

PROPOSED DRAFT

OF

NFPA 791

Recommended Practice and Procedures

for Unlabeled Electrical Equipment

Evaluation

2012 Edition

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NFPA 791

Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation

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Chapter 1 Administration

1.1 Scope.

1.1.1 This document covers the recommended practice for the procedures that should be utilized in evaluating unlabeled electrical equipment for compliance with nationally recognized standards and the local jurisdiction’s acceptability criteria.

1.2.1 The process detailed in this recommended practice will not result in a “listing”, “recognition”

or in a “product certification”. The only units of any equipment that will achieve an “evaluated” status are those that undergo this procedure and no assessments are made or assumed for past or future like equipment produced by the manufacturer.

1.2 Purpose.

1.2.1 The purpose of this recommended practice is to provide information on the basic evaluation process to Authorities Having Jurisdiction (AHJ) in determining the adequacy and completeness of completed evaluations and evaluation reports submitted by recognized third party evaluation providers.

1.2.2 This document provides for uniformity and consistency in the overall evaluation process used to complete evaluations and evaluation reports on unlabeled electrical equipment.

1.3 Application.

New or used electrical equipment not ‘listed’ or ‘labeled’ as a complete unit or assembly is considered to be un-evaluated by a third party and will be subject to a thorough inspection, required testing and final evaluation as required by the Authority Having Jurisdiction (AHJ). The overall evaluation of such non-labeled equipment is for the purpose of attaining an ‘approval’ of the complete installation including the subject equipment.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this document and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 70, National Electrical Code®, 2008 edition.

2.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003

2.4 References for Extracts in Mandatory Sections.

NFPA 70, National Electrical Code®, 2008 edition

Chapter 3 Definitions

3.1 General. The definitions contained within this chapter shall apply to the terms used in this document. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. Merriam-Webster's Collegiate Dictionary, 11th Edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction

3.2.2* Authority Having Jurisdiction (AHJ). The organization, office, or individual responsible for enforcing the requirement of a code or standard, or approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Recommended Practice. A document that is similar in content and structure to a code or standard but that contains only nonmandatory provisions using the word "should" to indicate recommendations in the body of the text.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.3 General Definitions.

3.3.1 Creepage Distance. Shortest distance along the surface of the insulating material between two conductive parts.

3.3.2* Critical Component(s). Electrical components or assemblies used in a power or safety circuit whose proper operation is essential to the safe performance of the system or circuit.

3.3.3 Electrical Equipment. Any device, appliance, or machine that generates, conducts, or utilizes electrical energy.

3.3.4* Emergency Stop (EStop). An emergency operation intended to switch off the supply of the electrical energy to all or part of the equipment.

3.3.5 Equipment. A general term, including material, fittings, devices, appliances, luminaries, apparatus, machinery, and the like used as part of or in connection with, an electrical installation. [70, 2008]

3.3.6* Field Evaluation. The process used for one-of-a-kind, limited production, used, or modified products that are not listed or field labeled under a full listing and certification program. The process is completed at the point of manufacturing, interim points of distribution, in the evaluating company's facilities or at the final installation site or a combination of the above.

3.3.7 Field Evaluation Body (FEB). An organization or part of an organization, that performs Field Evaluations of electrical or other equipment.

3.3.8 Identified (as applied to equipment).

Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular code requirement. [70, 2008]

3.3.9 Nationally Recognized Testing Laboratory (NRTL). An identifier used by the United States Occupational Safety and Health Administration (Fed OSHA). A NRTL is recognized by Federal OSHA to perform testing per nationally recognized standards and to certify products as stipulated in the Federal Register.

Chapter 4 Procedure Overview

4.1 Determination of Product Safety Standard. The Evaluator should determine the appropriate product safety standard that applies to the equipment to be evaluated.

4.1.1 Where no one product safety standard is applicable, a compilation of applicable parts of other product safety standards should be permitted to be used.

4.2 Evaluation Elements. All equipment evaluations involving non-labeled, used and modified equipment should comply with 4.2.1 and 4.2.2.

