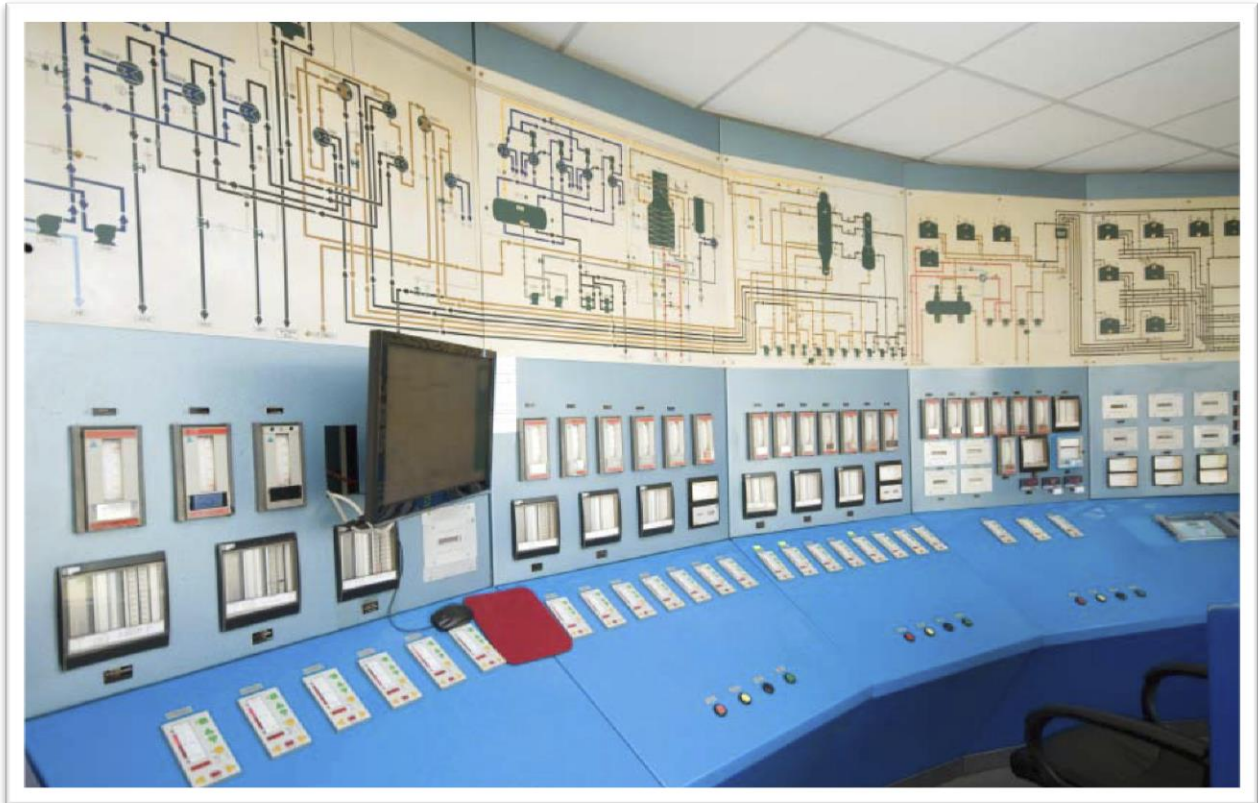


Requirements for Industrial Control Panel Safety, Effective December 20, 2014: Addressing Updates to UL 508A 2nd Edition



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Introduction

The standard for the safety of Industrial Control Panels, UL 508A, released its 2nd Edition at the end of 2013. Now, an effective date for many additions, revisions, and deletions to the standard is quickly approaching. That effective date—December 20, 2014—represents an enforceable date for requirements for the entire UL 508A 2nd Edition, including many changes that previously were unenforced. In order to stay compliant and keep production moving, Industrial Control Panel manufacturers need to be prepared.

UL 508A covers Industrial Control Panels and Industrial Panel Enclosures operating at 600 volts or less and intended for applications of general industrial use and specific use. These specific use applications can include elevator control, crane or hoist control, service equipment use, marine use, air conditioning and refrigeration equipment, as well as for control of industrial machinery and more. The UL 508A standard directs manufacturers on various issues regarding Industrial Control Panels and Industrial Panel Enclosures, including appropriate component selection, wiring methods, and calculation of Short Circuit Current Ratings (SSCR).

The standard's update addresses safety for Industrial Control Panels and Industrial Panel Enclosures, helping to ensure a certified safe environment where this type of equipment is in use. Additionally, changes in the standard can potentially help in providing better cost and time efficiencies for manufacturers in the production of Industrial Control Panels and Industrial Panel Enclosures.

Manufacturers of Industrial Control Panels and Industrial Panel Enclosures need to have a copy of the UL 508A 2nd Edition standard for reference and compliance. Additionally, this white paper includes references to tables, figures, and clauses not incorporated into this document, and in those cases, manufacturers should refer to their own copy of the standard in order to continue to be correct in their observance of its requirements.

