices protecting lighting and appliance branch-circuits.

Number of Devices in Panelboards:

A maximum of 42 overcurrent devices (excluding the main device) are permitted to be installed in a lighting and appliance branch circuit panelboard per NEC Section 384-15. In addition, a physical means to prevent the installation of more devices than that for which the panelboard has been designed, rated or approved must be provided. Lastly, a multiple pole circuit breaker or fused switch is considered to be a multiple overcurrent device equal to the number of poles. Thus, a two pole circuit breaker is considered as two overcurrent devices.

Overcurrent Protection of Panelboards:

NEC Section 384-16(a) requires that each lighting and appliance branch circuit panelboard must be individually protected on the supply side by not more than two sets of fuses or two main circuit breakers having a combined rating not greater than that of the panelboard. Two exceptions are permitted:

- (1) Individual protection is not required when the panelboard feeder has overcurrent protection not greater than that of the panelboard.
- (2) Individual protection in existing installations is not required for individual residential occupancy service entrance panelboards.

NEC Section 384-16(b), requires a power panelboard having supply conductors which include a neutral and having more than 10% of its overcurrent devices

protecting branch circuits of 30 amperes or less, to have individual protection on the line side not greater than the rating of the panelboard. However, this individual protection is not required when the power panel is used as service equipment in accordance with 230-71.

Panels with snap switches rated at 30 amperes or less must have overcurrent protection not larger than 200 amperes per NEC Section 384-16(c). Fusible panelboards are available with heavy duty toggle switches rated more than 30 amperes; these panelboards are not restricted by this 200 ampere requirement.

When the load continues for more than 3 hours under normal operation, the total load on any overcurrent device in the panelboard should not exceed 80% of the overcurrent device rating per NEC Section 384-16(d), unless, the assembly including the overcurrent device is listed for continuous duty at 100% of its rating.

If the panelboard is supplied through a transformer, the overcurrent device for the protection of the panelboard must be located on the transformer secondary per NEC Section 384-16(e) except when the overcurrent device on the primary complies with Section 240-21(c)(1). NEC Section 240-21(c)(1) states that overcurrent devices are not required on the secondary of a single phase 2-wire or three phase, three wire, delta-delta transformer to provide conductor protection where all of the following are met:

- (1) The transformer is protected in accordance with 450-3
- (2) The overcurrent protective device on the primary of the transformer does not exceed the ampacity of the secondary conductor multiplied by the secondary to primary voltage ratio.

Note: Other assumptions for conductor protection are present in NEC Section 240-21 based upon distance.

Conclusion:

Proper panelboard protection and application is essential to electrical distribution system design. When applying panelboards be sure to note the possible requirements of 450-3 & 240-21 in addition to those found in Article 384.

For more information, consult the Bussmann SPD at <http://www.bussmann.com> or contact Bussmann Application Engineering at (636) 527-1270, (636) 527-1607 (fax), or e-mail (fusetech@buss.com).