

NFPA®

1982

**Standard on
Personal Alert Safety Systems
(PASS)**

2018



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NFPA® 1982

Standard on

Personal Alert Safety Systems (PASS)

2018 Edition

This edition of NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)*, was prepared by the Technical Committee on Electronic Safety Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on November 10, 2017, with an effective date of November 30, 2017, and supersedes all previous editions.

This edition of NFPA 1982 was approved as an American National Standard on November 30, 2017.

Origin and Development of NFPA 1982

The Technical Committee on Protective Equipment for Fire Fighters began work on this standard in 1980 in answer to requests from the fire service to establish requirements for a device that would sound an audible signal for aid if a fire fighter became incapacitated while operating at an emergency. The International Association of Fire Fighters (IAFF) was instrumental in the developmental work that resulted in this standard. Developmental work was completed in the spring of 1982 and submitted to the NFPA for official adoption. The first edition was presented at the Annual Meeting in Kansas City, Missouri, and released on June 9, 1983.

Between the first and second editions, the name of the technical committee was changed to the Technical Committee on Fire Service Protective Clothing and Equipment, and the Subcommittee on Personal Alert Safety Systems (PASS) was organized to manage this document. The second edition was presented to the membership of the Association at the 1988 Annual Meeting in Los Angeles, California, and had an effective date of June 28, 1988.

For the third edition, the Subcommittee on PASS undertook a complete revision of its work, which was completed in December 1991. The document was passed on to the Technical Committee on Fire Service Protective Clothing and Equipment, presented to the membership of the Association at the 1993 Annual Meeting in Orlando, Florida, and was issued with an effective date of August 20, 1993.

In January 1995, the Standards Council reorganized the entire project for fire service protective clothing and equipment. The new project had a Technical Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment and seven technical committees operating within the project. The former standing Subcommittee on PASS was combined with the Subcommittee on SCBA to form the new Technical Committee on Respiratory Protection and Personal Alarm Equipment, which took over the responsibility for NFPA 1982.

The fourth edition represented a complete revision of the third edition and included PASS that are integrated with SCBA and automatic activation of all PASS. It was presented to the membership of the Association at the 1998 Annual Meeting in Cincinnati, Ohio, and had an effective date of August 5, 1998.

In October 2002, the NFPA Standards Council established a new committee, the Technical Committee on Electronic Safety Equipment, within the project structure. This new committee was given the responsibility for addressing all electronics in equipment used by emergency responders and was assigned responsibility for NFPA 1982.

The fifth edition of NFPA 1982 was a complete revision of the fourth edition. During this revision cycle, the Committee received reports from the National Institute for Occupational Safety and Health (NIOSH) Division of Safety Research on its investigations of fire-fighter fatalities where there was evidence the PASS alarm signal failed to function or was not heard by other personnel in the

area, and in some instances that there was water ingress to the electronic components that diminished or canceled the alarm signal. The National Institute for Standards and Technology (NIST) Building and Fire Research Laboratory partnered with NIOSH to characterize the performance of PASS devices in the fire-fighting environment. NIST determined that exposure to high-temperature environments reduced the loudness of the alarm signal. That reduction in loudness can cause the alarm signal to become indistinguishable from background noise at an emergency scene. Initial laboratory testing by NIST highlighted that this sound reduction could begin to occur at temperatures as low as 149°C (300°F). All PASS devices that were evaluated experienced significant alarm signal degradation at temperatures between 149°C and 260°C (300°F and 500°F). As the PASS cooled, the alarm signal on most of the units returned to pre-exposure sound levels.

NIOSH and others also noted that water ingress did occur or could have occurred in several cases, causing the alarm signal to cease to function effectively, but that after the PASS electronics dried, the alarm signal would again function.

