

**REPORT ON DISCUSSIONS
DURING UL MEETINGS
WITH ELECTRICAL INSPECTORS
AT THE
2018 IAEI SECTION MEETINGS**





March 8, 2019

TO: Attendees of Underwriters Laboratories Inc. Meetings with Electrical Inspectors at the 2018 IAEI Section Meetings

SUBJECT: Report of Meetings

Underwriters Laboratories held meetings with Electrical Inspectors during the 2018 IAEI Section Meetings. Historically, these meetings have provided for an open exchange between the electrical inspection community and UL regarding any subject of interest to authorities.

UL acknowledges the importance of this feedback. The electrical inspector is an integral part of the UL information loop. It is the inspector, who during the examination of the final installation, can judge under field conditions, the adequacy of the constructions and markings for proper installation. It is the inspector who can pass this installation information to UL for use in modifying product safety requirements.

The questions and answers in this Report present the items discussed during the meetings. This is not a verbatim transcript; only the pertinent points have been recorded. Each question has been identified with the designation of the Section meeting at which the subject was discussed.

UL appreciates all those who took the time to participate in these meetings and provided us with information important for our endeavors and goals toward public safety. I would appreciate hearing from you on any comments or suggestions you have on this Report or the UL/Inspectors meetings.

UNDERWRITERS LABORATORIES INC.

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FROM
UL MEETINGS WITH ELECTRICAL INSPECTORS
AT THE 2018
ANNUAL IAEI SECTION MEETINGS

This report contains questions and answers from the 2018 meetings. Where necessary, the answers have been expanded to include information that may not have been available during the meetings. Where specific actions have taken place in response to the Inspector's input, the status of the actions is indicated. This report may provide insights into UL's intent and efforts that are associated with the certification of electrical equipment so that it meets the purposes of the National Electrical Code® and is installable in accordance with it. The questions have been arranged by subject matter and are identified in the margin with an identifier for the IAEI Section where the question was raised.

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Regulators on the UL Web Site**

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TABLE OF CONTENTS

Topic	Page
1.0 UL Listing, Certification, and Field Evaluation Information	2
2.0 Service Equipment, Switchboards, Panelboards and Power Distribution Equipment	12
3.0 Industrial Control Equipment	15
4.0 Luminaires and Signs	18
5.0 Wiring Systems	21
6.0 Hazardous Locations and Utilization Equipment	22
7.0 Generators and Photovoltaic Equipment	25

IAEI Section Identifier Legend

- (E) Eastern Section
- (NW) Northwestern Section
- (S) Southern Section
- (SW) Southwestern Section
- (W) Western Section

1.0 UL LISTING, CERTIFICATION, AND FIELD EVALUATION INFORMATION

1.1 (SW) Q. When we find equipment with obvious defects, should we fill out the Product Incident Report (PIR) form?

A. Yes, if you find products that are UL Certified (Listed) with defects or you have other safety concerns, you can open a Product Incident Report by completing the Product Incident Report form at www.ul.com/ahjreport. Once the report is open, a member of UL's Market Surveillance department will investigate the report and take appropriate action with the manufacturer to correct the defects going forward.

Providing photos of the UL Mark, nameplate markings, and any other photos showing the specific issue in question is always helpful.

You can also contact one of the UL Regulatory Services staff members with your concerns. Contact information is provided at the front of this report.

1.2 (SW) Q. From the UL Field Evaluation (FE) deficiency stats we received, it appears that only a few states are pushing for FEs. What is the reason why some states seem to require more FEs than others?

A. As reported by AHJs in attendance, there were a number of reasons cited, including some jurisdictions where AHJs take on this responsibility themselves, competition from other FEBs, and some jurisdictions not requiring the use of listed products. Strong enforcement of the NEC and compliance with NEC Sections 90.7 and 110.3 often leads to greater demand for field evaluations.

1.3 (SW) Q. Does AC 354 accreditation cover Field Evaluation Bodies (FEB) in general or cover specific standards that the FEB is accredited for?

- A.** AC 354, Accreditation Criteria for Field Evaluation of Unlisted Equipment is a document developed by IAS (International Accreditation Services) for the accreditation of field evaluation bodies (FEB's). The "AC" portion of the document AC 354 stands for "accreditation criteria." The scope of the IAS document is as follows:

Scope: These criteria set forth the requirements for obtaining and maintaining International Accreditation Service, Inc. (IAS), Field Evaluation of Unlisted Electrical Equipment accreditation. These criteria supplement the IAS Rules of Procedure for Field Evaluation Body accreditation.

The following Standards are referenced within the AC 354 document.

Standards:

- NFPA 790, Standard for Competency of Third-Party Field Evaluation Bodies.
- NFPA 791, Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation.
- ISO/IEC Standard 17025, General requirements for the competence of testing and calibration laboratories.
- ISO/IEC Standard 17020, Conformity assessment – Requirements for the operation of various types of bodies performing inspection.
- ISO/IEC Standard 17000, Conformity assessment — Vocabulary and general principles.

The primary documents a Field Evaluation Body must meet are the NFPA 790 and NFPA 791 documents listed above.

1.4 (SW) Q. As an AHJ, how do I know what is the appropriate standard for a field evaluation? It seems that some FE's just use NFPA 79 or UL 508A.

- A.** For UL Field Evaluations, UL's practice is to notify the AHJ that we have been contracted to conduct a field evaluation prior to commencement. There are a couple of options with respect to verifying that the correct standard was selected, based on the scope of the field evaluation.