The changes to UL 508A 2nd Edition are numerous, so to help ensure compliance with the revised standard, this white paper offers an overview of some of the major changes for this second edition, as well as includes timeline information. Please note, Industrial Control Panels can vary greatly and this paper is unable to cover all the intricacies of UL 508A, so it is highly recommended that manufacturers work with a Nationally Recognized Testing Laboratory (NRTL) partner in order to ensure optimum compliance.

Timing

The 2nd Edition update of the UL 508A standard was issued on December 20, 2013, with a revision released on January 13, 2014. As noted above, the effective date for compliance with this UL 508A 2nd Edition is December 20, 2014—a date that is imminent—and a variety of previously unenforced requirements will now be effective in order for Industrial Control Panels to be compliant.

Many manufacturers are already ensuring, completing, instituting, or working on adjustments in order to comply with the new edition of this standard, and third-party certification companies are assisting manufacturers on a case-by-case basis to ensure the compliance of all equipment governed under UL 508A. However, time is certainly of the essence here, as there is only a short window to ensure a company's production is in proper compliance in order to continue manufacturing.

Overview of Changes

While this paper does provide information on several of the changes manufacturers may need to address in order to become or stay compliant with UL 508A, it does not in any way constitute a comprehensive overview of all the additions, revisions, and deletions to the standard that become effective December 20, 2014. As one example, multiple clarifications on what the scope of UL 508A does not cover are not included in this paper. Other changes not addressed here include revisions to clauses regarding barriers and ventilation, air conditioner control panels, field wiring, branch circuit protection, overload protection of motor loads, switching devices, and individual load ratings.

For complete information on the changes to UL 508A, as well as staying efficient and compliant with all Industrial Control Panels and Industrial Panel Enclosures and their components, contact a third-party testing and certification company (see page 21).

Fountain and Irrigation System Control Panels

One of the largest changes for this 2nd Edition of UL 508A is the addition of specific use requirements for Control Panels for **Fountain Control** and **Industrial Control Panels for Irrigation Equipment**. Previously, these were regulated under the general industrial use standards. Now, Fountain Control Panels—including general information, construction, grounding, grounding–fault protection, equipotential bonding, cord strain relief, ratings and markings—are detailed in **Clauses 93–96** of UL 508A, and Irrigation Equipment Control Panel

standards are now explained in **Clauses 97–99**. These Irrigation Equipment-specific clauses address topics including general information, construction, size of motor controller, disconnecting means, branch circuit protection, internal conductors, and markings.

Transformer and Power Supply Secondary Grounding

Clause 16, which focuses on **Transformer and Power Supply Secondary Grounding** under **All Panels**, discusses how a bonding jumper is required for electrical systems that must be grounded, whether at the service or a separately derived source. The standard previously referred to both types of bonding jumper as the “main bonding jumper,” but to clarify and differentiate between bonding jumpers at the service entrance and those provided for a separately derived system, **Clause 16.2** now refers to the bonding jumper for a separately derived system as a “system bonding jumper,” and **Table 75.1** (see standard) utilizes the same terminology. Additionally, the new Exception No. 2 under Clause 16.2 and revision to **Clause 54.10**, which focuses on field wiring terminal markings, add an option for a single grounding electrode conductor terminal to be supplied to terminate a single grounding electrode conductor that serves to simplify the installation and eliminate the need for multiple grounding electrode conductor terminals where multiple derived systems are provided. Also, a new Exception under Clause 54.10 states, “When a single grounding electrode conductor terminal is supplied for multiple separately derived systems in accordance with Exception No. 2 to 16.2, the marking in 54.10 shall specify that a 3/0 AWG grounding electrode conductor is required to connect the grounded conductors of multiple separately derived systems to a grounding electrode.”

In **Clause 16.4** it is now required that ungrounded secondary circuits greater than 100 volts be provided with a means to identify when a ground fault has occurred in any of the circuit conductors. Not all secondary voltages are required to be grounded by Clause 16.1. For those systems that were ungrounded, there was no means for detecting a ground fault in the secondary circuit, and a second fault could either trip the overcurrent protection or create a parallel circuit path via conducting parts. Additionally, in **Clause 66.3.2** (which covers Industry Machinery panels), a clarification and an Exception were added. Clause 66.3.2 now states the secondary winding of not only a control transformer but also the secondary of a power supply is not required to be grounded when the secondary supplies only devices included as part of the controlled machine, not other machines or circuits, and is provided with a monitoring device. The new Exception for Clause 66.3.2 notes, “A control circuit, as described in 66.3.2, supplied from a secondary of a Class 2 transformer or Class 2 power supply is not required to be supplied with a monitoring device or a ground fault protective device.”

For **Clause 16.5** an industrial control panel that contains a transformer or power supply with a 3-phase, 4-wire delta secondary, as described in 16.1(d) (see standard), and provided with field

wiring terminals for loads to be connected between a phase and the neutral, shall comply with Clause 29.3.13. **Clause 29.3.13** states an industrial control panel constructed specifically for connection to a 3-phase, 4-wire delta supply, such as shown in Figure 75.7 and 75.8 (see standard), and provided with internal components connected between a phase and neutral, or an industrial control panel that contains a transformer or power supply with a 3-phase, 4-wire delta secondary, as described in 16.1(d), and provided with field wiring terminals for loads to be connected between a phase and the neutral, shall have the internal conductor or bus bar connected to the phase having the higher voltage to ground to be identified by the color orange at each termination point.