The Committee addressed these issues and others and developed changes to the requirements for the fifth edition. More significant changes were the following:

- (1) New water immersion requirements and testing where PASS is exposed to 177°C (350°F) for 15 minutes and then to water submersion in 1.5 m (4.9 ft) also for 15 minutes for each of six cycles. PASS is then examined to determine no water ingress, that all PASS signals function properly, and that electronic data logging functions operate properly. PASS is then reimmersed in the test water for an additional 5 minutes with the power source compartment(s) open; after those 5 minutes, the PASS is removed from water and wiped dry, and the electronics compartment is opened and examined to determine no water ingress.
- (2) Revised high-temperature resistance requirements and added new high-temperature functionality requirements and testing procedures where PASS is exposed to 260°C (500°F) for 5 minutes while mounted in a circulating hot air oven. The PASS alarm signal must function at or above the required 95 dBA sound level for the required duration of the signal, electronic data logging functions must operate properly, and no part of the PASS can show evidence of melting, dripping, or igniting.
- (3) New tumble-vibration requirements and testing in which PASS is “tumbled” in a rotating drum for 3 hours. The PASS alarm signal must function at the required 95 dBA sound level, and electronic data logging functions must operate properly.
- (4) New requirements to prevent muffling of the alarm signal where PASS is mounted on a test subject and evaluated in five positions (face down with arms extended, supine left, supine right, fetal right with knees drawn to chest, fetal left with knees drawn to chest), and the alarm signal must function at or above the required 95 dBA sound level in each of the positions.

The 2013 edition of NFPA 1982 was a complete revision of the fifth edition. During this revision cycle, the Technical Committee received reports from NIST on technical changes with respect to the testing of PASS.

The 2013 edition added the minimum requirements for radio frequency (RF) PASS devices that are capable of transmitting a distress alarm and receiving an evacuation alarm via an RF signal. New definitions in this edition included *RF PASS*, *base station*, *evacuation alarm*, *loss-of-signal alarm*, *RF interference*, and *RF transceiver*. In addition, the informational references in Annex B were updated to include NIST publications.

In Chapter 4, the test matrices for stand-alone, removable, and nonremovable integrated PASS were updated, and in Chapter 6, alarm signals were revised. In Chapter 8, several new test methods were added, including radio system tests for RF PASS, loss-of-signal alarms, and an RF interference test for optional RF PASS.

The 2018 edition of NFPA 1982 features referenced document edition updates, additions to Chapter 2 and Annex D, clarifications and editorial changes, and harmonization with NFPA 1801, *Standard on Thermal Imagers for the Fire Service*.

The Technical Committee has added a failure mode and effects analysis (FMEA) for PASS devices to identify and prioritize critical failures that could have a serious effect on the safety and reliability of a PASS in the expected operating environment. The FMEA also will help describe how the PASS system might fail.

Also added are changes to the PASS annunciator now driven by an alarm sequence of eight steps, changes to the frequency of sweep and tone, and the pre-alarm sound specification.

Revisions also were made to the low power source warning signal due to the introduction of rechargeable batteries to SCBA/PASS alarms, and the standard now requires that the battery must be discharged to the low battery trip point voltage or the low battery trip point capacity remaining percentage.

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2018 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex D. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex D.

Chapter 1 Administration

1.1 Scope.

1.1.1* This standard shall specify minimum requirements for the design, performance, testing, and certification for all personal alert safety systems (PASS) for emergency services personnel.

1.1.2* This standard shall specify the requirements for all new PASS, including, but not limited to, stand-alone PASS, integrated PASS, and RF PASS.

1.1.3* This standard shall also specify the minimum requirements for the design, performance, testing, and certification of PASS or RF PASS devices certified to an earlier edition of this standard that incorporate parts, components, and/or software to meet this edition of the standard.

1.1.4 This standard shall not specify requirements for any accessories that could be attached to the PASS but that are not necessary for the PASS to meet the requirements of this standard.

1.1.5 This standard shall not be construed as addressing all the safety concerns associated with the use of compliant PASS. It shall be the responsibility of the persons and organizations that use compliant PASS to establish safety and health practices and to determine the applicability of regulatory limitations prior to use.