4.2.1 Non-Labeled, Used and Modified Equipment. Evaluation of non-labeled, used and modified equipment includes and is not be limited to the following:

- (1) Review of Equipment Drawings
- (2) Review of Nameplates and Markings
- (3) Assessment of Suitability for installation in accordance with NFPA 70, the NEC
- (4) Enclosure suitability
- (5) Environmental Suitability
- (6) Visual inspection of critical components for evidence of listing or recognition by a Nationally Recognized Testing Laboratory and correct application in accordance with the listing or recognition.
- (7) Identification and assessment of damaged Components
- (8) Equipment grounding
- (9) Clearance and creepage distances
- (10) Access and working space
- (11) Guarding of Live Parts
- (12) Wiring methods and Ratings

4.2.2 Electrical Testing. Electrical testing includes but is not limited to:

- (1) Insulation resistance
- (2) Heat rise testing
- (3) Dielectric withstand
- (4) Ground continuity test
- (5) Ground Bond Test
- (6) Leakage current tests

(7) Safety circuit functional tests including safety interlocks and emergency power off switches.

Chapter 5 Pre-Site Preparation

5.1 Pre-Site Information. The following information/material should be made available to the evaluator prior to or upon arrival on site.

5.1.1 General. The following information/material should be provided for all inspections:

- (1) Layout drawings showing components with designators that match the schematic and actual marks on the or adjacent to the components
- (2) Schematic of all the power circuits, line voltage, control, safety interlock and emergency stop
- (3) Bill of material for all critical components including certification(s)
- (4) Conditions of acceptability for any recognized components.

5.1.2 Complex Equipment. For complex equipment, at least one complete set of accurate drawings for the specific equipment to be evaluated.

5.1.3 Simple Equipment. For simple equipment one set of basic electrical schematics of the power circuits should be provided.

5.2 Used Equipment. Used equipment presents some evaluation requirements seldom encountered in new equipment. If the scope of a project involves used equipment, the following examples of commonly encountered issues and any other relevant issues should be communicated and resolved as best as possible at the beginning of the evaluation:

- (1) Damaged Components. Damaged components such as oil soaked wiring, damaged enclosures with excessive openings, damaged items such as conduit, fittings and transformers
- (2) Equipment not Suitable for Use. The equipment found not suitable for the intended use such as industrial environments with enclosures not using oil tight control devices, field modifications that differ from the original design and equipment relocated into a classification hazardous location
- (3) Absence of Drawings. Equipment drawings not available so the evaluation must produce a schematic and possibly layout drawings to complete the evaluation of the circuitry
- (4) Absence of Manufacturer or Technical Support. The manufacturer no longer exists or no longer

has the technical support for the equipment so that component certifications, drawings or other documentation not available. This may cause additional inspections and/or testing to be done to determine suitability of components or validate the design

5.3 Standard(s). The assessor should determine the appropriate standard, based on the standard's scope, for the equipment to be evaluated based on the equipment design and intended application.

5.3.1 General. Where no single standard applies to the equipment, then applicable portions of related standards for subassemblies and supplementary standards should be applied.

5.3.2 Primary Standard. The primary standard to be used should be a nationally recognized product safety standard written and maintained by a standards development organization that issues product safety standards such as Underwriters Laboratories, Factory Mutual Research Corporation and Institute of Electrical and Electronic Engineers. These standards are generally adopted by the American National Standards Institute. Supplementary standards may include ones from manufacturing organizations such as a National Electrical Manufacturers Association or general safety bodies such as the National Fire Protection Association.

5.4 Jurisdictional Notification.

The assessor should provide a notification letter to the electrical Authority Having Jurisdiction (AHJ) that the project is to commence and what evaluation company will be performing the work. Some jurisdictions might not require that such a letter be provided and in that case this item can be omitted.

Chapter 6 Construction Inspection

6.1 Construction Inspection. Perform the construction inspections using the mechanical construction sections of the standard or standard(s) as the guide for this part. This part would include evaluation of the components and markings such as the following examples:

- (1) Nameplate is complete including the applicable information based on the standard and the NEC
- (2) Provisions for mounting in accordance with the NEC
- (3) Installation instruction showing raceway entry points, supply conductor wiring methods, supply conductor types, field wiring torque values, and installer supplied overcurrent protection
- (4) Adequate wire bending space is provided for all field wiring (power supply conductors, load conductors leaving enclosure, control, signaling and data) in accordance with the standard and the NEC.