Identification of Grounding and Grounded Circuit Conductors and Terminals

Similar to the identification marker requirement now outlined in Clause 29.3.13, **Clause 17, Identification of Grounding and Grounded Circuit Conductors and Terminals** under **All Panels**, now includes several color identification requirements.

Clause 17.4, new **Exception No. 4** states, “Insulated conductors of a multi-conductor cable colored other than as in 17.4 (white or gray or by three continuous white strips on other than green) shall be identified at each termination point by a white marking, such as tape wrapped around the conductor.”

The new **Clause 17.5** also requires a unique identification to grounded circuit conductors that are supplied from different grounded systems. It will be effective that where more than one grounded circuit conductor is identified within an industrial control panel, each grounded circuit conductor shall:

- a) have the insulation colored white or gray or by three continuous white strips on other than green, or an outer covering identified by the color white or gray with a colored stripe other than green running along the length of the insulation; and
- b) identified by means in (a) that is different than the grounded circuit conductors of another system and no other conductors in the industrial control panel shall be so identified.

Clause 17.6 also now clarifies that a grounded circuit conductor provided as part of a flexible cord must have a means to identify the grounded circuit conductor. The new Clause 17.6 states, “A grounded circuit conductor of a flexible cord shall be identified by one of the following means:

- a) A white or gray outer finish;
- b) A braid with an outer finish colored white or gray; or
- c) A white or gray tracer woven into the braid of contrasting color and no other conductor in the cord having a tracer.”

Internal Wiring

Clause 29, Internal Wiring under **Power Circuits**, deals with some new requirements too. The new **Clause 29.3.12**, addressing wiring methods, notes that, “Unless otherwise marked, the intended phase arrangement on 3-phase horizontal and vertical buses shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the industrial control panel; and on 3-phase, 4-wire, delta-connected systems, the B phase shall be that phase having the higher voltage to ground. Where the intended bus bar phase arrangement differs from the above convention, each bus bar shall be marked to identify the intended phase at each termination point.”

A change to Clause 29.3.13 is described above in the changes to Clause 16.

Also, for **Clause 29.4.4**, regarding routing of internal wiring, the standard previously required wiring subject to movement, flexing, handling, or manipulation during its intended use or during maintenance be provided with insulation at least 1/32 inch (0.8 mm) thick where it is flexed. This requirement has been removed, which will allow the use of many additional types of insulated conductors and could reduce the bulk of bundled conductors to doors. The additional protection of the conductors, which has always been required, will now be more important if using thinner insulated conductors.

Disconnect Switches

Addressed in **Clause 30, Disconnect Switches** under **Power Circuits**, bypass circuits are commonly installed in industrial control panels containing variable speed drives. In such cases, a motor disconnect is often used to disconnect the variable speed drive while the motor is operated in bypass mode. A single set of branch circuit fuses or circuit breaker is used as the branch circuit protection for the motor circuit in either mode, with the drive controlling the motor or in bypass.

As the branch circuit protection is on the line side of the manual motor controller, the installation meets the current Clause 30.3.3 of UL 508A. However, manufacturers have questioned whether the installation still complies with 30.3.3 when the drive circuit or the variable speed drive itself contains semiconductor fuses that are fast acting under short circuit conditions and where these fuses are on the load side of the manual motor controller. UL added the new 30.3.3.1 (1st edition), now **Clause 30.3.4 (2nd edition)**, that specifically permits the installation of a manual motor controller on the line side of semiconductor fuses protecting variable speed drive circuits only when additional branch circuit protection devices are installed on the line side of the manual motor controller disconnect switch in accordance with 30.3.3. Clause 30.3.4 states, “A

manual motor controller marked, “Suitable as Motor Disconnect” is able to be installed on the line side of semiconductor fuses protecting power conversion equipment, as in 31.1.3, when separate branch circuit protective devices are also installed on the line side of the manual motor controller as in 30.3.3. In this case, the branch circuit protective devices on the line side of the manual motor controller shall comply with 31.3, as they serve as the branch circuit protection, and the semiconductor fuses are considered as supplementary protection.”

Other Circuit Components

Clause 36 looks at **Other Circuit Components** under **Power Circuits**, and under **Clause 36.3.5**, regarding surge control devices, the current requirements assume a surge arrester is installed on an electrical system that has been solidly grounded. Surge arrestors for other systems are specially designed for the purpose and are marked to indicate the system or systems on which they are intended to be installed. The addition of Clause 36.3.5 clarifies that surge arrestors supplied as part of an industrial control panel shall have been evaluated for the electrical system arrangement provided. The clause states, “A surge arrester or a transient voltage surge suppressor marked with a slash voltage rating shall only be used in a circuit where the source is solidly grounded as noted in 16.3 [see standard] when voltage is from transformer or power supply provided within the industrial control panel, or by marking the slash voltage rating on the industrial control panel nameplate in accordance with 49.6(a) [see standard], as appropriate. A surge arrester or transient voltage surge suppressor marked for use on a delta system, such as “600V delta”, can be used on either a wye or a delta system.”

