



Member of the FM Global Group

**Examination Standard
for
Public Mode Visible Signaling
Appliances for
Automatic Fire Alarm
Signaling**

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for public mode visible signaling appliances for automatic fire alarm signaling.
- 1.1.2 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard describes performance requirements for public mode visible signaling appliances (hereafter referred to as appliances), such as high intensity strobes, used for automatic fire alarm signaling for the visible notification of indoor building occupants by the distribution of light by indirect visible signaling.
- 1.2.2 Certification criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program. Evaluation for environmental or hazardous location ratings will require additional examination per other standards such as Examination Standard 3600 — *Electrical Equipment for Use in Hazardous (Classified) Locations*.
- 1.2.3 Other types of commercially available appliances (such as outdoor direct viewing strobes) may not be applicable to the test protocol described in this document.
- 1.2.4 These appliances are intended to be installed in accordance with the manufacturer's installation instructions and in accordance with ANSI/NFPA 72, *National Fire Alarm & Signaling Code* and in a manner acceptable to the local Authority Having Jurisdiction.
- 1.2.5 These requirements cover visual emergency-signaling devices (notification appliances), which can be used with or without audible emergency-signaling devices (notification appliances). These devices are to be used in accordance with the requirements of the ANSI/NFPA 72, *National Fire Alarm & Signaling Code*.
- 1.2.6 This standard evaluates visible signaling appliances for public mode operation. These appliances are designed to alert occupants or inhabitants within the protected area. The requirements in this standard do not cover appliances intended for private mode fire alarm signaling, lights intended for non-fire-alarm signaling applications, manual boxes, automatic fire detectors, or other initiating devices; nor do they cover audible notification appliances such as bells, horns and speakers.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing and/or the standards of other organizations. Advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of electrically powered high intensity strobes for the purpose of obtaining certification. Appliances having characteristics not anticipated by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.4.1 Examination and tests on production samples shall be performed to evaluate

- the suitability of the product;
- the performance of the product as specified by the manufacturer and required for certification;
- the durability and reliability of the product.

1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be conducted to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/ IEEE/ ASTM SI 10.

1.8 Normative References

The following referenced documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

ANSI/IEEE/ASTM SI 10 *American National Standard for Metric Practice*
NEMA 250 *Enclosures for Electrical Equipment*
ANSI/IEC 60529 *Degrees of Protection provided by Enclosures (IP Code)*

ANSI/NFPA 72 *National Fire Alarm & Signaling Code*
 ANSI/UL 1971-2013 *Signaling Devices for Hearing Impaired*
 ANSI/UL 864, 10th Edition *Control Units and Accessories for Fire Alarm Systems*

1.9 Definitions

For purposes of this standard, the following terms apply:

Candela – The light output of a flashing strobe is measured with an integration radiometer and the summation of light intensity over time (I_{dt}) is used in the following equation to determine the effective light intensity. The candela (Cd) value assigned to a flashing light is calculated and corresponds to the same value of candela of a fixed light operating under identical conditions of observation, color, size, and shape:

$$Cd = (I_{dt}) / (0.2 + t_2 - t_1)$$

in which:

I_{dt} is the measured lumens recorded by the radiometer over time for ten consecutive pulses;

0.2 is two-tenths of one second, the value which represents nighttime threshold effective illumination as specified in the *Illuminating Engineering Society Handbook, 5th Edition*; and

t₂ – t₁ represents the time period of the light pulse.

Critical Angle – The five-degree (5°) dispersion angle that has the lowest ratio of measured light output to minimum required light output for all five-degree increments within the plane of measurement. This angle is identified by comparison of all ratios of measurements obtained within the plane during the Signal Strength and Field of View Test, Section 4.1. All ratios of measured light to required minimum light shall be equal to or greater than 1. For example:

$$\text{Ratio} = \text{Measured light} / \text{Minimum required light}$$

$$15 \text{ Cd} / 12 \text{ Cd}$$

$$5/4 = 1.25$$

Regulated Appliance – An appliance of which an operational range and limits were verified and defined.

Special Application Appliance – An appliance of which its tested operational range does not meet the limitation of a regulated appliance.