1. The link below will take you to the UL Standards catalog area. You may type in the actual standard used, open the standard and review the scope. <https://standardscatalog.ul.com/>

2. The AHJ may always contact the UL Field Evaluation team with any questions with respect to the appropriate standards, prior to conducting the evaluation, during the evaluation, or post-evaluation.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field .

1.5
(SW) **Q.** When doing a field evaluation, does UL identify any potentially noncompliant issues with the equipment that may be outside the scope of the FE? We would appreciate it if you could help identify other potential issues with the equipment.

A. Some jurisdictions want UL to limit our evaluation to only the specific unlisted or modified equipment. UL will always review the equipment based on the scope of the initial request. If, during the field evaluation, UL notes additional safety concerns that are outside the scope of our evaluation, we will notate the item(s) within our UL Field Evaluation Report under Section 5.0 or contact the AHJ directly.

Any change of project scope being requested by the AHJ prior to the evaluation or on-site are authorized by the customer.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field .

1.6
(S) **Q.** How did UL arrive at the 65% overall failure rate of performed Field Evaluations?

A. For 12 years, UL Field Evaluation Services has been keeping statistics on all field evaluations performed. From January 1, 2006 through August 15, 2018, the number of products that were found to not be in compliance with the applicable product safety standard was approximately 65%.

1.7 **Q.** Some jurisdictions permit professional engineers (PE's) to perform field evaluations, what can be done to eliminate this practice?
(S)

A. It was recommended by several AHJ's in attendance to adopt NFPA 790 (Standard for Competency of Third-Party Field Evaluation Bodies) and NFPA 791 (Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation) as an ordinance. One of the AHJ's in attendance from LA County stated that when adopting a newer version of the Code, the jurisdiction may include an ordinance stating that Field Evaluations may only be performed by a NRTL (Nationally Recognized Testing Laboratory). It was also mentioned that one may also consider identifying Field Evaluation Bodies that are accredited by ICC/IAS to AC354 (Field Evaluation of Unlisted Electrical Equipment). Additional considerations:

- NRTLs recognize that field evaluations are a subset of the listing and certification process. Without knowledge of what is required for the testing, certification and listing of equipment, it is not easy to understand how to effectively apply standards in the field. NRTLs with a strong field evaluation program are intricately linked to the engineering knowledge required to perform the testing on the equipment in the first place. PEs will more than likely not have that type of technical experience.
- Emphasize to AHJs that Field Evaluations rely heavily on hazard-based safety engineering (HBSE), which takes into account the equipment and the specifics surrounding its installation. This means not merely following the applicable standard line by line. A PE may not know when to apply HBSE, and he may not know what additional standards may be necessary to apply to a given installation.
- Require field evaluations be conducted only by entities which have a specific field evaluation program, and not just individuals with a general knowledge of engineering principles for the reasons cited above.
- There will be occasions where a field evaluation will require lab testing – what resources does a PE have to complete that testing? It would be easier for the PE to merely accept the questionable component instead of delaying the customer or being unable to fulfill the field evaluation due to limited lab resources.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field.

1.8
(S)

Q. How does UL handle energy storage system field evaluations?

A. A field evaluation on a battery-based energy storage system can be conducted to UL9540, the Standard for Energy Storage Systems and Equipment in the field under the following conditions:

- The batteries in question are UL Certified to UL1973 – The Standard for Batteries for Use in Electric Light Rail Applications and Stationary Applications (if not, additional testing will be required on the system that cannot be conducted in the field)
- The battery management system (BMS) is UL (Certified) Listed and suitable for the battery system (addressing overcharge, undercharge, overtemperature, unbalanced charging, and other potential hazards). If not, an assessment for functional safety will need to be conducted to:
 - IEC61508 (Standard for Functional Safety of Electrical/Electronic/Programmable Electronic Safety Related Systems),
 - UL991(The Standard for Tests for Safety Related Control Employing Solid-State Devices)
 - UL1998 (Standard for Software in Programmable Components)
- The inverter is UL Certified (Listed) and suitable for the particular energy storage technology.
- A risk assessment is provided on the system indicating the potential risks and how they have been addressed.

From this, an assessment is made on the battery, the DC distribution system, the inverter, enclosure, the AC distribution system, and any support circuitry (such as cooling, or fire detection/suppression). Further, testing will be conducted on the system as follows:

- Operation (temperature) test – two charge and discharge cycles underload
- Dielectric test
- Ground Continuity
- Rain test (If located outdoors)

Fire testing as noted in UL9540A ,Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems is not conducted and is noted in the report on such field evaluation. The testing would be at the discretion of the AHJ.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field.

1.9 (S) Q. Some jurisdictions are starting to see 5G small cell networks, are there requirements for Certified (Listed) products?

A. It was recommended by AHJ's in attendance to look at Chapter 8 of the NEC for assistance. Sections 800.18 and 800.170 reference that communications equipment shall be listed as being suitable for electrical connection to a communications network. UL Certifies (Lists) communications equipment under the following product categories:

- Communications Service Equipment (DUZO). The basic requirements used to investigate products in this category are ANSI/UL 497, "Protectors for Paired-Conductor Communications Circuits," UL 1459, "Telephone Equipment," and UL 1950, "Information Technology Equipment."
- Information Technology Equipment Including Electric Business Equipment (NWGQ). The basic requirements used to investigate products in this category is ANSI/UL 60950-1, "Information Technology Equipment – Safety – Part 1: General Requirements," in conjunction with ANSI/UL 60950-21, "Information Technology Equipment – Safety – Part 21: Remote Power Feeding," ANSI/UL 60950-22, "Information Technology Equipment – Safety – Part 22: Equipment to be Installed Outdoors," and/or ANSI/UL 60950-23, "Information Technology Equipment – Safety – Part 23: Large Data Storage Equipment."
- Custom-built Telecommunications Equipment (WYKM). The basic requirements used to investigate products in this category are ANSI/UL 1459, "Telephone Equipment," or ANSI/UL 60950 or ANSI/UL 60950-1, "Safety of Information Technology Equipment," and ANSI/UL 60950-21, "Safety of Information Technology Equipment – Remote Power Feeding," as appropriate.