6.2 Construction of Enclosures. Inspect enclosure construction including but not limited to the

following:

- (1) Suitable construction materials, metallic or non-metallic
- (2) Listed and labeled for the intended environment or evaluated for the intended environment as part of the project
- (3) Corrosion protection of internal and external parts
- (4) Hinged doors open at least 90 degrees
- (5) Proper door bonding for hinged doors that have electrical equipment mounted on the door
- (6) No access to live parts through any opening in the enclosure walls or ventilation openings

6.3 Disconnecting Means. A lockable disconnecting means should be provided.

6.4 Main Overcurrent Protection Device (OCPD). Main overcurrent protection should be either supplied internally or specified by the installation instructions.

6.5 Field Terminations. The line conductor connection point should be clearly identified.

6.6 Components. Inspect components including but not limited to the following:

- (1) Match the bill of material or create one from inventory of equipment
- (2) Critical components are to be listed or recognized and labeled by a Nationally Recognized Testing Laboratory
- (3) Critical components are to be used in accordance with their listing or the “conditions of acceptability” that is part of the component’s recognition.
- (4) Components are properly mounted
- (5) Adequate spacing is provided around components for mounting, termination and heat dissipation under maximum designed loading

6.7 Overcurrent Protection. Inspect overcurrent protection including but not limited to the following:

- (1) Proper protection of conductors per the conductor ampacity
- (2) Power supplies including power supplies for PLCs and computers
- (3) Transformers for power and control

- (4) Inspect motors for proper overcurrent protection including to ensure that short circuit, ground fault, and overload protection is provided and properly rated
- (5) Maintenance receptacle overcurrent protection provided.
- (6) Heater loads have proper overcurrent protection
- (7) Plug strips and portable power taps have proper protection

6.8 Maintenance Receptacles and Lighting. Inspect maintenance receptacles and lighting for the following:

- (1) Separate circuit(s) identified
- (2) Class A GFCI protection as applicable

6.9 Wiring. Inspect wiring for the following:

- (1) Correct color code or other identification used. Where color is used, the grounded (neutral) and grounding (equipment grounding and bonding) conductors have specified colors
- (2) Insulation types rated for the application and intended environment
- (3) Conductor temperature ratings adequate
- (4) Ampacity for load served and overcurrent protection provided
- (5) Flame rating of VW-1 or equivalent on insulation
- (6) Proper use of flexible cords
- (7) Proper use and physical protection of flexible cables
- (8) Separation of low energy circuits from power circuits

6.10 Markings. Inspect markings for the following:

- (1) Access warnings for shock hazard
- (2) Multiple source warnings
- (3) Environmental restrictions such as “Indoor Use Only”
- (4) Field wiring type such as “Copper Conductors Only”
- (5) Component designations that match the layout and schematic drawings
- (6) Control device functional identification

(7) Equipment grounding terminal marking

6.11 Grounding. Inspect for the following grounding/bonding provisions:

- (1) Ensure that there is a provision for terminating the supply equipment grounding conductor
- (2) One conductor per terminal for all equipment grounding conductors in ground fault paths
- (3) Equipment grounding conductors are properly identified by color coding (green or green with one or more yellow stripes) or by other suitable markings
- (4) All conductive enclosure doors and panels are properly bonded

Chapter 7 Electrical Testing

7.1 Application.

7.1.1 The electrical testing program should follow as closely as practical the requirement of the applicable standard, taking into consideration the limits of the non-laboratory setting and specific electrical-mechanical requirements of the equipment being evaluated to perform its stated design function after the testing in accordance with the following:

- (1) Insulation resistance test on power circuit with all sensitive electronic components such as line filters and Rf filters disconnected
- (2) Ground continuity of bonded parts to supply equipment grounding conductor termination point
- (3) Measure the input voltage while under maximum design load
- (4) Measure the input full load current while at the maximum design load normal operation
- (5) Temperature rise testing of terminals, heat producing devices (transformers, power supplies, coils, heaters) and components that could be affected by an elevated ambient caused by other heat producing components
- (6) Safety interlock circuit function testing
- (7) Emergency stop

7.2 Electrical Tests.

7.2.1 The following electrical tests should be completed as required by the applicable product standard where identified as production or routine tests:

- (1) Leakage current on cord and plug connected equipment
- (2) Dielectric withstand (hi-pot) on power circuits

(3) Other production tests

Chapter 8 Reporting and Documentation

8.1 Report. Each project should have a complete engineering report written that documents the evaluation process and the evaluation results.