Duty Cycle - The percentage of time within a light source's flash cycle that the light can be 10% of the maximum light output. The NFPA (2014) requirements for visual alarms stipulate a maximum pulse duration of 0.2 s; in conjunction with a maximum allowable frequency of 2 Hz, this means that the duty cycle can be as high as 40%.

2 GENERAL INFORMATION

2.1 Product Information

A visual notification appliance is a fire alarm system component such as a strobe or combination of a strobe light and an audio appliance such as bell, horn or speaker that provides a visual output actuated by an alarm signaling and/or fire extinguishing systems for the purpose of evacuation or relocation of the occupants or for providing information to occupants or staff.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures, and
- The number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing based on the following:

- For functional testing described below, the manufacturer must provide a minimum quantity of 2 of each visual only appliance and/or combination which are deemed to be representative of the manufacturer's normal production with regard to construction and calibration.
- Sample requirements to be determined by the certification agency

2.3.2 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.3.3 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of the certification agency.

2.3.4 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the appliances.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

3.3.1 During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the ease and practicality of installation and use. The certification investigation shall define the limits of the certification.

3.2 Physical or Structural Features

- 3.2.1 Appliances shall be mounted independently of their attachments to the circuit conductors and in accordance with the manufacturer's instructions.
- 3.2.2 The appliance shall be capable of withstanding the abuse of normal handling and installation.
- 3.2.3 Appliances intended for use in special environments, outdoors, high or low temperatures, high humidity, dusty conditions and hazardous locations shall have a housing that adequately protects against the conditions of expected services.
- 3.2.4 Appliances intended for use in hazardous locations shall comply with certification requirements for hazardous location electrical equipment in addition to this standard.
- 3.2.5 The appliance and enclosure shall be suitable for the intended environmental exposures as determined by testing in accordance with acceptable national, regional, or international electrical codes.
- 3.2.6 The unit shall accommodate secure wiring methods in accordance with NFPA 72.
- 3.2.7 Appliances rated at or above 30 V ac and 60 V dc require a proper ground terminal to be provided.
- 3.2.8 A terminal or lead shall be provided on each notification appliance circuit provided that the design and construction of the terminal does not permit an uninsulated section of a single conductor to be looped around the terminal and serve as two separate connections, thereby precluding supervision of the connection in the event that the wire becomes dislodged from under the terminal. A notched clamping plate under a single mounting screw is acceptable, only if separate conductors of an indicating circuit are intended to be inserted in each notch. This arrangement shall be supplemented by the following additional marking in the wiring area or on the installation wiring diagram specifying the intended connection to the terminals: "USE BOTH TERMINALS (OR LEADS) FOR CONNECTION, BREAK WIRE RUN TO PROVIDE ELECTRICAL SUPERVISION."

3.3 Markings

3.3.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer;
- date of manufacture or code traceable to date of manufacture or lot identification;
- model number, operating voltage, candela and electrical rating and temperature rating;
- special conditions, as applicable (Hazardous location rating, NEMA)

When hazard warnings are needed, the markings shall be universally recognizable.

3.3.2 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the certification agency's mark of conformity.

3.3.3 The certification agency's mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

3.3.4 All markings shall be legible and durable.

3.4 Manufacturer's Installation and Operation Instructions

3.4.1 The manufacturer shall:

- prepare instructions for the installation, maintenance, and operation of the product;
- provide facilities for repair of the product and supply replacement parts, if applicable; and
- provide services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be reasonable to expect the average user to be able to provide such installation, inspection, or maintenance.

3.5 Calibration

3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.

3.5.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of this equipment.

3.6 Sample Requirements

Test description	Sample allotment: 8 samples	
General Measurement Tests	Samples 1 & 2	
Light Pulse Measurements	Samples 1 & 2	
Voltage Variations	Samples 1 & 2	Signal Strength Test required
Continued Operation	Samples 7 & 8	Post Signal Strength Test required
Temperature and Humidity Extremes	Samples 5 & 6	Post Dielectric Voltage-Withstand and Signal Strength Tests required
Jarring	Samples 1 & 2	Post Signal Strength and Field of View Test required
Dielectric Strength	Samples 5 & 6	
Bonding	Samples 7 & 8	
Surge Transient Tests	Samples 3 & 4	Post Signal Strength Test required
Enclosure Requirements (including Plastic housings)	Samples 5 & 6	

4. PERFORMANCE REQUIREMENTS

4.1 General Measurement Tests

4.1.1 Requirements

Visible Alarm signaling appliance shall be subject to applicable general measurement test (performance tests) specified in ANSI/UL 1971-2008 – Signaling Devices for Hearing Impaired Standard.