The UL guide information and Certifications (Listings) for these products can be viewed on UL Product Spec at www.ul.com/productspec and enter [DUZO](#), [NWGQ](#) or [WYKM](#) at the category code search field. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or

www.ul.com/database and enter DUZO,NWGQ or WYKM at the keyword search.

1.10 **Q.** Can all UL Certified (Listed) electrical equipment be rebuilt or refurbished?
(E)

A. No. UL's rebuilt product certifications cover a wide range of product types but not all.
UL has established rebuilt equipment programs where requested in those categories where the rebuilder is able to demonstrate that their rebuilding process results in compliance with the most current related UL Standard. The general guide information for each UL product category with a rebuilt certification program identifies the applicable requirements and the specific marking to identify products rebuilt under the program. Only rebuilt products that bear the UL Mark together with the word "Rebuilt," "Refurbished," "Remanufactured," "Reconditioned" or "Renovated" have been investigated by UL to the applicable certification requirements.
For additional information on the UL rebuilt equipment certification program, visit [UL Rebuilt Equipment](#).

1.11 **Q.** Who, besides the Authority Having Jurisdiction (AHJ) can request a field evaluation (FE)? As an AHJ I will issue a certificate of occupancy on buildings where the equipment is not installed at the time of final inspection and the equipment is installed later. When this occurs I sometimes get Field Evaluation Reports on the equipment when it gets installed but the installers do not obtain an electrical permit.
(NW)

A. Field evaluations can be requested by anyone involved with the product, including owners, manufacturers and contractors. United States' Occupational Safety and Health Administration (OSHA) requirements mandate that all electrical equipment in the workplace be Certified (Listed) or subjected to a complete and thorough evaluation before use (29 CFR 1910.303 and 1910.399). Additionally, many cities, counties, and other municipalities, states and regions have regulations requiring building, gas fired and electrical products to be certified (listed) or evaluated.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field .

- 1.12 (W) Q. Does cutting or cross punching holes over factory punched concentric or eccentric knockouts into the top of an enclosed panelboard affect the Certification (Listing) of the enclosed panelboard? Sometimes installers will install a large opening such as a 2" hole that crosses into the existing KO's and causes the concentric rings to fall out and leave large openings in the enclosure. Installers then use items such as "4 square" blank covers to patch the top of the cabinet.
- A. When a UL Certified (Listed) product leaves the factory, the UL Mark on the product is the manufacturers attestation that the product complied with UL's requirements at the time of manufacture. If that product is modified after it leaves the factory UL no longer knows if that product complies with UL's requirements unless UL conducts a Field Evaluation to evaluate the modified product. It is the responsibility of the Authority Having Jurisdiction (AHJ) to determine the acceptability of the modification or if the modifications are significant enough to require a UL staff member to field evaluate the modified product. UL's Regulatory Services staff can assist the AHJ in making this determination. Contact information for UL's Regulatory Services staff are detailed at the beginning of this report.

An exception for a field modification authorized by UL is when the product has specific replacement markings. For example, a switchboard may have specific grounding kits added in the field. The switchboard is marked with a list of specific kit numbers that have been investigated for use in that particular switchboard. Only grounding kits that are included on the marking on the product have been investigated for use in that product.

Often it is necessary to punch a knockout into an electrical enclosure where there is none. The installation instructions for the equipment may offer guidance on where a knock out can be placed to not reduce electrical spacings and where the wire bending space has been evaluated or where knock outs can be placed to not affect the environmental rating of the enclosure. If the installation instructions do not address the knock out location, there are requirements in the NEC that address wire bending space and the proper use of UL Certified (Listed) conduit fittings may be a solution to maintain the environmental rating. If an appropriately sized punch is used to remove the existing concentric or eccentric knocks out in one piece and the punch is perfectly aligned to not damage the enclosure and not damage the

knock out rings, that would seem to achieve a clean way of removing the knock outs. However, when cross punching or cutting into existing concentric or eccentric knockouts, other issues need to be considered as well, such as the effect on structural integrity of the enclosure, restoring the enclosure over the openings to equivalent of what is required by the UL standard as well as maintaining the environmental rating and short circuit current rating of the panelboard. The holes in the enclosure may affect the ability of the panelboard enclosure to contain a fault. Under that scenario a UL field evaluation of the field modified product would be appropriate to determine compliance with UL's requirements.

For more information UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field.