8.1.1 The report could be completed in stages in accordance with the following:

- (1) A preliminary assessment or discrepancy report where the client needs to resolve issues before the evaluation can proceed
- (2) When the remediation of unacceptable issues is complete, a final written report should be prepared, reviewed and issued to the client

8.1.2 A copy should be provided to the Authority Having Jurisdiction.

8.1.3 Engineering Report Documentation.

8.1.3.1 Title Page. The title page should include the following items:

- (1) The identification of the company performing the evaluation, which can be accomplished by the use of letterhead paper or printing the company's letterhead at the top of the field report form
- (2) The descriptive nomenclature of the equipment that was evaluated
- (3) The actual facility name and full address and specific location where the equipment installation takes place
- (4) The name and full address of the jurisdiction that has inspection responsibility over the final installation site
- (5) Date the report was prepared
- (6) The project number or identifier
- (7) The signature and title of the person preparing the report, typically the evaluator
- (8) The signature and title of the person performing the technical review

8.1.4 Summary. The report contents should include a summary containing the following information:

- (1) The individual that initiated the project and company affiliation

- (2) The location of the preliminary inspection
- (3) The location of the final inspection and testing if different from the preliminary site location
- (4) Name(s) of the evaluator(s)
- (5) The date(s) of the preliminary inspection
- (6) The date of the final inspection, testing, evaluation and application of the label
- (7) A summary statement of the findings
- (8) The name of the authority having jurisdiction responsible for the final approval

8.1.5* Conditions of Acceptability. A statement or series of statements establishing specific conditions of acceptability to be adhered to in order to maintain the label as valid.

8.1.6 Standards. List the complete citations of the primary and any contributing support standards used to complete the evaluation.

8.1.6.1 The citation should be complete enough that any subsequent audit can clearly identify the exact edition, and revision of the standard(s) used.

8.1.7 Equipment Identification and Nameplate. The equipment nameplate information should be clearly documented for each manufactured unit that was evaluated as follows:

- (1) Product name
- (2) Product manufacturer's name
- (3) Model identification
- (4) Serial number for each unit evaluated
- (5) Electrical ratings
- (6) Mechanical ratings as applicable
- (7) FEB label serial number

8.1.8 Evaluation Procedures. Document the detailed procedures used to inspect, test, and evaluate the product.

8.1.8.1 The evaluation procedures should be separated into the major category areas as detailed in chapters 6 and 7 of this document with sufficient explanation for clear understanding to all parties

involved – client, authority having jurisdiction and the end user.

8.1.9 Evaluation. The evaluation section includes the following:

- (1) A brief product description of the equipment function and its intended operation
- (2) Construction evaluation results found acceptable from chapter 6
- (3) Electrical testing results found acceptable from chapter 7
- (4) Discrepancies for each item found nonconforming including a description of the nonconformance, explanation of the hazards, the standards citation, the remedial action to resolve the nonconformance and final resolution
- (5) Test instrumentation calibration information

8.1.10 Appendices or Attachments. The following details could be included as appendices or attachments:

- (1) Reference drawings used for the evaluation
- (2) Data sheet(s) documenting the test results from each of the electrical tests
- (3) The bill of material (Critical Components list)
- (4) Photographs of the discrepancies found, the resolution and the overall equipment
- (5) Field notes, checklists or other supporting data that would benefit the client.

Chapter 9 Field Evaluation Body (FEB) Label

9.1 Label Application.

9.1.1 When all identified issues are fully resolved, all electrical testing is satisfactorily completed and the evaluation has determined the equipment meets the applicable requirements of the standard(s), then a label is to be affixed to the equipment.

9.1.2 Label Contents.

9.1.2.1 The label should contain the registration mark of the evaluation company.

9.1.2.2 The label should have some means of unique identification or serialization.

9.1.2.3 The label should have a means to identify if the equipment has more than one major assembly and therefore has more than one serialized label applied.

9.1.2.4 The label used should clearly differentiate the field evaluation from the “listing” or “recognition” of components.

