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Examination Standard for Video Image Fire Detectors 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 Video Image Fire Detectors (VIFD) 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 applies to Video Image Fire Detectors (VIFD), and Video Image Fire Detection Systems (VIFDS) for Automatic Fire Alarm Signaling for the protection of occupants, building space, structure, area, or object and designed to detect products of combustion in a specific location.

1.2.2 This standard applies to Video Image Fire Detectors intended for use in fire alarm signaling or extinguishing system applications that operate via the image within the field of view area as defined by the camera. This standard employs test protocol dependent on the installation and operating instructions provided by the manufacturer. This information assists in defining the limits for the overall application and certified use of the product.

1.2.3 A Video Image Fire Detector is a combination Video Image Smoke and Flame Detector (VIS&FD) and will be examined in accordance with this standard and will be listed as a Video Image Fire Detector.

1.2.4 Other types of commercially available video image detectors (such as Flame only) may not be applicable to the test protocol described in this document.

1.2.5 These detectors are intended to be installed in accordance with the manufacturer's installation instructions and in accordance with ANSI/NFPA 72 *The National Fire Alarm Code* and in a manner acceptable to the local Authority Having Jurisdiction. Other NFPA Standards may apply, such as those covering extinguishing system applications.

1.2.6 The Video Image Fire Detector is not intended to be a direct replacement for standard open area protection, but does offer detection capabilities not possible with conventional detectors. Special consideration must be given to Video Image Fire Detectors regarding the overall system's sensitivity and special care required to reduce the possibility of false alarms.

1.3 Basis for Requirements

1.3.1 The requirements of this standard are based on field experience, research and testing, and/or the standards of other organizations. The 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 Video Image Fire Detectors (VIFD) for the purpose of obtaining certification. Video Image Fire Detectors 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 certification 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 the ANSI/IEEE/ASTM SI-10.

Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this standard.

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 and Signaling Code*
ANSI/UL 268 6th Edition *Smoke Detectors for Fire Alarm Signaling Systems*

1.9 Definitions

For purposes of this standard, the following terms apply:

Video Image Fire Detector (VIFD) for Automatic Fire Alarm Signaling – A discrete, self contained automatic smoke and flame detection device intended to perform analysis of real time video images representative of smoke and flame as generated by accidental fire and over-heat conditions within the viewing area covered by the video camera. This detection principle typically requires a clear line-of-sight with the area being viewed by the camera and the detector can connect directly to the initiating or signaling line circuits of a fire alarm system. The detection principle might consider the plume, pattern, edge content, movement and colors associated with the smoke and flame signature(s).

Video Image Fire Detection System (VIFDS) for Automatic Fire Alarm Signaling – A combination of camera(s), processing equipment and interfaces that together can operate as an automatic smoke and flame detection system intended to perform analysis of real time video images representative of smoke as generated by accidental fire and over-heat conditions within the viewing area covered by the video camera(s). This detection system typically requires a clear line-of-sight with the area being viewed by the camera and often requires additional equipment (dedicated primary and secondary power systems) be provided as component of a fire alarm system. The detection principle might consider the plume, pattern, edge content, movement and colors associated with the smoke and flame signature(s).

Sensitivity – The sensitivity of a Video Image Fire Detector (VIFD) is the result of an engineering evaluation that includes the following parameters as specified by the manufacturer.

- Volume and Size of the smoke and fire signature required for detection
- Fuel Source(s)
- Field of View of the detector
- Minimum & Maximum detection range (fire source to the detector)
- Presence or influence of false alarm sources within the viewing area
- Purpose of the system
- Response time required

2. GENERAL INFORMATION

2.1 Product Information

2.1.1 Video Image Fire Detectors are intended to detect (respond to) changes in the viewing area of the camera. These by-products of fire and combustion are quantifiable and measurable. Other designs meeting the criteria of this standard may also be considered for certification.

2.1.2 Video Image Fire Detectors are intended to operate in environments as specified in the manufacturer's installation instructions.

2.1.3 3 Video Image Fire Detectors have a limited field of view and rely on a line-of-sight transmission of the monitored image from the source to the detector. Video Image Fire Detectors employ video cameras that monitor a protected area for the plume, pattern, edge content, movement and colors associated with the fire (smoke and flame) signature(s).