Service Equipment Use

Clause 75 deals with **Construction** under **Service Equipment Use**, and Clause 75.4 focuses on disconnecting means. Clause 75.4.3 permits a maximum of six disconnecting means without exception. However, now **Clause 75.4.4** allows separate disconnecting means for transient voltage surge suppression, ground fault equipment, and the control circuit of power-operated disconnecting means to not be counted toward the total number of disconnecting means supplied with an industrial control panel. Clause 75.4.4 states, “A disconnecting means for transient surge protection, ground fault equipment, and the control circuit for power operated disconnecting means shall not be counted towards the number of disconnecting means allowed by 75.4.3.”

Also, **Clause 75.6.1**, focusing on ground-fault protection, saw changes. The original and current clause states, “A device provided for ground fault protection for equipment as required in 75.6.2 shall comply with the requirements in the Standard for Ground-Fault Sensing and Relaying Equipment, UL 1053.” New added text now states, “Circuit breakers that have been investigated to the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker

Enclosures, UL 489 and include ground-fault protection for equipment comply with this requirement.”

Short Circuit Current Ratings (SCCRs) for Industrial Control Panels

Regarding ratings, and specifically Short Circuit Current Ratings (SCCRs) of individual power circuit components, **Clause SB4.2.1** requires all power circuit components to be assigned a short circuit current rating to be used in the calculation of the panel short circuit current rating. It also provides a list of components that do not need to be assigned a SCCR. Now, Exception No. 3 has been added, which states, “Enclosure air conditioners or multimotor and combination load equipment that is cord-and-attachment-plug connected or supplied from a branch circuit protected at 60 A or less is not required to have a short circuit current rating.”

Also, **Clause SB4.2.3**, which requires devices with high-fault SCCRs to only be used with the branch circuit protection specified by the component documentation, was addressed. A new Exception No. 4 was added, which allows the use of any current-limiting overcurrent devices when the specified overcurrent device is a non-current limiting overcurrent device. The same high-fault SCCR can be assigned to the component where the interrupting rating of the current-limiting overcurrent device is equal to or greater than the specified overcurrent device.

For feeder components that limit the short circuit current available, **Clauses SB4.3.2** and **SB4.3.3** saw changes, but these were editorial in nature and clarified that branch circuit protective devices could include combination motor controllers. However, **Clause SB4.3.1** saw very significant changes for branch circuits supplied by a power transformer. The 1st Edition requirements were simplistic and only allowed the transformer branch circuit to be assigned the fault current rating of the feeder BCPDs (Branch Circuit Protective Devices) when the transformer was not more than either 10kVA or 5kVA when all components in the secondary circuit had SCCRs (short circuit current ratings) of at least 5kA or 2kA, respectively. A transformer over 10kVA was not considered to be current limiting. The new requirements (in the 2nd Edition) now allow a formula to be used to calculate the short circuit current of the secondary winding when the transformer has a marked and known impedance. Also, there are now tables that can be used to determine the worst case available short circuit secondary current for transformers from 1kVA to 75kVA when the transformer has no marked impedance or with a marked or known impedance of not less than 2.1% (see standard). Also now the interruption rating of the feeder BCPDs can be assigned to the transformer branch circuit where the short circuit and interrupting rating of all components in the secondary circuit are not less than the calculated secondary short circuit current or the corresponding available short-circuit current shown in Column 2 of the appropriate Table (see standard). This will allow some circuits with secondary components with lower SCCRs to be assigned higher SCCRs, and will allow in some

cases an increased short circuit current rating for circuits with transformers rated greater than 10kVA.

Additional information on additions, deletions, and revisions to UL 508A 2nd Edition can be found in this paper’s next section, Standard Changes: Clause by Clause Resource Guide.

Standard Changes: Clause by Clause Resource Guide

The following offers additional clause-by-clause notes on changes in the UL 508A Standard 2nd Edition that may affect various manufacturers and industry stakeholders.

Clause	Change
1.6.5	<p>Equipment intended to control the operation of pumps dispensing gasoline or other flammable liquids is covered by the Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices, UL 1238.</p> <p>The contents of this clause has been deleted (it would have been between new clauses 1.13 and 1.14). The current scope of UL 1238 does not permit assembly of equipment other than that used specifically for dispensing equipment. It is possible to have a panel that includes a subset of components for remote control of dispensing equipment in non-hazardous locations.</p>
2.17	<p>DUTY, INTERMITTENT – Operation for alternate intervals of (1) load and no load; or (2) load and rest; or (3) load, no load, and rest.</p> <p>This is a new definition for the 2nd Edition.</p>
2.23	<p>The definition of FUSE, BRANCH CIRCUIT TYPE added Class CF fuses.</p>
7.1a	<p>This clause no longer references the ANSI/NFPA 70-1999 National Electric Code. The 1999 date has been removed.</p>
16.2	<p>Revisions currently effective. Changed “main” to “system” and added Exception 2.</p> <p>A bonding jumper is required for electrical systems that must be grounded, whether at the service or a separately derived source. Currently UL 508A refers to both types of bonding jumper as the “main bonding jumper.” To clarify and</p>