1.1.6 This standard shall not be construed as addressing all the safety concerns, if any, associated with the use of this standard by testing facilities. It shall be the responsibility of the persons and organizations that use this standard to conduct testing of PASS to establish safety and health practices and to determine the applicability of regulatory limitations prior to using this standard for any designing, manufacturing, and testing.

1.1.7 Nothing herein is intended to restrict any jurisdiction or manufacturer from exceeding these minimum requirements.

1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish minimum requirements for PASS that are intended for use by emergency services personnel during emergency operations and that emit an audible signal to summon aid in the event the user becomes incapacitated or needs assistance.

1.2.1.1 This standard shall establish minimum requirements for optional RF PASS that are capable of transmitting an alarm signal and receiving an evacuation alarm via an RF signal.

1.2.1.2 This standard shall establish minimum requirements for the base station used in optional RF PASS for the receipt of an alarm signal and the transmission of an evacuation alarm via an RF signal.

1.2.2* Controlled laboratory tests used to determine compliance with the performance requirements of this standard shall not be deemed as establishing PASS performance levels for all situations to which fire-fighting or emergency services personnel can be exposed.

1.2.3 This standard shall not be interpreted or used as a detailed manufacturing or purchase specification but shall be permitted to be referenced in purchase specifications as minimum requirements.

1.3 Application.

1.3.1 This standard shall apply to the design, performance, testing, and certification of PASS or RF PASS devices certified to an earlier edition of this standard that incorporate replacement parts, components, and/or software to be certified to this edition of the standard.

1.3.2* This standard shall not apply to any accessories that could be attached to the certified product before or after purchase but that are not necessary for the certified product to meet the requirements of this standard.

Δ 1.3.3 This standard shall not apply to the use of PASS, the requirements for which are specified in NFPA 1500.

1.4 Units.

1.4.1 In this standard, values for measurement are followed by an equivalent in parentheses, but only the first value stated shall be regarded as the requirement.

1.4.2 Because the equivalent values in parentheses are approximate, they shall not be considered as the requirement.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard 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 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2018 edition.

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2018 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2018 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations*, sixth edition.

ANSI S1.4, *Specification for Sound Level Meters*, 1983, reaffirmed 2006.

ANSI/ASA S1.13, *Measurement of Sound Pressure Levels in Air*, 2005, reaffirmed 2010.

2.3.2 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME B46.1, *Surface Texture (Surface Roughness, Waviness & Lay)*, 2009.

ASME Y14.38, *Abbreviations and Acronyms for Use on Drawings and Related Documents*, 2007, reaffirmed 2013.

ASME Y14.5, *Dimensioning and Tolerancing*, 2009.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*, 2011.

2.3.4 ISO Publications. International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandinnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 9001, *Quality management systems — Requirements*, 2015.

ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*, 2004.

ISO/IEC 17021-1, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*, 2015.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, 2005, Technical Corrigendum 1, 2006.

ISO/IEC Guide 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*, 2012.

ISO 17493, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*, 2000.

IEC 61000-4-21, *Testing and measurement techniques — Reverberation chamber test methods*, 2011.

ISO Guide 27, *Guidelines for corrective action to be taken by a certification body in the event of misuse of its mark of conformity*, 1983.

2.3.5 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 47, Code of Federal Regulations, Subchapter A, General, Telecommunications, Chapter I, Federal Communications Commission, Part 15, Radio Frequency Devices.

2.3.6 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 1801, *Standard on Thermal Imaging for the Fire Service*, 2018 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. 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). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for 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 equip-

ment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Alarm Signal. An audible warning that is identifiable as an indication that an emergency services person is in need of assistance.

3.3.1.1 Evacuation Alarm. An alarm initiated by a base station, transmitted to an RF PASS via an RF signal. The evacuation alarm warns emergency services personnel to evacuate the premises.

▲ **3.3.1.2 Loss-of-Signal Alarm.** A visual signal that is initiated automatically when the RF communication between a base station and RF PASS is lost

3.3.2 Certification Organization. An independent, third-party organization that determines product compliance with the requirements of this standard with a labeling/listing/follow-up program.