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 4 of each detector (camera) type 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 detectors.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

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 final certification.

3.2 Physical or Structural Features

3.2.1 Required Features

3.2.1.1 Means shall be provided to mount the detector securely and independently of the wiring.

3.2.1.2 The detector shall be capable of withstanding normal handling and installation.

3.2.1.3 Means shall be provided to identify that a detector is in alarm. If the detector is equipped with an integral visual alarm indicator, it shall be red in color.

3.2.1.4 Video Image Fire Detectors intended for use in hazardous (classified) locations shall comply with certification requirements for hazardous (classified) location electrical equipment in addition to this standard.

3.2.1.5 The detector and enclosure shall be suitable for the intended environmental exposures as determined by testing in accordance with acceptable national, regional, or international codes and standards.

3.2.1.6 The detector shall accommodate secure wiring methods in accordance with NFPA 72.

3.2.1.7 The detector shall be compatible with a certified fire alarm control unit that will produce an alarm and a distinctive trouble signal.

3.2.1.8 The detector shall have response times in accordance with Sections 4.1.1. and 4.1.2 of this document, and within those defined in the manufacturer's specifications and installation and operational manual.

3.2.1.9. Detectors rated at or above 30 V ac and 60 V dc require a proper ground terminal to be provided.

3.2.1.10 Duplicate terminals or leads, or their equivalent, shall be provided on each Video Image Fire Detector for the express purpose of connecting into the fire alarm system to provide supervision of the device and termination in accordance with NFPA 72 requirements.

3.2.1.11 Video Image Fire Detection Systems require consideration and verification of; equipment compatibility (camera(s), computer, processors, power supply(ies) as well as the redundancy (reliability) and secondary power concerns of the VIFDS towards NFPA 72 requirements.

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, electrical rating and temperature rating.

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. It shall include the following:
    - Environmental operating conditions
    - Minimum and maximum lighting (for natural white light and IR if applicable)
    - Electrical ratings
    - Enclosure ratings
    - Fuel, size of fire, distance from detector
    - False alarm sources as enumerated in paragraph 4.4
- 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.

3.4.2 The instructions for two-wire detectors shall either include or provide reference to other identifiable literature and its source that contains the following information:

- Name of manufacturer, model number(s) of compatible control unit(s), IDC interface and compatibility identification marker.
- Identification of any part of the control unit, such as specific wiring terminal numbers, or reference to the control unit installation wiring diagram by issue number and date, or any other variables requiring programming which are a factor in determining compatibility.
- The maximum number of detectors that are intended to be connected to each initiating device circuit of the control unit. This includes detectors that employ an integral component, such as a relay or sounder that consumes power during an alarm condition.
- Minimum and maximum rated operating voltage, standby current, and alarm current required for intended operation of integral components, such as a relay or sounder.

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.

3.6 Software Requirements

3.6.1 All software and firmware shall be identified by release level which is clearly marked on, or capable of being displayed by, the product for ease of identification.

3.6.2 Any changes to the executive software /firmware shall result in a revision to the release level.

3.6.3 The operating software and firmware shall not be accessible for any changes or modification beyond what it has been certified for.

3.6.4 The executive software / firmware shall not be accessible for change, modification or addition by any party other than the manufacturer or agents operating under the direction of the manufacturer.

3.6.4 Site-specific programming for configuration customization is permitted, and shall only be accessible by authorized users. Access control measures such as a password or keylock shall meet the intent of this requirement.

3.6.5 Any software failure that renders the VIFD inoperable shall result in a trouble condition at the detector and be appropriately transmitted to the fire alarm control (e.g. watchdog timer). Techniques such as stopping the microcontroller clock oscillator, or holding the microcontroller in permanent reset are considered to be suitable to validate this requirement.

4. PERFORMANCE REQUIREMENTS

4.1 Normal Operation-Sensitivity

4.1.1 Smoke Tests

4.1.1.1 Requirement

The VIFD detector will be tested to the smoke tests as described in Sections 38 & 39 of ANSI/UL 268 6th Edition.