	<p>differentiate between bonding jumpers at the service entrance and those provided for a separately derived system, Clause 16.2 now refers to the bonding jumper for a separately derived system as a “system bonding jumper” and Table 75.1 (see standard) utilizes the same terminology. References to the bonding jumper required at a service entrance will continue to be referred to as the “main bonding jumper.” The requirements for determining the size of a main bonding jumper and a system bonding jumper remain the same.</p>
16.4	<p>New and currently effective with standard:</p> <p>This new clause requires that ungrounded secondary circuits be provided with a means to identify when a ground fault has occurred in any of the circuit conductors.</p> <p>Currently not all secondary voltages are required to be grounded in accordance with Clause 16.1 of UL 508A. For those systems that are ungrounded, there has been no means for detecting a ground fault in the secondary circuit and a second fault could either trip overcurrent protection or create a parallel circuit path via conducting parts. This proposal is consistent with Section 250.21(B) of the 2014 National Electrical Code (NEC). Note that Clause 250.21(C) of the NEC now requires these ungrounded systems to be marked “Caution: Ungrounded System Operating — _____ Volts Between Conductors” at the source or first disconnecting means of the system. Note that this marking is not currently required in UL 508A, but should be applied to comply with the NEC.</p>
16.5	<p>Previous revision currently effective with standard:</p> <p>An industrial control panel that contains a transformer or power supply with a 3-phase, 4-wire delta secondary, as described in 16.1(d), and provided with field wiring terminals for loads to be connected between a phase and the neutral, shall comply with 29.3.13.</p>
17.4	<p>Previous addition of Exception No. 4 currently effective with standard:</p> <p>Exception No. 4: Insulated conductors of a multi-conductor cable colored other than as in clause 17.4 shall be identified at each termination point by a white marking, such as tape wrapped around the conductor.</p>
17.5	<p>New and currently effective with standard:</p> <p>Where more than one grounded circuit conductor is identified within an industrial control panel, each grounded circuit conductor shall be:</p>

	<p>a) Identified by:</p> <ul style="list-style-type: none"> 1) A means that complies with 17.4; or 2) An outer covering of white or gray with a colored stripe other than green running along the length of the insulation; and <p>b) Identified by means in (a) that is different than the grounded circuit conductors of another system and no other conductors in the industrial control panel shall be so identified.</p> <p>The new clause requires a unique identification to grounded circuit conductors that are supplied from different grounded systems. The proposed requirement is consistent with sections 200.6(D) and 200.6(E) of the 2005 National Electrical Code.</p>
17.6	<p>New and currently effective with standard:</p> <p>A grounded circuit conductor of a flexible cord shall be identified by one of the following means:</p> <ul style="list-style-type: none"> a) A white or gray outer finish; b) A braid with an outer finish colored white or gray; or c) A white or gray tracer woven into the braid of contrasting color and no other conductor in the cord having a tracer. <p>The new clause clarifies that a grounded circuit conductor provided as part of a flexible cord must have a means to identify the grounded circuit conductor. The proposed requirement is consistent with sections 200.6(C) and 400.22 of the 2005 National Electrical Code.</p>
22.1	<p>Ventilation openings less than 12 inches from a possible source of arcing require an interposing barrier between the ventilation opening and the source of arcing. The new clause has removed reference to a fuse as a possible source of arcing.</p> <p>Some constructions may be allowed to have barriers removed if they were placed there because of the presence of a fuse less than 12 inches from a ventilation opening.</p>
26.3	<p>This clause has been expanded to include air conditioners evaluated to UL 1995. Clarification on how to use the environmental ratings of an enclosure air conditioner in determining the panel rating was also added. Supplement SA also clarified that Listed UL 1995 air conditioners may be used, but neither UL 1995 nor UL 484 Recognized air conditioners may be used without further</p>

	<p>evaluation.</p> <p>26.3.1 – For air conditioners, added “or the Standard for Heating and Cooling Equipment, UL 1995.”</p> <p>26.3.2 – For an air conditioner as described in 26.3.1 that is marked with an “interface” environmental rating, such as Type 1 enclosure with Type 12 interface, the “interface” type rating marked on the component is used as the basis for compliance with Table 19.1 (see standard).</p>
<p>28.3.7</p>	<p>Addition of requirements for controllers for multi-speed and part-winding motors.</p> <p>The current requirements in UL 508A do not specifically mention part-winding motors. This interpretation clarifies the output load rating, sizing of field wiring terminals, and other related construction requirements that apply to part-winding motor circuits. These requirements are consistent with Section 430.4 of the National Electric Code.</p> <p>New 28.3.7 — Field wiring terminals intended to carry the current of a part winding motor, where half of the motor winding is energized during starting and the remaining half of the motor winding is subsequently energized for the running condition, the ampacity of the field wiring shall be:</p> <ul style="list-style-type: none"> a) In accordance with 28.3.2; and b) Based upon the FLA from the respective part or half winding being energized instead of the full motor FLA (both halves).
<p>28.3.8, 30.2.5, 31.9.1, 36.1.7, and 55.8</p>	<p>Regarding these clauses, although the addition of requirements for power factor correction circuits—where the construction is currently procedure-described—were proposed in the January 11, 2013, bulletin, the requirements were never adopted. The proposal was for new clauses 28.3.8, 30.2.5, 31.9.1, 36.1.7, and 55.8. The proposed requirements were taken from Article 460 of the National Electric Code. It is not known if these requirements will be added in the future and so for now, power factor correction circuits will continue to need to be further evaluated and described in the Listing Report.</p>
<p>29.3.12</p>	<p>New and currently effective with standard:</p> <p>Unless otherwise marked, the intended phase arrangement on 3-phase horizontal and vertical buses shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the industrial control panel; and on 3-phase, 4-wire, delta-connected systems, the B phase shall be that phase having</p>