4.1.2 Test/Verification

All performance measurements tests shall be conducted in accordance with ANSI/UL 1971-2013 – Signaling Devices for Hearing Impaired Standard.

4.1.3 Required Tests

1. Signal Strength and Field of View Tests – *Chapter 27.1, ANSI/UL 1971-2013*
2. Light Output Measurements – *Chapter 27.2, ANSI/UL 1971-2013*
3. Quadrant Vector Alignment – *Chapter 27.4, ANSI/UL 1971-2013*

4.2 Light Pulse Measurements

4.2.1 Requirement [“regulated” appliance]

The appliance flash rate shall not exceed two flashes per second (2 Hz) nor be less than one flash every second (1 Hz) throughout the listed voltage range of the appliance.

Maximum pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent.

The light source color shall be clear or nominal white and shall not exceed 1000 cd (effective intensity).

For a “regulated” appliance the peak of the initial surge current shall not exceed 10 times the operating RMS current rating.

The methods for measuring current, rate, duration and intensity shall be as described below.

4.2.2 Requirement [“special application” appliance]

For a “special application” appliance the operating RMS current, RMS surge currents, peak of the surge currents, and the time frame of the surge current time window shall be within the limits specified by the manufacturer over the voltage range of the appliance. The methods for measuring current shall be as described below.

4.2.3 Test/Verification

The current measurements are to be recorded with an RMS voltage meter or any other RMS measurement capable device. The maximum RMS current value obtained from the measurement over the rated DC or FWR voltage range shall not exceed the marked rating of each visual signaling appliance tested. The pulse duration shall be defined as the time interval between initial and final points of 10 percent of maximum signal. The maximum pulse duration of 0.2 s in conjunction with a maximum allowable frequency of 2 Hz, defines the duty cycle not exceeding 40%.

The pulse waveform parameters shall be verified using a light sensitive electronic device, such as a photo diode in conjunction with an oscilloscope. The sensing device shall be chosen so that the response time is insignificant (<1%) compared to the light pattern period.

4.3 Voltage Variations

4.3.1 Requirement

The appliance shall operate between 85% and 110% of rated input voltage. If a specific operating voltage range is identified by the manufacturer beyond the 85% to 110% of nominal, then the unit shall be tested at the extremes of that range.

4.3.2 Test/Verification

Each appliance sample shall be subjected to a light output test as described in 4.2 while the input power to each unit is varied from 85% to 110% of its rated input voltage, or at the extremes of the operating voltage range as described by the manufacturer. While at described voltages, the test samples shall comply with the requirements in the Signal Strength Test, Section 4.1. The signal strength is to be measured on-axis.

4.4 Continued Operation

4.4.1 Requirement

The appliance shall operate properly during and after 24 hours continuous operation at any selected voltage between 85% and 110% of nominal, or the manufacturer's range (whichever is wider).

4.4.2 Test/Verification

During this test, the input operating voltage is to be adjusted to rated voltage and any load that is intended to be used with the device is to be connected during the continued operation. Upon completion of this test, the test samples shall comply with the requirements in the Signal Strength Test, Section 4.1. The signal strength is to be measured on-axis.

4.5 Temperature and Humidity Extremes

4.5.1 Requirement

Following exposure to temperature extremes described below, the test samples shall comply with the requirements in the Signal Strength Test, Section 4.1. The appliance signal strength is to be measured on-axis and one or more critical angles.

