



Member of the FM Global Group

Examination Standard for Audible Notification 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 the 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 audible notification appliances (hereafter referred to as appliances) such as electrically powered bells and horns, but not speakers, used 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. 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 Scope

- 1.2.1 This standard sets performance requirements for electrically powered bells and horns to sound an alarm in the event of fire or other abnormal condition for the protection of occupants, building space, structure, area, or object.

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. The advice of manufacturers, users, trade associations, jurisdictions, and loss control specialists has also been considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of electrically powered bells and horns 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 was 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/NFPA 72 National Fire Alarm and Signaling Code

NEMA 250 Enclosures for Electrical Equipment

ANSI/IEC 60529 Degrees of Protection provided by Enclosures (IP Code)

ANSI/IEEE/ASTM SI 10 American National Standard for Metric Practice

2 GENERAL INFORMATION

2.1 Product Information

An audible notification appliance is a fire alarm system component such as a bell or horn that provides an audible 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;
- brochures, sales literature, specification 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. Sample requirements are to be determined by the certification agency.
- 2.3.2. Requirements for samples may vary depending on design features, results of prior testing, and results of the foregoing tests.
- 2.3.3. The manufacturer shall submit samples representative of production. Any decision to use data generated utilizing 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

During the initial investigation and prior to physical testing, the manufacturer's specifications, technical data sheets, and design details shall be reviewed to assess the ease and practicality of installation and use. The product shall be capable of being used within the limits of the final 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, such as outdoors versus indoors, high or low temperatures, high humidity, dusty conditions, and hazardous locations shall have housing that adequately protects against the conditions of expected services.
- 3.2.4 Appliances intended for use in hazardous locations shall comply with the 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 its 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, size, rating, capacity, etc., as appropriate

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

- 3.3.2 The model or type designation 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 product installation, operating, and maintenance instructions shall be reviewed for each type and model of audible notification appliance submitted for certification; the instructions shall be complete and appropriate for the appliance. The installation instructions or manual must be marked with a document name, number, revision, and date.

3.4.2 The installation, operating, and maintenance instructions shall be included with each audible notification appliance shipped.

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 thus equipment.

4 PERFORMANCE REQUIREMENTS

4.1 Audible Characteristics

4.1.1 Public Mode Audible Requirements

Audible notification appliances intended for operation in the public mode shall have a sound level of not less than 75 dBA at 10 ft (3 m) or more than 120 dBA at the minimum hearing distance from the audible appliance. If the minimum hearing distance is not provided by the manufacturer, a minimum hearing distance of zero will be used.

4.1.2 Private Mode Audible Requirements

Audible notification appliances intended for operation in the private mode shall have a sound level of not less than 45 dBA at 10 ft (3 m) or more than 120 dBA at the minimum hearing distance from the audible appliance. If the minimum hearing distance is not provided by the manufacturer, a minimum hearing distance of zero will be used.

4.1.3 Test/Verification

Each appliance sample shall be subjected to a sound level test to verify that the sound output for that appliance meets the requirements of 4.1.1 and 4.1.2 as applicable. The sample shall be mounted in its intended position within a semi anechoic chamber. The measurements shall be taken at a horizontal distance of 10 ft (3 m) on center using a calibrated sound pressure meter. The results shall be within ± 3 dBA of the documented manufacturer's claim. In addition, the audible appliance should produce the sound levels as described in 4.1.1 and 4.1.2 at a minimum.

4.2 Voltage Range

4.2.1 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.

4.2.2 Test/Verification

Each appliance sample shall be subjected to a sound level test as described in 4.1.3 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.

4.3 Continued Operation

4.3.1 Requirement

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

4.3.2 Test/Verification

A sound level test shall verify that the unit, with nominal rated voltage applied, can consistently produce at least the sound levels specified in Section 4.1 of this standard and in accordance with manufacturer's claims after being subjected to 24 hours of continuous operation.

4.4 Temperature Extremes

4.4.1 Requirement

The appliance shall produce at least the sound levels specified in Section 4.1 of this Standard and in accordance with manufacturer's claims following exposure to temperature extremes described below.

4.4.2 Test/Verification

4.4.2.1 For indoor applications, the appliance 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 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. The unit shall produce at least the sound levels specified in Section 4.1 of this Standard and in accordance with manufacturer's claims at the conclusion of these tests.

4.4.2.2 In addition to the temperatures identified in Section 4.4.2.1, the appliance 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. The unit shall produce at least the sound levels specified in Section 4.1 of this Standard and in accordance with manufacturer's claims at the conclusion of this test.

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.

4.5 Vibration

4.5.1 Requirement

The appliance assembly, including housing and mounting hardware, shall withstand the effects of vibration.

4.5.2 Test/Verification

When energized at its rated voltage and mounted in its intended orientation, the appliance shall be subjected to a 4-hour vertical vibration test of 0.02 in. (0.5 mm) total displacement at a linear frequency sweep of 10 to 30 Hz. There shall be no loosening of parts or permanent deformation as a result of this test.

4.6 Dielectric Strength

4.6.1 Requirement

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

4.6.2 Test/Verification

Within one hour following the humidity conditioning described in Section 4.4.2.2, 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 whose 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.

4.7 Bonding

4.7.1 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.

4.7.2 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.

4.8 Surge Transient Tests

4.8.1 Requirement

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

4.8.2 Test/Verification

A powered sample appliance shall be subjected to transient waveforms having peak levels of 100, 500, 1000, 1500, and 2400 V dc, as delivered into a 200-ohm load. This test applies to all field wiring terminals that have a possibility of being subjected to line-induced voltage (i.e., notification appliance circuits, initiating appliance circuits, power circuits, and remote/auxiliary connections).

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.

EXCEPTION

Circuits specified to be 20 ft. (6 m) or less in length and in conduit.

4.9 Enclosure Requirements (including plastic housings)

4.9.1 Requirement

In accordance with NEMA 250 and/or ANSI/IEC 60529, the appliance enclosure constructed for indoor use must provide a degree of protection to personnel against incidental contact with the enclosed appliance and to provide a degree of protection against falling dirt. Additional claims made by the manufacturer shall be verified according to appropriate enclosure classifications.

4.9.2 Test/Verification

The appliance enclosure shall be evaluated according to acceptable national, regional or international electrical codes.

5 OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

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

- Design quality is determined during the examination and tests and may be 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
- handling and disposition of non-conformance materials.

5.1.3 Documentation/Manual

There shall exist 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 shall 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, may be required to 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 insure a consistently uniform product consistent with that which was tested and certified.
- 5.2.2 Certified products or services shall be produced or provided at, or provided from, 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 for changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

5.4 Manufacturing and Production Tests

Appliances rated at 30 V rms or 60 V dc and above shall be dielectric tested on 100% of production. The power leads and/or relay terminal leads and associated circuitry shall withstand, for one minute with no insulation breakdown, the application of 1000 V ac, 60 Hz, or 1400 V dc with respect to the protective ground lead. Alternatively, test potentials 20% higher may be applied for at least one second.

WARNING

The dielectric test required may present a hazard of injury to personnel and/or property and should be performed only under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.

6 BIBLIOGRAPHY

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