- 1.13**
(W)
- Q.** Are there any repercussions for manufactures or retailers who choose to sell unlisted products? Many times consumers purchase very expensive unlisted equipment and when the AHJ asks for listing or a field evaluation they are put in a tough position.
- A.** In the United States there are no requirements for retailers to only sell products that have been Certified (Listed) for safety. UL works with many retailers who are interested in selling only certified products to verify their certification, however, it is up to the consumer to do their due diligence and source products that are compliant with the installation codes enforced in their municipality.
- 1.14**
(W)
- Q.** How does an AHJ determine if a field evaluation body (FEB) is qualified to perform a field evaluation? Can a NRTL that is only approved by OSHA to list to a small number of standards perform field evaluations on equipment that they are not approved to certify?
- A.** One method would be to select a field evaluation body (FEB) accredited by IAS (International Accreditation Service) such as UL. You can view the scope of accreditation for each IAS accredited FEB at <https://www.iasonline.org> In combination with a field evaluation organizations FEB IAS accreditation, NEC 110.3(C) requires product testing, evaluation, and listing (product certification) shall be performed by recognized qualified electrical testing laboratories. NEC 110.3(C) Inf. Note., refers to The Occupational Safety and Health

Administration (OSHA) Nationally Recognized testing Laboratory (NRTL) program to identify recognized qualified testing laboratories.

So that if a field evaluation provider is a NRTL and an IAS accredited FEB that has been accredited by both OSHA and IAS for the type of equipment that is being field evaluated then the AHJ should be confident the organization conducting that field evaluation has the technical qualifications to do so. If the FEB is not also a NRTL for the type of equipment being evaluated, there may be questions on their qualifications to field evaluate a product that they are not accredited to certify under the NRTL program.

UL has the broadest NRTL and FEB IAS accreditation. For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at (877) 854-3577, #2 or www.ul.com/field.

2.0 Service Equipment, Switchboards, Panelboards and Power Distribution Equipment

- 2.1
(E) Q. Can the project electrical engineer inspect and grant approval for field modifications made to switchgear?
- A. No.
Field modified electrical equipment should be evaluated by a Field Evaluation Body which is defined in Article 100 of the National Electrical Code (NEC). According to the NEC, a Field Evaluation Body (FEB) is *an organization or part of an organization that performs field evaluations of electrical or other equipment. [790, 2012]*.
The bracketed text after the definition refers the code reader to NFPA 790 which is the *Standard for Competency of Third-Party Field Evaluation Bodies*. NFPA 790 addresses requirements and qualifications needed for those Field Evaluation Bodies who wish to perform field evaluations.
For a field evaluation or additional information, you can call Customer Service at 1-877-854-3577 then press 2, by E-mail at FieldEvaluations@UL.com or on the Web at www.UL.com/Field.

- 2.2
(E) Q. I recently came across a UL Certified (Listed) surge protective device (SPD) with installation instructions that required conductors to be field terminated to the same lugs containing the service conductors at the automatic transfer switch (ATS). The ATS lugs were not identified as suitable for multiple conductor terminations. Wouldn't this be a code violation?
- A. If the ATS lugs are not suitable for multiple terminations, then the installation as described would conflict with NEC 110.14(A) which requires terminals that are suitable for more than one conductor to be so identified. This would also be a violation of NEC 110.3(B) as the ATS terminals were not Certified(Listed) for multiple conductor terminations.

The suitability of making additional field terminations to lugs in an ATS that are already occupied by other conductors would be based on the Certified (Listed) ATS lug markings.

The general provisions for terminals in distribution and control equipment is addressed in the UL guide information for Electrical Equipment for Use in Ordinary Locations, (AALZ), the UL guide information can be located on UL Product Spec at www.ul.com/productspec and enter [AALZ](#) at the category code search. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (AALZ) at the keyword search.

According to AALZ, under the heading of Distribution and Control Equipment Terminations, then Terminals, it states: "Product terminals, including wire connectors and terminal screws, are acceptable for connection of only one conductor, unless there is marking or a wiring diagram indicating the number of conductors which may be connected."

If the installation instructions for the SPD conflict with the applicable code, a Product Incident Report (PIR) should be submitted to generate an investigation by UL. This can be done online at Market Surveillance Report Form or www.ul.com/ahjreport and complete the form. Once the PIR is opened, UL verifies the concern, works to determine the root cause, and takes appropriate action to resolve the concern.

2.3
(NW)

Q. I was inspecting a service disconnecting means that consisted of a fused disconnect and discovered that the line terminals were not provided with barriers or finger safe guards. Does the NEC or the Product Standard require barriers such as those required for Service Panelboards, Switchboards, and Switchgear in NEC Section 408.3(A)(2)?

A. The 2017 NEC does not contain requirements for barriers to be placed over busbars or service terminals in equipment such as enclosed switches, transfer switches suitable for use as service equipment (SUSE), motor control centers (MCC's) SUSE rated etc. A first revision was created for the 2020 NEC Section 230.62(C) that would add the following requirement: "Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed is to inadvertent contact by persons or maintenance equipment while servicing load terminations."

2.4
(NW)

Q. I heard that there was a product recall for two manufacturers 30- and 60-amp safety disconnects. The manufacturers have sent out replacement and repair kits that are to be installed in the field. How does this effect the UL Certification (Listing) of the disconnects?

A. When a product bearing a UL Mark is modified after it leaves the factory, UL does not know if the product complies with the applicable requirements unless the modification has been specifically investigated by UL. The repair kits that are being sent out by the manufacturer and installed in the field would be a modification of a Certified (Listed) product. A UL field evaluation would be required to determine that the modified equipment complies with the requirements of the applicable standards.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field.

2.5
(W)

- Q.** Utilities have been using unlisted medium voltage equipment for many years. Today many large solar photovoltaic installations are using medium voltage equipment such as switchgear etc. Much of this equipment may be utility grade equipment that has been built to IEEE Standards but not certified (listed). Is there Certified (Listed) medium voltage equipment? Can uncertified (unlisted) equipment be field evaluated?
- A.** UL does Certify (List) and field evaluate uncertified (unlisted) medium voltage equipment. The certification requirements used for several of these types of equipment are IEEE standards. UL Certification (Listing) of medium voltage switchgear is not unusual, most major manufacturers of medium voltage switchgear offer UL Certified (Listed) medium voltage switchgear and other equipment.