	<p>the higher voltage to ground. Where the intended bus bar phase arrangement differs from the above convention, each bus bar shall be marked to identify the intended phase at each termination point.</p>
<p>29.3.13</p>	<p>New and currently effective with standard:</p> <p>An industrial control panel constructed specifically for connection to a 3-phase, 4-wire delta supply, such as shown in Figure 75.7 and 75.8 (see standard), and provided with internal components connected between a phase and neutral, or an industrial control panel that contains a transformer or power supply with a 3-phase, 4-wire delta secondary, as described in 16.1(d) (see standard), and provided with field wiring terminals for loads to be connected between a phase and the neutral, shall have the internal conductor or bus bar connected to the phase having the higher voltage to ground to be identified by the color orange at each termination point.</p>
<p>30.3.4</p>	<p>Previously identified as clause 30.3.3.1 and currently effective with standard:</p> <p>A manual motor controller marked, “Suitable as Motor Disconnect” is able to be installed on the line side of semiconductor fuses protecting power conversion equipment, as in clause 31.1.3, when separate branch circuit protective devices are also installed on the line side of the manual motor controller as in clause 30.3.3 (see standard). In this case, the branch circuit protective devices on the line side of the manual motor controller shall comply with clause 31.3, as they serve as the branch circuit protection, and the semiconductor fuses are considered as supplementary protection.</p> <p>Bypass circuits are commonly installed in industrial control panels containing variable speed drives. In such cases, a motor disconnect is often used to disconnect the variable speed drive while the motor is operated in bypass mode. A single set of branch circuit fuses or circuit breaker is used as the branch circuit protection for the motor circuit in either mode, with the drive controlling the motor or in bypass.</p> <p>As the branch circuit protection is on the line side of the manual motor controller, the installation meets the current 30.3.3 of UL 508A. However, manufacturers previously questioned whether the installation still complies with 30.3.3 when the drive circuit or the variable speed drive itself contains branch circuit protection type semiconductor fuses that are fast acting under short circuit conditions and where these fuses are on the load side of the manual motor controller. Manual motor controllers are normally not allowed to be</p>

	<p>installed on the line side of the branch circuit protective device. The additional clause 30.3.3.1 which is now 30.3.4 specifically permits the installation of a manual motor controller on the line side of branch circuit type semiconductor fuses protecting variable speed drive circuits only when additional branch circuit protection devices are installed on the line side of the motor disconnect switch in accordance with clause 30.3.3. This requirement is consistent with Section 430.109(A)(6) of the 2005 National Electrical Code.</p>
31.3.2	<p>Revised requirements indicate fuse or breaker rating shall be based on full-load output current rating, if a UL 508C compliant variable-speed drive controller is used, rather than the input current rating.</p> <p>Revised 31.3.2 — The branch circuit protection for a single-motor circuit provided with a variable-speed drive shall be of the type and size specified by the manufacturer’s instructions provided with the drive. When the instructions do not specify the type and size, a branch-circuit fuse or inverse-time circuit breaker shall be used and shall be sized in accordance with 31.3.1(a) based upon the full-load motor output current rating of the drive.</p>
31.3.6	<p>Revised and currently effective with standard:</p> <p>The branch circuit protective device(s) provided in an industrial control panel for a multi-speed motor having two or more windings or a part winding motor shall have:</p> <ul style="list-style-type: none"> a) Individual branch circuit protection for each winding that complies with 31.3.1 based on the full load current rating of the protected winding; or b) A single branch circuit protective device or set of branch circuit protective devices supplying all windings that complies with 31.3.1 based on the full load current rating of the smallest winding.
33.6	<p>New and currently effective with standard:</p> <p>A controller provided for a winding of a multi-speed motor or a part winding motor shall comply with 33.2.1 based on the full-load current rating of the winding.</p>
33.7	<p>New requirements added to address components provided that are configured as autotransformer- and resistor-type reduced voltage motor controllers.</p> <p>Reduced voltage starters are to be purchased as Listed assemblies rather than being built with individual components such as autotransformers and/or</p>