- Paper fire
- Wood fire
- Flammable liquid fire
- Smoldering smoke

4.1.1.2 Test/Verification

A VIFD system installed per the manufacturer's instructions shall respond in accordance with the parameters defined for these four standard test fires.

4.1.2 Fire Tests

4.1.2.1 Requirement

The VIFD sensitivity shall be specified i.e. fuel, size, minimum and maximum distances and response time shall be tested during the examination. The manufacturer shall identify the sensitivity of a VID to all of the fires defined below:

- 12 x 12 in. (0.3 x 0.3 m) N-heptane pan fire
- 12 x 12 in. (0.3 x 0.3 m) alcohol (type specific) pan fire
- 39 in. (1m) methane flame from a 0.375 inch (9.5 mm) orifice
- 2 flaming, 10in. x 10 in. x 4in. cardboard containers each loaded with 4 crumbled sheets of standard letter size paper.

4.1.2.2 Test/Verification

The sensitivity shall be verified at the minimum and maximum distance from the center of the fire source in accordance with the manufacturer's specifications. The VIFD will give consistent alarm responses in a specified time not to exceed thirty seconds.

4.1.3 Optional Smoke-Fire Test (As Specified by the Manufacturer)

4.1.3.1 Requirement

When fuels other than those described in 4.1.1 and 4.1.2 above are specified by the manufacturer, the sensitivity shall be specified (i. e. fuel, size, minimum and maximum distances and response time shall be tested during the examination to each additional fuel source.

4.1.3.2 Test/Verification

The sensitivity shall be verified at the minimum and maximum distances from the center of the fire source in accordance with the manufacturer's specifications. The VIFD will give consistent alarm responses as specified by the manufacturer.

4.2 Field of View

4.2.1 Requirement

The VIFD detector will be tested to confirm the manufacturer's claims for field of view.

4.2.2 Test/Verification

VIFDs will be tested using at least one of the fires specified by the manufacturer. The field of view will be verified in four (4) off axis directions (+/- Left and Right and +/- Up and Down) as defined by the manufacturer's specifications.

The unit shall produce:

- The detector response (sensitivity) shall remain consistent and not decrease by more than - 10% at the specified field of view limits to the results obtained when tested on-axis to the lens of the detector.

4.3 Switching

4.3.1 Requirement

The VIFD's alarm signal processing time to the FACP shall occur within the manufacturer's specified response time and not to exceed 30 seconds.

4.3.2 Test/Verification

There shall be:

- For any VIFD, an alarm operation within the defined parameters (smoke curves and time) of 4.1.1
- Additionally, all VIFD when exposed to the fire sources 4.1.2 and 4.1.3 shall be monitored to ensure actuation according to the manufacturer's specifications and in no case to exceed 30 seconds following the introduction of the fire source to the detector.

4.4 False Stimuli Test Response

4.4.1 Requirement

The VIFD shall respond to the specified fire samples as define in their specifications without false alarm due to modulated and non-modulated direct and reflected sunlight, or to various modulated and non-modulated sources of artificial light when installed in accordance with the manufacturer's instructions.

4.4.2 Test/Verification

The VIFD will be tested in the presence of both modulated and non-modulated sources. Distances from these sources will vary accordance with the manufacturer's claims and the type of detector.

- direct and reflected sunlight (outdoor rated VID's only)
- arc welding (⅛ in. (0.3 cm) or 3/16 in. (0.5 cm) type 7014, 7013 or 6012 rod, and a 180-200 Ampere setting
- heated bodies (1,500w electrical heater)
- artificial light (100w incandescent)

- artificial light (40w fluorescent)
- artificial light (500w halogen)

4.4.1 While subjected to the false stimuli, there shall be:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test.

4.4.2 In addition, the VIFD will respond satisfactorily to a test fire while under the influence of the false stimuli placed directly within the field of view of the VIFD.

The unit shall produce:

- Operate normally prior to ignition, and provide an alarm indication consistent with the results obtained in Section 4.1.

4.5 Electrical Supervision and Video Image Monitoring

4.5.1 Requirement

The integrity of the video image and its transmission pathway must be supervised to provide complete end-to-end supervision of the video transmission system (i.e. camera to processing equipment).