Here is just a portion of the UL product categories that UL Certifies (Lists) medium voltage equipment under. These can be located by browsing through the [electrical lists](#) on the Product Systems or Assemblies search on UL Product Spec at www.ul.com/productspec.

- [Circuit Breakers and Metal-clad Switchgear Over 1000 Volts \(DLAH\)](#)
- [Circuit Breaker Switchgear, Metal Enclosed, Over 1000 Volts \(DLBK\)](#)
- [Switchgear Over 1000 Volts \(WVDA\)](#)
- [Switchgear, Gas Insulated Type, Over 1000 Volts \(WVEK\)](#)
- [Switchgear, Metal Enclosed, Over 1000 Volts \(WVGN\)](#)
- [Switchgear, Pad Mounted, Over 1000 Volts \(WVHN\)](#)
- [Switches, Load Interrupter and Isolating, Over 1000 Volts \(WIQG\)](#)
- [Transfer Switches \(WPTZ\)](#)
- [Automatic Transfer Switches Over 1000 Volts \(WPYC\)](#)
- [Overcurrent and Switching Devices](#)

For more information on obtaining a UL field evaluation for medium voltage products please contact UL's Customer Service at (877) 854-3577, or www.ul.com/field.

3.0 Industrial Control Equipment

3.1 (W) Q. Does UL 508A cover the equipment connected to the industrial control panel? Does the electrical inspector need to inspect the wiring between the ICP and the motors, switches control devices installed on the industrial machinery?

A. UL 508A does not cover the equipment connected to an industrial control panel. ANSI/UL 508A is the Standard for Safety for Industrial Control Panels. Industrial control panels Certified (Listed) for compliance with UL 508A are Certified (Listed) under the product category Industrial Control Panels (NITW). The UL guide information for NITW states in the General section that “ An industrial control panel does not include the controlled loads, including motors, luminaires, heaters, or utilization equipment.” Therefore, an electrical inspector needs to inspect the wiring between the industrial control panel and the motors, switches, control devices, etc. installed on the industrial machinery.

The only exception would be if the overall industrial machine that incorporated the industrial control panels was UL Certified (Listed). Then the wiring, equipment and devices connected to the integral industrial control panel would have been evaluated for compliance with the requirements used for Certification (Listing). UL does Certify (List) industrial machinery under the UL product category Factory Automation Equipment (GPNY).

The UL guide information and Certifications (Listings) for Industrial Control Panels (NITW) and Factory Automation Equipment (GPNY) can be viewed on UL Product Spec at www.ul.com/productspec and enter [NITW](#) or [GPNY](#) at the category code search. In addition, you can locate that information on the next generation of UL’s Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter NITW or GPNY at the keyword search.

3.2 (W) Q. Does UL Certify industrial machinery? Are there specific UL Standards that cover industrial machinery or does UL use NFPA 79?

A. UL does Certify (List) industrial machinery under the product category Factory Automation Equipment (GPNY). This category covers production equipment for attended and unattended assembly of products and subassemblies. This equipment is designed to be programmed for a specific manufacturing application, such as assembly of components, packaging, sorting, or counting of parts, or hole punching or cutting. The equipment may also incorporate manufacturing processes involving heating or cooling, drying, or gluing of parts.

This equipment is intended to be installed in accordance with ANSI/NFPA 79, "Electrical Standard for Industrial Machinery," and Article 670 of ANSI/NFPA 70, "National Electrical Code."

The basic requirements used to investigate products in this category are contained in UL Subject 2011, "Outline of Investigation for Factory Automation Equipment."

The UL guide information and Certifications (Listings) for GPNY can be located on UL Product Spec at www.ul.com/productspec enter [GPNY](#) at the category code search. You can also locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter GPNY at the keyword search.

In addition, UL can field evaluate industrial machinery. For more information on UL field evaluations or to obtain a quote, contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field.

3.3
(W)

Q. Does equipment installed in micro-breweries need to be listed? Can this equipment be field evaluated? How should an AHJ Approach this issue?

A. The NEC doesn't specifically address micro-breweries; however, NEC 110.3(A) requires all equipment to be evaluated for eight specific criteria, the first of which is suitability. An AHJ doesn't have the time, the expertise or the equipment to evaluate every product they inspect, so they rely on a third-party certification (Listing) as a basis for their installation approval as provided for in NEC 90.7.

It is up to the AHJ to require a Certified (Listed) product or a Field Evaluation to make their approval decision. If an AHJ isn't comfortable evaluating a product for compliance with NEC 110.3(A), then they can require a Certified (Listed) product or require the product to be Field Evaluated.

Micro-brewing equipment is similar to other industrial process equipment and UL can Certify/List this type of equipment under the product category Factory Automation Equipment (GPNY). This category covers production equipment for attended and unattended assembly of products and subassemblies. This equipment is designed to be programmed for a specific manufacturing application, such as assembly of components, packaging, sorting, or counting of parts, or hole punching or cutting. The equipment may also incorporate manufacturing processes involving heating or cooling, drying, or gluing of parts. This equipment is intended to be installed in accordance with

ANSI/NFPA 79, "Electrical Standard for Industrial Machinery," and Article 670 of ANSI/NFPA 70, "National Electrical Code."

The basic requirements used to investigate products in this category are contained in UL Subject 2011, "Outline of Investigation for Factory Automation Equipment."