	<p>resistors typically with taps to achieve desired level of reduced voltage. These constructions also involve the use of two or more contactors sized per NEMA ICS2. A motor starting autotransformer or a motor starting resistor shall comply with the component requirements in Part V or Part XVII of UL 508, respectively. Also a mechanical, electrical, or electronic interlocking means must be provided between contactors that would create an overload or short circuit condition if energized simultaneously.</p> <p>New 33.7 — Autotransformer- and resistor-type reduced voltage motor controllers 33.7.1 For an autotransformer-type or resistor-type reduced voltage motor controller shall comply with the requirements in the Standard for Industrial Control Equipment, UL 508.</p>
34.1.1	<p>Revised and currently effective with standard:</p> <p>Included UL 508 Category NMFT, solid-state motor controllers, into Table SA1.1 (see standard) as suitable for motor overload protection, as some of these devices can be evaluated for suitability of providing motor overload protection. These may now be used as the required motor overload protection only if Listed and when motor overload function is described in the manufacturer's instructions.</p> <p>Revised 34.1.1 — An overload relay, including a mechanically- or electrically-operated type, a solid-state motor controller with integral overload protection, a manual motor starter, and an overload unit of a self-protected combination motor controller shall comply with the requirements in the Standard for Industrial Control Equipment, UL 508.</p>
34.3.7	<p>New and currently effective with standard:</p> <p>An overload relay shall be provided for each winding of a multi-speed motor or a part winding motor based on the full-load current rating of the winding.</p>
36.3.5	<p>New and currently effective with standard:</p> <p>A surge arrestor or a transient voltage surge suppressor marked with a slash voltage rating shall only be used in a circuit where the source is solidly grounded as noted in 16.3 when voltage is from transformer or power supply provided within the industrial control panel, or by marking the slash voltage rating on the industrial control panel nameplate in accordance with 49.6(a) (see standard), as appropriate. A surge arrestor or transient voltage surge</p>

	<p>suppressor marked for use on a delta system, such as “600V delta,” can be used on either a wye or a delta system.</p> <p>The current requirements in 36.3.4 assume that a surge arrestor is installed on an electrical system that has been solidly grounded. Surge arrestors for other systems are specially designed for the purpose and are marked to indicate the system or systems on which they are intended to be installed. This additional clause clarifies that surge arrestors supplied as part of an industrial control panel shall have been evaluated for the electrical system arrangement provided. This proposal is consistent with Section 280.4(4) and 285.3 of the 2005 National Electrical Code.</p>
40.1.5	<p>The new clause 40.1.5 requirements indicate that when overcurrent protective devices (fuse, breaker, etc.) are in a DC circuit above 32 volts, they must be evaluated to appropriate product standard and have a DC voltage rating equal to or greater than the operating circuit voltage.</p> <p>This clause, therefore, now allows the use of AC rated overcurrent protective devices in DC circuits that are rated 32 volts and less. This had previously been permitted but was not confirmed in writing in the standard.</p>
45.4.1	<p>UL 508A requires panels controlling motors to have “undervoltage protection” so that motors will not automatically restart upon resumption of power. Clients have asked what acceptable form of undervoltage protection is required. The 508A requirement is based on paragraph 7.5.3 of NFPA 79-2002, which says, “electrical equipment shall be designed to prevent automatic restart of any machine motion or cycles after power has been restored to required operating levels.” It does not specify how the undervoltage protection is achieved, so 45.4.1 has been modified to add acceptable methods requested by clients.</p> <p>Revised 45.4.1 — The control circuitry shall be arranged such that operation of motors or motor-operated appliances is not automatically re-started upon the return of power after an undervoltage condition, power failure, or motor overload relay cycling. The circuit shall directly control the motor controller, such as a 3-wire momentary push to start circuit. The use of programmable components shall be permitted to be used as part of this circuit, when the operation provides equivalent protection.</p>
50.1	<p>Revised and currently effective with standard:</p> <p>The output terminals to each individual external motor load shall be rated in</p>

	<p>volts and amperes, or volts and horsepower. When an output is rated in horsepower, the output circuit of the panel shall be evaluated based on the FLA rating from Table 50.1 and Table 50.2 (see standard). The output terminals to individual windings of a multi-speed motor or a part winding motor shall comply with this requirement for each individual winding.</p>
<p>54.10</p>	<p>Previous wording currently effective: “marked to indicate the need for connecting the secondary grounded circuit neutral conductor to a grounding electrode in accordance with existing installation requirements pertaining to separately derived systems” Revised wording indicates, “marked to identify the size of the field supplied grounding electrode conductor and the source of the separately derived system voltage.”</p> <p>Actual revisions of clause (with noted edits marked): With respect to 16.2, For an industrial control panel containing one or more grounding electrode conductor terminals required by 16.2, each grounding electrode conductor terminal shall be marked to identify the size of the intended connection for each terminal, that is, connection of a field supplied grounding electrode conductor for connecting the secondary grounded circuit conductor to a grounding electrode and the source of the separately derived system voltage.</p> <p>Added Exception No. 2: When a single grounding electrode conductor terminal is supplied for multiple separately derived systems in accordance with Exception No. 2 to 16.2, the marking in 54.10 shall specify that a 3/0 AWG grounding electrode conductor is required to connect the grounded conductors of multiple separately derived systems to a grounding electrode.</p>
<p>62.4</p>	<p>New — Type 4 or 4X enclosure/compartment that is ventilated must now also comply with 62.4 (including dust test, rod entry test and with any fan on and off.)</p> <p>In addition to complying with 62.2 and 62.3 (see standard), a Type 4 or 4X enclosure or compartment having ventilation openings shall be subjected to the indoor Circulating Dust Test, Section 8.4.2, and the Rod Entry Test, Section 8.14, in accordance with the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E. When the enclosure or compartment is provided with a fan, it shall be subjected to all environmental tests required by UL 50E, both with the fan on and with the fan off. As a result of these tests, there shall be no entry of dust into the enclosure or compartment having a Type 4 or 4X rating.</p>