4.5.2 Test/Verification

The unit shall produce a trouble indication for:

- Loss of camera power
- Loss of video transmission pathway
- Loss of image contrast
- Loss of image clarity
- Operation of any manual switching component from it's "normal" position

The unit shall not produce an alarm signal for:

- The interruption and restoration of either primary or secondary power sources.

4.6 Voltage Variations

4.6.1 Requirement

The device shall produce no instability, trouble signal or false response and maintain ≤ 10% shift in measured sensitivity when operated between 85% and 110% of rated input voltage. If an absolute voltage range, beyond the 85% and 110% of nominal, is specified by the manufacturer, the unit will be tested at the extremes of the range.

4.6.2 Test/Verification

The unit, with nominal rated voltage applied, shall be exposed to a standard test fire. The input voltage shall then be varied from 85 to 110% of nominal, or the manufacturer's range (whichever is wider), and the unit again exposed to a specified source (a single smoke room test) at both of these voltage extremes. The sensitivity of the device shall be +/- 10% from the vale obtained in the original sensitivity test, no trouble signal, and no false indication of fire during these tests.

The unit shall produce:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test
- and remain fully operational at the conclusion of this test.

***Exception**: This test can be waived if the power supplies are found to regulate the detector voltage so as to not be subject to any variations.*

4.7 Temperature Extreme

4.7.1 Requirement

The device shall produce no (unexpected) trouble signal and no false indication of fire during, or following exposure to the temperature extremes described below.

4.7.2 Test/Verification

- For indoor applications, the device 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 device shall be exposed to minimum limits of -40° to 140°F (-40° to 60°C) for at least 24 hours at each limit.

The unit shall produce:

- No false signals (alarm or unexpected trouble) and
- No evidence of instability during or at the end of this test

***Note:** Detector intended for use at higher or lower temperatures than those shown above shall be tested at the rated temperature extremes and specially marked for use at the specified temperatures.*

4.8 Humidity Cycling and Conditioning

4.8.1 Requirement

The VIFD assembly shall withstand the effects of heat and humidity, remain functional and produce no false indication of fire under the following conditions.

- A change from 50% relative humidity at 70F (21C) to a relative humidity of 90% relative humidity at 100F (38C) in 15 minutes
- For detector intended solely for indoor dry environments, a relative humidity of 93% ± 2% and a temperature of 90F ± 3F (32C ± 2C) for a period of 24 hours or .
- For detector intended for indoor/outdoor damp or wet environments, a relative humidity of 95% ± 3% and a temperature of 140F ± 3F (60C ± 2C) for a period of 24 hours

4.8.2 Test/Verification

With the unit powered and mounted as intended the unit shall produce:

- No false alarm signal and

- and remain operational at the conclusion of this test.

4.9 Vibration

4.9.1 Requirement

The detector assembly (camera) and mounting hardware, shall withstand the effects of vibration.

4.9.2 Test/Verification

With rated input voltage applied and mounted in its intended orientation the detector (camera) 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, at a sweep rate of approximately two cycles per minute.

The unit shall produce:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test
- No loosening of parts or permanent deformation
- and remain operational at the conclusion of this test.

4.10 Dielectric Voltage-Withstand

4.10.1 Requirement

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

4.10.2 Test/Verification

A sample detector shall successfully withstand for one minute

- Rated ≥30 V ac or 60 V dc 60 Hz, a dielectric strength test of 1000 V ac plus twice the maximum rated voltage.
- Rated ≤ 30 V ac or 60 V dc, a dielectric strength of 500 V ac or 710 V dc.

The dielectric strength test shall be conducted between all applicable combinations of the following: power supply conductors, signaling circuit conductors, ground connection, other output conductors, and detector body.

4.11 Bonding

4.11.1 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 0.1 ohm.

- This requirement applies to those VIDs in which the maximum voltage is ≥ 30 V ac 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.

4.11.2 Test/Verification

The detector sample shall be evaluated according to Section 4.11.1 requirements. Measurements of bonding resistance shall be made with a calibrated multi-meter. Bonding impedance shall be calculated by applying 20 A ac current at up to 12 V ac, measuring the voltage and calculating the resistance.