The UL guide information and Certifications (Listings) for GPNY can be located on UL Product Spec at www.ul.com/productspec enter [GPNY](#) at the category code search. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter GPNY at the keyword search.

In addition, UL can field evaluate microbrewing equipment UL staff have completed many field evaluations on micro brewing equipment and commonly find discrepancies between the applicable UL Standards and the equipment being evaluated. The non-compliant discrepancies include improperly sized overcurrent protection, wiring not rated for use in the United States, incorrect wire routing, and improperly grounded components. Remember, micro-brewing Equipment is more than just a control panel. The UL Certification (Listing) Mark on an industrial control panel does not cover the entire micro-brewing equipment construction, it only covers the control panel and not what is connected to it.

For more information on UL field evaluations or to obtain a quote, please contact UL's Customer Service at 877-854-3577, #2 or www.ul.com/field .

4.0 Luminaires

4.1
(S)

Q. What Standard does UL use to evaluate horticultural luminaires?

A. The basic requirements used to investigate horticultural luminaires are contained in UL 8800, "Outline of Investigation for Horticultural Lighting Equipment." UL 8800 expands on the general safety requirements of ANSI/UL1598, [the Standard for Safety of Luminaires](#) and includes additional requirements for construction and resistance to environmental conditions for lighting structures used to position and support horticultural luminaires. Certified (Listed) luminaires for horticultural use are further evaluated for photobiological safety to verify that the light source does not pose a risk of optical injury to persons due to exposure necessary for the normal operation, maintenance and servicing of the horticultural lighting equipment.

UL Certifies (Lists) horticultural luminaires under the product category for Horticultural Luminaires (IFAU) and Horticultural Lighting Systems (HRTI). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at <http://www.ul.com/productspecproductspec> and enter [IFAU](#) or [HRTI](#) at the category code search field. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (IFAU) or (HRTI) at the keyword search.

4.2
(S)

Q. When a luminaire imported from China is listed by an NRTL other than UL, but does not comply with the NEC marking and grounding requirements, is an inspector required to approve the product installation?

A. No. The National Electrical Code (NEC) Section 410.6 requires luminaires to be listed. Additionally, NEC Section 410.42 addresses grounding of exposed conductive parts as well as Section 410.74 addresses required luminaire markings. NEC Section 110.2 states that conductors and equipment required or permitted by this Code shall be acceptable only if approved. The definition of "Approved" in NEC Article 100 states; Acceptable to the authority having jurisdiction.

Just because a product bears a NRTL listed label does not mean the AHJ must automatically approve the use and installation. The AHJ must first verify that the product has not been altered or damaged as required by NEC Section 90.7 and that it is installed and used in accordance with any instructions included in the listing or labeling as required by NEC Section 110.3(B). If an AHJ encounters a NRTL listed product that appears to be in violation of the NEC, the AHJ should contact the NRTL responsible for certifying that product to verify if that product is certified (listed) by the NRTL

and if so to what applicable safety standard. Remember, NEC Section 110.3(C) requires that product certification shall be in accordance with applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with the NEC. Once it has been determined if the product in question is certified (listed) and not a counterfeit product, now the AHJ and the NRTL can determine if the product installation is in compliance with the NEC. On the rare occasion that a NRTL listed product is installed and the installation violates the NEC, such as missing required markings, the AHJ and the NRTL may work together to achieve an acceptable solution. I know that the original question stated that this was not a UL Listed product, but at UL we have a process called a UL Product Incident Report and this provides a path for AHJ's to initiate an investigation with any UL listed product that is believed to not to be able to be installed in conformance the NEC or that it not in compliance with the applicable safety standard.

For more information regarding UL's Market Surveillance Program or to file a Product Incident Report you can go to [UL.com/customer-resources/market-surveillance-department/](https://ul.com/customer-resources/market-surveillance-department/).

- 4.3**
(S)
- Q.** There are a lot of hotel renovations occurring, are backlit mirrors required to be Certified (Listed)?
- A.** Yes, National Electrical Code (NEC) Section 410.6 requires all luminaires, lampholders, and retrofit kits to be listed. The basic standard used to evaluate these products is UL 962, "Household and Commercial Furnishings." For some LED Illuminated mirrors, the standards used to evaluate these products are UL 1598, the Standard for Safety for Luminaires and UL 8750, the Standard for Safety for Light Emitting Diode (LED) Equipment for Use in Lighting Products.

UL Certifies (Lists) illuminated mirrors under the product category for Furniture, Powered and Nonpowered (IYNE). Additionally, there are a few manufacturers of LED illuminated mirrors that are covered under product category Light-emitting-diode Surface-mounted Luminaires (IFAM). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at <http://www.ul.com/productspecproductspec> and enter [IYNE](#) or [IFAM](#) at the category code search field. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (IYNE) or (IFAM) at the keyword search.

4.4
(NW)

Q. I performed an inspection on a multifamily building where there were recessed cans installed in the fire rated floor-ceiling assembly. The cans were not Certified (Listed) for use in a rated floor-ceiling assembly and the contractor wanted to use an intumescent coating on the inside of the can to provide a fire rating. Can an intumescent coating be applied this way or are there other options for compliance?

A. No. Intumescent coatings have been investigated for use as part of a complete fire-resistance design as detailed in Fire-resistance Ratings-ANSI/UL 263 (BXUV). For an intumescent coating to be used to coat a recessed luminaire in a fire-resistant floor-ceiling assembly the Certified (Classified) fire resistance rated design would have to detail its use.