66.3.2	<p>Previous revision currently effective with standard included the following: Additional wording “on the secondary of a power supply,” and Exception. Actual wording of clause: “The secondary winding of a control transformer or the secondary of a power supply is not required to be grounded, as specified in 16.1, when the secondary supplies only devices included as part of the controlled machine, not other machines or circuits, and is provided with a monitoring device that: ...” “Exception: A control circuit, as described in 66.3.2, supplied from a secondary of a Class 2 transformer or Class 2 power supply is not required to be supplied with a monitoring device or a ground fault protective device.”</p>
75.4.4	<p>New and currently effective with standard: A disconnecting means for transient surge protection, ground fault equipment, and the control circuit for power operated disconnecting means shall not be counted towards the number of disconnecting means allowed by 75.4.3.</p>
75.6.1	<p>A clarification was needed to 75.6.1 to include circuit breakers with ground-fault protection complying with UL 489. Note that the change was not reflected in Supplement SA as it should have been. Revised 75.6.1 — A device provided for ground fault protection for equipment as required in 75.6.2 shall comply with the requirements in the Standard for Ground-Fault Sensing and Relaying Equipment, UL 1053. Circuit breakers that have been investigated to the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, UL 489 and include ground-fault protection for equipment comply with this requirement.</p>
93–96	<p>New requirements for control panels intended to control permanently installed fountains or floating fountains: 93 – General 94 – Construction 95 – Ratings 96 – Markings</p>
97–99	<p>New requirements for control panels intended to control electrically operated irrigation equipment: 97 – General</p>

	98 – Construction 99 – Marking
SB4.2.1	Added Exception No. 3: Enclosure air conditioners or multimotor and combination load equipment that is cord-and-attachment-plug connected or supplied from a branch circuit protected at 60 A or less is not required to have a short circuit current rating.
SB4.2.3	Added Exception No. 4: When the specified branch circuit protection related to the high fault short-circuit current rating is a non-current limiting overcurrent device, a current-limiting overcurrent device is able to be used at the same high fault rating where the interrupting rating of the current-limiting overcurrent device is equal to or greater than the specified overcurrent device.
SB4.3.2– SB4.3.3	<p>The revisions to these clauses were editorial in nature and clarified that branch circuit protective devices could include combination motor controllers. The changes to these clauses were the same and only included SB4.3.2 below (with noted edits marked):</p> <p>a) The short-circuit current interrupting rating of the feeder circuit breaker when all of the <u>individual</u> components in the branch circuit have a short circuit current rating not less than the published peak let-through current of the circuit breaker, see Figure SB4.1, and the interrupting rating of all branch circuit protective devices or SCCR the short circuit current rating of any Type E combination motor controller on the load side are not less than the short circuit current <u>interrupting</u> rating of the feeder circuit breaker. For branch circuit protective devices not marked with an interrupting rating, <u>or combination motor controllers not marked with a short circuit current rating</u>, the values in Table SB4.1 shall be used.</p> <p>b) The smallest short-circuit current <u>interrupting</u> rating of any branch circuit protective device <u>or the short circuit current rating of any combination motor controller</u> on the load side of the feeder circuit breaker, when the conditions of SB4.3.2(a) exist except the interrupting rating of the branch circuit protective devices <u>or the short circuit current rating of any combination motor controller</u> on the load side are less than the short-circuit current <u>interrupting</u> rating of the feeder circuit breaker. For branch circuit overcurrent protective devices not marked with an interrupting rating, <u>or for combination motor controllers not marked with a short circuit current rating</u>, the values in Table SB4.1 shall be used.</p>

Becoming and Staying Compliant

In order to ensure the continued safety and efficiency of the production of Industrial Control Panels and Industrial Panel Enclosures, manufacturers must become compliant with these changes to the UL 508A 2nd Edition as soon as possible. To that end, a third-party certification company can offer the experience, resources, and engineering expertise needed to meet standard requirements for all of a manufacturer's panels and components, including basic wall- or machine-mounted panels, floor-mounted with bus bar panels, enclosures, and other specific applications.

Many third-party certifiers also offer programs with a cost-efficient, timely approach for manufacturers that custom-build or mass produce Industrial Control Panels. For example, through panel shop certification programs, compliant products can be eligible to bear [Listing Marks](#) and be featured in a [Directory of Listed Products](#). Such programs cover proper component usage, enclosure environmental ratings, and conformance to National Electric Code (NEC) and Canadian Electrical Code (CEC) standards, helping manufacturers to avoid costly delays by eliminating red-tagged panels at the job site.

For those manufacturers building a limited number of panels or that already have some in the field, third-party certifiers can make the conformity process easier by conducting field evaluations at installation sites and issuing Field Evaluated Marks. These types of evaluations can see qualified inspectors conducting unannounced on-site audits multiple times per year, during which they inspect the business's manufacturing practices and panels destined to carry a Listed Mark.

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