4.5.2 Test/Verification

4.5.2.1 For indoor applications, the appliance (two samples) shall be exposed to minimum limits of 32° and 120°F (0° and 49°C) for a period of at least 24 hours at each limit. For outdoor applications, the appliance (two samples) shall be exposed to minimum limits of -40° to 120°F (-40° to 49°C) for at least 24 hours at each limit. The appliance is then to be operated at the test temperature while connected to a rated source of voltage and frequency. Following the exposure, the test samples shall comply with the requirements in the Signal Strength Test, Section 4.1. The appliance signal strength is to be measured on-axis.

4.5.2.2 In addition to the temperatures identified in Section 4.5.2.1, the appliance (two samples) shall be exposed to 100°F (38°C) @ 90% Relative Humidity for a period of at least 24 hours. The appliance is to be operated at the test temperature while connected to a rated source of voltage and frequency. Immediately after exposure to the above ambient condition, the samples are to be removed from the test ambient and subjected to the Dielectric Voltage-Withstand Test, Section 4.7.1.

Note: APPLIANCES INTENDED FOR USE AT HIGHER OR LOWER TEMPERATURES THAN THOSE SHOWN ABOVE SHALL BE TESTED AT THE SPECIFIED TEMPERATURE EXTREMES AND SPECIALLY MARKED FOR USE AT THE

SPECIFIED TEMPERATURES.

4.6 Jarring

4.6.1 Requirement

The appliance assembly (one sample), including housing and mounting hardware, shall withstand the jarring resulting from an impact as might be expected during normal installation.

4.6.2 Test/Verification

When energized at its rated voltage and mounted in its intended orientation, the appliance shall be subjected to a 3 foot-pound (4.08 Joules) impact.

The appliance under test shall be mounted in its intended orientation to a 3/4 in. (19.1 mm) thick plywood board measuring 6 by 4 ft (1.8 by 1.2 m) secured in place at four corners. The sample shall be subjected to a 3 foot-pound (4.08 joule) impact applied to the reverse side of this board via a 1.18 pound (0.54 kg), 2 inch (50.8 mm) diameter steel sphere swung through an arc (or dropped) from a height of 2.54 ft (775 mm), depending on the mounting for the equipment. See Figures 1 and 2.

There shall be no loosening of parts or permanent deformation as a result of this test. Following the impact, the test sample shall comply with the requirements in the Signal Strength and Field of View Test, Section 4.1. The appliance signal strength is to be measured on-axis and one or more critical angles.

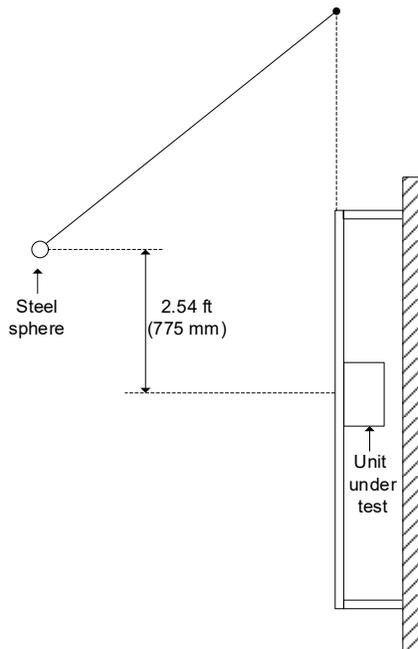


Figure 1 - Vertically Mounted Equipment

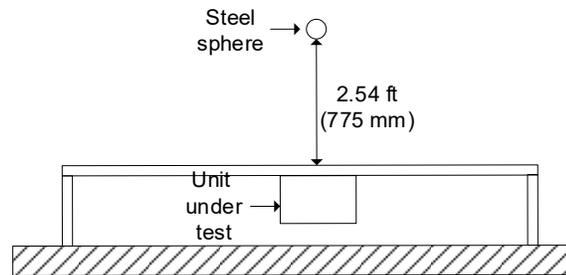


Figure 2 - Horizontally Mounted Equipment

4.7 Dielectric Strength

4.7.1 Requirement

The appliance shall provide the required degree of protection from electrical shock.