UL Certifies (Lists) intumescent coatings under product category (CDWZ) for Mastic and Intumescent Coatings located on UL Product Spec at www.ul.com/productspec and enter [CDWZ](#) at the category code search. Within the guide information for these products it indicates that mastic and intumescent coatings are investigated for use in fire-resistance designs as detailed in Fire-resistance Ratings – ANSI/UL 263 (BXUV).

A Certified (Classified) luminaire enclosure could be used to enclose the recessed luminaire provided that the enclosure and luminaire are installed in accordance with the installation instructions and the applicable UL Fire-resistance rated design.

UL Certifies (Classifies) Luminaires and Luminaire Assemblies Classified for Fire Resistance under product category (CDHW) located on UL Product Spec at www.ul.com/productspec and enter [CDHW](#) at the category code search. The guide information states that luminaire enclosures are investigated for use in fire-resistance designs as detailed in Fire-resistance ratings-ANSI/UL 263 (BXUV). The luminaires, assemblies and enclosures (in conjunction with a luminaire) are intended for recessed installation in ceilings in accordance with ANSI/NFPA 70, “National Electrical Code.” They have been shown to provide a degree of fire resistance with the floor or roof assemblies with which they have been tested.

You can also locate that information on the next generation of UL’s Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (CDWZ) or (CDHW) at the keyword search.

5.0 Wiring Systems

5.1 (NW) Q. Has Type NM-B nonmetallic sheathed cable been evaluated for use in direct contact with spray foam insulation?

A. UL Certified (Listed) nonmetallic sheathed cable (Type NM-B) has not been investigated by UL for use with spray in foam thermal insulation and it is unknown if the heat generated by the chemical reaction of the foam during the curing process will damage the conductor insulation or the cable sheath.

The cable manufacturer should be contacted regarding compatibility information.

Type NM-B cable is UL Certified (Listed) under the product category Nonmetallic Sheathed Cable (PWVX). The UL guide information and Certifications (Listing) can be viewed on UL Product Spec at www.ul.com/productspec and enter [PWVX](http://www.ul.com/productspec) at the category code search. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (PWVX) at the keyword search

6.0 Hazardous Locations and Utilization Equipment

6.1 (SW) Q. For a plant oil extraction booth, would it be marked with hazardous location Class and Division markings?

A. UL Certified oil extraction booths for use in hazardous locations, include the following required markings or equivalent:

- "Area within booth is Class I, Division 1, Group D; area outside booth around openings is Class I, Division 2, Group D for distance of 3 feet in all directions".
- "For use with listed Class I, Division 1, Group D plant oil extraction process equipment having a Temperature Class suitable for the solvent used", unless investigated otherwise.
- "See Instructions for itemized list of evaluated equipment integral to booth".
- "For indoor use only", unless investigated otherwise.
- "WARNING - Risk of Explosion. Do not operate unprotected ignition sources within or around the booth".

Regarding instructions, they include the following:

- Itemization of the electrical equipment and factory-provided interconnections for electrical equipment that were investigated.
- Itemization of the process-handling equipment that was investigated.
- Required markings as shown above, or equivalent.

Issues for consideration include fire suppression, exhaust ventilation, other ventilation, vapor detection, smoke detection, and workspace issues such as ingress and egress.

UL Certifies plant oil extraction booths under the product category for Plant Oil Extraction Booths for Use in Hazardous Locations (QMCV). The UL guide information and Certifications (Listings) can be located on UL Product Spec at www.ul.com/productspec and enter [QMCV](#) at the category code search. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (QMCV) at the keyword search

6.2 (S) Q. The NEC requires the pool water to be bonded, pool skimmers with metal plates are being installed and exposed copper wire inside the skimmer.

These are Listed by a non-UL NRTL, does the UL Standard permit exposing the copper wire directly to the pool water and will the exposed copper wire provide proper grounding and bonding?

- A.** Products intended to provide bonding of the pool water in accordance with NEC Section 680.26(C) are evaluated for compliance with UL 1081, The Standard for Safety for Swimming Pool Pumps, Filters and Chlorinators. UL 1081 requires that the wire connector shall be on the exterior surface at a point easily accessible for field connection and shall be able to accommodate an 8 AWG copper conductor.

UL Certifies (Lists) products to bond pool water under the product category for Swimming Pool and Spa Equipment, Miscellaneous (WDUT). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at <http://www.ul.com/productspecproductspec> and enter WDUT at the category code search field. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (WDUT) at the keyword search.

6.3
(E)

- Q.** Are all Class II Division 2 motors required to be marked with a "T" code?

- A.** No.

The basic hazardous (classified) locations requirements used to investigate motors for use in hazardous locations are contained in UL 1836, "Outline of Investigation for Electric Motors and Generators for Use in Class 1, Division 2 and Class II, Division 2 Hazardous (Classified) Locations. UL 1836 requires the motor nameplate to be marked with the operating-temperature code designating the maximum internal or external surface temperature determined at rated full-load steady-state conditions, if the temperature is greater than 100°C (212°F). For Class II Division 2 motors operating at 100°C or less, no temperature code marking is required. See also NEC 500.8(C)(4) exception.

In the event that an ordinary location motor without a surface temperature marking is used in a Class II Division 2 location as permitted in NEC 502.125(B), the AHJ would enforce the reference to 500.8(D)(2) and need to ask for evidence that the full load temperature does not exceed 100°C .

UL Certifies (Lists) Class II Division 2 Motors under the product category for Motors, Division 2 for Use in Hazardous Locations (PTHE). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at

www.ul.com/productspec and enter [PTHE](#) at the category code search field. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (PTHE) at the keyword search.