9.1.3 Label Location.

9.1.3.1 The evaluation label should be in the area of the equipment nameplate. Consideration should be given if expected environmental or operating conditions could cause deterioration of the label.

9.1.4 Label Control.

9.1.4.1 The label should be applied exclusively by the FEB.

9.1.4.2 The label should not be handled by anyone other than the FEB.

9.1.4.3 In no case is a label to be applied to a product that has not been evaluated by the FEB. See Annex B for the process for multiple units.

9.1.4.4 The evaluator should enter the label serial number(s) into the field data work sheets. The label information should be finally recorded in the report and into a label control system set up by the FEB.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department;

building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Critical Component(s). Electrical components or assemblies including but not limited to the following:

- (1) All electrical components acting as protective device to interrupt current in an abnormal condition such as circuit breakers, circuit protectors, fuses, overload or thermal relays.
- (2) All components and wiring for the emergency stop system including power supply, emergency stop contactor or interrupting device and pushbuttons.
- (3) All hardware or firmware components and wiring for safety interlock circuits.
- (4) All devices that are in an area that is classified as a Hazardous Location must have the appropriate rating for the area such as Class 1 Division 1 or Class 1 Division 2 unless listed as intrinsically safe.
- (5) Those components that upon evaluation present a risk of fire or shock in their use or application.

Note, it is possible and understood that like components can exist on equipment where one is required to be approved (listed) since it is used in a safety circuit or other as described above, and the other is not used in such a circuit. In these cases like components will be treated differently.

A.3.3.4 Emergency Stop (EStop). In this document, the term Emergency Stop includes, but is not limited to the following industry recognized terms: Emergency Power Off (EPO), Emergency Machine Off (EMO), all of which can be configured as Category 0, Category 1 and/or Category 2 stop function.

Numerous variations of devices perform the emergency/safety function of disconnecting electrical energy to all or part of equipment using electromechanical or solid state components. There are

various types of control actuator switches used that range in scope from push button maintained contact latching function, momentary contact action for control sequence interlock, specialized interface with life safety monitoring equipment and computerized logic control programs.

A.3.3.6 Field Evaluation. The field evaluation process is an alternate to the typical requirements for a manufacturer's quality assurance program and the laboratory follow-up program corroborating the listings. If the manufacturer chooses to apply labels, the manufacturer should be directed to complete an application for the equipment with a requisite follow-up program established.

A.8.1.5 Conditions of Acceptability. For example, the equipment should be suitable for an indoor dry location only, or the equipment is stated by note as being suitable only for installation in a hazardous location.

Annex B Multiple Units of Same Equipment

Annex B is not a part of the recommendations of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

B.1 Introduction. There are cases where multiple units of the same equipment are evaluated. In that case at least one unit will be completely evaluated according to this procedure and be labeled.

B.1.1 The following procedures are not intended for use for "lot" inspection or evaluations. The remaining units can be assessed in one of the methods shown in B.1.1.1 through B.1.1.3.

B.1.1.1 Each additional unit is to be inspected, tested, and evaluated by the evaluation firm as needed to insure each unit is built the same as the "accepted" prototype unit. This process will result in an issuance of evaluation label on each subsequent unit and the evaluation company becomes in essence the manufacturer's quality assurance inspectors.

B.1.1.2 With prior AHJ approval, the process has the first unit evaluated as above, then a representative sampling of additional units are inspected to determine with a reasonable degree of assurance that all the remaining units are constructed the same as the "accepted" prototype. Only the units that were examined by the evaluator will have a label applied. Sample quantities should be determined by a standard such as ASQ Z1.4 "Sampling Procedures and Tables for Inspection by Attributes".

B.1.1.3 With prior AHJ approval, the prototype is evaluated and the manufacturer declares that all the remaining units are constructed to the same standard as the "accepted prototype". The evaluation company will only label the prototype and will not extend label coverage to any other units. With the labeled unit and the declaration from the manufacturer, the AHJ completes the approval of the installation.

Annex C Informational References

Annex C is not a part of the recommendations of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

C.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this Code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

C.1.1 Other Publications.

C.1.1.1 ASQ Publications. American Society for Quality, PO Box 3005, Milwaukee, WI, 53201-3005

ASQ Z1.4 *Sampling Procedures and Tables for Inspection by Attributes*, 2008