4.7.2 Test/Verification

Within one hour following the humidity conditioning described in Section 4.5, a sample appliance shall successfully withstand for one minute a 60 Hz dielectric strength test of 1000 V ac plus twice the maximum rated voltage. Appliances for which voltage ratings are less than 30 V ac or 60 V dc shall successfully withstand 500 V ac or 710 V dc for one minute. The dielectric strength test shall be conducted between all applicable combinations of the following: power supply conductors, notification circuit conductors, ground connection, other output conductors, and appliance body. There must be no indication of a dielectric breakdown or leakage current greater than 0.5mA during the one-minute test exposure.

4.8 Bonding

4.8.1 Requirement

Any accessible conductive surface which is likely to become energized in the event of a fault shall be bonded to a ground terminal with a circuit resistance of less than or equal to 1.0 ohm. This requirement applies to those audible notification appliances in which the maximum voltage is greater than 30 V rms or 60 V dc. The bonding conductor(s) shall be green or green with one or more yellow stripes. The size of the bonding conductor(s) shall be at least equivalent in size to the primary circuit conductors.

4.8.2 Test/Verification

Measurements of bonding resistance, made with a calibrated multi-meter, between accessible conductive surfaces on the appliance and the Protective Ground Terminal shall be less than 1 ohm.

4.9 Surge Transient Tests

4.9.1 Requirement

Protection against line surge transients shall be a requirement for each visual notification appliance.

4.9.2 Test/Verification

A powered sample appliance shall be subjected to transient waveforms having peak levels of 100, 500, 1000, and 2400 V dc, as delivered into a 200-ohm load. The waveforms shall be calibrated according to the curves described in ANSI/UL 864, 10th Edition, figures 77.1-77.4. This test applies to all field wiring terminals that have a possibility of being subjected to line-induced voltage (i.e., notification appliance circuits).

The appliance is required to perform satisfactorily at the conclusion of the test, and it must not exhibit any instability such as false alarm signals and non-self-restoring trouble signals during testing. Following the transient tests, the test sample shall comply with the requirements in the Signal Strength Test, Section 4.1. The appliance signal strength is to be measured on-axis.

EXCEPTION

Circuits specified to be 20 ft. (6 m) or less in length and in conduit.. Circuits not meeting the exception criteria must be tested per 4.9.2.

4.10 Enclosure Requirements (including plastic housings)

4.10.1 Requirement

4.10.1.1 The enclosure must meet the ingress protection requirement for a NEMA 250, Type 1 or ANSI/IEC 60529, IP30 enclosure ratings as a minimum for indoor applications. It is not necessary to mark the product for Type 1 enclosures. Additional claims made by the manufacturer will be verified according to specified enclosure classifications.

4.10.1.2 Polymeric Materials used as an enclosure (or the sole support of current carrying parts) shall not warp to an extent that it impairs the intended operation or exposes high voltage components.

4.10.2 Test/Verification

4.10.2.1 The appliance enclosure (three samples) shall be evaluated according to acceptable national, regional or international electrical codes.

4.10.2.2 When constructed of Polymeric Materials, an enclosure sample shall be mounted as intended and placed in a circulating air-oven shall be aged at 194°F (90°C) for seven days or at 158°F (70°C) for twenty-eight days.

Following the aging tests, the samples are to be viewed for:

- No evidence of warping and distortion.
- No exposure to high voltage components.
- The unit shall operate normally following this test.

5. OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that subsequent appliances produced by the manufacturer shall present the same quality and reliability as the specific appliance (appliances) examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests, and is documented in the certification report.
- Continued conformance to this standard is verified by the certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in-process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.4 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.5 Drawing and Change Control

The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the certification report, must be reported to, and authorized by, the certification agency prior to implementation for production.

Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

5.2.1 An audit of the manufacturing facility may be part of the certification agency's surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the

manufacturer's equipment, procedures, and quality program are maintained to ensure a uniform product consistent with that which was tested and certified.

- 5.2.2 Certified products or services shall be produced or provided at or from the location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Manufacturer's Responsibilities

- 5.3.1 The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

6. BIBLIOGRAPHY

ANSI/NFPA 70 *National Electrical Code*
FM 3010 *Fire Alarm Signaling Systems*
FM 3600 *Electrical Equipment for Use in Hazardous (Classified) Locations*
ISO/IEC 17025: 2017 *General Requirements for the Competence of Testing and Calibration Laboratories*.