4.12 Internal Transient

4.12.1 Requirement

The unit shall be tested for internal transient stability and durability.

4.12.2 Test/Verification

One sample (or more if required) shall be cycled through 500 power on/off cycles conducted at a rate of not more than 6 interruptions per minute with a power off cycle of 1 second.

There shall be:

- No false signals (alarm or unexplained trouble) and
- No evidence of instability during or at the end of this test.

4.13 Durability

4.13.1 Requirement

The unit shall be tested for durability.

4.13.2 Test/Verification

Any detector susceptible to the wearing of parts (i.e., a mechanical relay) shall be cycled through 500 alarm-reset functions under maximum rated load conditions.

There shall be:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test.
- The unit shall operate normally following this test.

4.14 Extraneous Transients

4.14.1 Requirement

No false signal will be generated when the VIFD is subjected to extraneous transients from sources which are described below.

4.14.2 Test/Verification

One powered sample of the detector will be subjected to extraneous transients described below

- Radio frequency transmissions with radiation power levels equivalent to 5 Watts at 24 inches (0.6 m) in the 27 MHz, 150-174 MHZ, 450-467 MHZ, 850-870 MHz, and 900-920 MHz bands.

- A sequential arc (Jacob's ladder) generated between two 15 in. (0.4 m) long, No. 14 AWG (2.1 mm) solid copper conductors attached rigidly in a vertical position to the output terminals of an oil burner ignition transformer or gas tube transformer rated 120 volts, 60 hertz primary; 10,000 volts, 60 hertz, 23 mA secondary. The two wires are to be formed in a taper, starting with a 1⁄8 in. (3.2 mm) separation at the bottom (adjacent to terminals) and extending to 1.25 in (32 mm) at the top.
- operation of an electric drill rated 120 V, 60 Hz, 2.5 A.
- operation of a soldering gun rated 120 V, 60 Hz, 2.5 A.
- Operation of a 6 in (150 mm) diameter solenoid-type vibrating bell with no arc suppression and rated 24 V dc.

The unit shall produce:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test.
- The unit shall operate normally following this test.

4.15 Surge Transients

4.15.1 Requirement

Protection against line surge transients will be a requirement for each low voltage circuit (power, IDC, SLC or NAC).

4.15.2 Test/Verification

This test applies to all field wiring terminals that have a possibility of being subjected to line-induced voltage (i.e., initiating device circuits, power circuits, and remote/auxiliary connections). One powered sample of the detector will be subjected to transient waveforms having peak levels of;

- 100 V dc
- 500 V dc
- 1,000 V dc
- 1,500 V dc
- 2,400 V dc

There unit shall produce:

- No false alarm signals or non-self-restoring trouble signals and
- No evidence of instability during or at the end of this test and
- The unit shall operate normally following this test.

Exception: *The video cable and any circuit specified to be 20 ft (6 m) or less in length and in conduit. Circuits not meeting the exception criteria must be tested per 4.15.2.*

4.16 Stability Test

4.16.1 Requirement

The detector shall be able to withstand an extended period in standby operation.

4.16.2 Test/Verification

One sample, adjusted to maximum sensitivity, will be energized for normal standby operation in a clean-air (working-office type) atmosphere for a period of at least 30 days.

There shall be:

- No false signals (alarm or trouble) and
- No evidence of instability during or at the end of this test.

4.17 Enclosure Requirements (Including Polymeric Housings)

4.17.1 Requirement

4.17.1.1 The detector enclosure must meet the ingress protection requirement only for a NEMA 250 Type 1 and / 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 appropriate enclosure classifications.

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

4.17.2 Test/Verification

4.17.2.1 The detector enclosure will be evaluated according to acceptable national, regional or international electrical codes.

4.17.2.2 Polymeric Materials, a complete detector sample shall be mounted as intended and placed in an 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 heat detector(s) produced by the manufacturer shall present the same quality and reliability as the specific detector(s) 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 audit.
- 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 provided from, location(s) as 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

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

NFPA 70 *National Electrical Code®*
ANSI/FM 3260 *Radiant Energy Fire Detector for Automatic Fire Alarm Signaling*
ISO/IEC 17025 *General Requirements for the Competence of Testing and Calibration Laboratories.*