6.4
(W)

- Q.** Is there any documentation regarding how many air changes are required to reduce the corrosive environment found in swimming pool pump and equipment room?
- A.** Assuming the question is in relation to 2017 NEC Section 680.14 regarding Corrosive Environments, UL is not aware of a specific document that addresses the air changes that are required to reduce the corrosive environment that may be found in swimming pool pump and equipment rooms.

To improve the usability and application of the NEC, it has been proposed for the 2020 edition that the Corrosive Environment description be revised and moved to 680.2 as a definition. Below is the latest version of this proposed definition. While this does not address your question regarding air changes, we wanted to share with you this proposed update in case it provides any additional clarity for your future needs. Please note that proposals are not final/adopted until the 2020 code is published.

CORROSIVE ENVIRONMENT

Areas where pool sanitation chemicals are stored, handled, or dispensed, and confined areas under decks adjacent to such areas, as well as areas with circulation pumps, automatic chlorinators, filters, open areas under decks adjacent to or abutting the pool structure, and similar locations.

Informational Note: Sanitation chemicals and pool water are considered to pose a risk of corrosion (gradually damage or destroy materials) due to the presence of oxidizers (e.g. calcium hypochlorite, sodium hypochlorite, bromine, chlorinated isocyanurates) and chlorinating agents that release chlorine when dissolved in water. More information about swimming pool chemicals can be found on or in the following:

- (1) Environmental Protection Agency website
- (2) NFPA 400-2019, Hazardous Materials Code
- (3) Advisory: Swimming Pool Chemicals: Chlorine, OSWER 90-008.1, June 1990, available from the EPA National Service Center for Environmental Publications (NSCEP)

7.0 Generators and Photovoltaic Equipment

7.1 (E) Q. Are generator interlock kits Certified (Listed)? Does installing one violate the UL Certification (Listing) of the panelboard or enclosure?

A. Yes, generator interlock kits are Certified (Listed).

These products have specific installation instructions which must be followed to ensure that the installation of the product does not compromise the integrity of the existing deadfront.

UL Certifies (Lists) generator interlock kits under the product category for Cabinets and Cutout Boxes (CYIV). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at www.ul.com/productspec and enter [CYIV](#) at the category code search field. You can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (CYIV) at the keyword search.

7.2 (NW) Q. I was performing an inspection on a solar photovoltaic (PV) installation and saw a production meter that did not have a listing. Does UL Certify (List) production meters for PV installations?

A. The NEC doesn't specifically require meters used in PV systems to be Certified (Listed). However, to provide the additional safety requirements necessary for Certifying (Listing) electric utility meters that measure, monitor, record, transmit or receive electrical energy generation or consumption information, UL published UL 2735, the Standard for Safety for Electric Utility Meters.

This standard was developed to address problems that have been reported from field installations of smart meters, including fires, meters ejecting from meter socket bases and exposed live parts.

UL Certifies PV meters under the product category for Meters, Electric Utility, (POCZ). The UL guide information and Certifications (Listings) can be located on UL Product Spec at www.ul.com/productspec and enter [POCZ](#) at the category code search. The UL guide information for POCZ states that these meters may or may not be under the exclusive control of the serving electric utility. When not under the exclusive control of the serving electric utility, such as in sub-metering applications, these meters are intended for installation in accordance with ANSI/NFPA 70, National Electrical Code.

You can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> or www.ul.com/database and enter (POCZ) at the keyword search.

Additional information on [Smart Meters](#) can be obtained in the UL technical library by visiting www.ul.com/codeauthorities.

7.3 **Q.** Are PV modules and associated mounting racks or frames fire rated together?
(E)

- A.** Installing a PV module mounting system that has been assigned a specific fire classification with PV module types not mentioned in the installation instructions would result in a combination that has not been evaluated by UL as an overall assembly with respect to the resistance to external fire exposure.

Since there tends to be a fair bit of similarity in the construction of PV modules a "Type Test" was developed for them that subjects' modules of a standard construction to the burning brand and spread of flame from the top surface test. On successful completion of this test, they are given a "Type Designation" which is a numeral designation that specifies both the construction style and the spread of flame/burning brand results. As an example, modules very often will be marked with "Type 1" on the label.

The idea is to allow the mounting manufacturer to test their mounting system with a specific module "type" and any module of that type can then be used with it. The outcome of a mounting manufacturer's fire test with a module type is a system fire classification of "A", "B", or "C". Modules can also get a fire classification, but to do so their installation instructions need to completely specify how the module is to be mounted on the roof – and – this is often different from a specific mounting manufacturer's system, so the two are not the same.

The UL guide information for PV Modules (QIGU) states:

When applicable, modules and panels are marked "Class A," "Class B" or "Class C" to denote their resistance to external fire exposure. Modules and panels that have not been identified with respect to their resistance to external fire exposure are marked "Not Fire Rated."

The UL guide information for PV mounting systems (QIMS) states:

When applicable, PV mounting systems are marked "Class A," "Class B" or "Class C" to denote their resistance to external fire exposure when installed in combination with specific PV modules and according to the PV mounting system installation instructions.

UL Certifies (Lists) PV modules under the product category for Photovoltaic Modules and Panels (QIGU) and PV mounting racks under the product category for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels (QIMS). The UL guide information and Certifications (Listings) can be viewed on UL Product Spec at www.ul.com/productspec and enter [QIGU](#) or [QIMS](#) at the category code search. In addition, you can locate that information on the next generation of UL's Online Certifications Directory, UL Product iQ at <http://productiq.ul.com> and enter QIGU or QIMS at the keyword search.