3.3.3 Certification/Certified. A system whereby a certification organization determines that a manufacturer has demonstrated the ability to produce a product that complies with the requirements of this standard, authorizes the manufacturer to use a label on listed products that comply with the requirements of this standard, and establishes a follow-up program conducted by the certification organization as a check on the methods the manufacturer uses to determine continued compliance of labeled and listed products with the requirements of this standard.

3.3.4 Compliance/Compliant. Meeting or exceeding all applicable requirements of this standard.

3.3.5 Compliant Product(s). Clothing or equipment that is certified to the applicable NFPA standard.

3.3.6* Component. Any material, part, or subassembly used in the construction of the compliant product.

3.3.7 Drip. To run or fall in drops or blobs.

3.3.8 Follow-Up Program. The sampling, inspections, tests, or other measures conducted by the certification organization on a periodic basis to determine the continued compliance of labeled and listed products that are being produced by the manufacturer to the requirements of this standard.

3.3.9 Manufacturer. The entity that directs and controls any of the following: compliant product design, compliant product manufacturing, or compliant product quality assurance; or the entity that assumes the liability for the compliant product or provides the warranty for the compliant product.

3.3.10 Melt. A response to heat by a material resulting in evidence of flowing or dripping.

3.3.11 Model. The collective term used to identify a group of elements or items of the same basic design and components from a single manufacturer produced by the same manufacturing and quality assurance procedures that are covered by the same certification.

3.3.12 PASS. Acronym for Personal Alert Safety Systems. See also 3.3.14, Personal Alert Safety Systems (PASS).

3.3.13 PASS Annunciator. The component designed to emit audible signals.

3.3.14 Personal Alert Safety Systems (PASS). A device that continually senses for lack of movement of the wearer and automatically activates the alarm signal, indicating the wearer is in need of assistance; can also be manually activated to trigger the alarm signal.

3.3.14.1 Integrated PASS. A removable or nonremovable PASS that is an integral part of another item or items of protective clothing, protective equipment, or both.

3.3.14.1.1 Nonremovable. An integrated PASS that is not removable and cannot be used independently of the item or items with which it is integrated.

3.3.14.1.2 Removable. An integrated PASS that is removable so that it can be used independently of the item or items with which it is integrated.

3.3.14.1.3 Stand-Alone PASS. A PASS that is not an integral part of any other item of protective clothing or protective equipment.

3.3.14.2 RF PASS. A PASS that contains an optional RF transceiver that enables the PASS to automatically transmit an alarm signal and receive evacuation alarms via RF signals; responds to an evacuation alarm with an audible and visual signal.

3.3.14.2.1 Base Station. An RF transceiver used in conjunction with an RF PASS that monitors for an alarm signal and emits a visual signal when this alarm is received. The base station is capable of sending an evacuation alarm to the RF PASS.

3.3.15 Pre-Alarm Signal. An audible warning that is identifiable as an indication that a PASS is about to sound the alarm signal.

3.3.16 Product Label. A marking provided by the manufacturer for each compliant product containing compliant statements, certification statements, manufacturer and model information, or similar data. The product label is not the certification organization's label, symbol, or identifying mark; however, the certification organization's label, symbol, or identifying mark is attached to or is part of the product label.

3.3.17 RF Interference. An unwanted radio-frequency signal that is present in the vicinity of an RF PASS system that could impede reception of an alarm signal or evacuation alarm.

3.3.18 RF Transceiver. A radio system capable of both transmitting and receiving a modulated radio-frequency (RF) signal that is then converted to an audio and/or data signal; used to transmit and receive signals such as the alarm signal and the evacuation alarm for RF PASS.

3.3.19 Safety Alert. The procedure by which a manufacturer notifies users, the marketplace, and distributors of potential safety concerns regarding a product.

3.3.20 Sample. (1) The ensemble, element, component, or composite that is conditioned for testing. (*See also 3.3.21, Specimen.*) (2) Ensembles, elements, items, or components that are randomly selected from the manufacturer's production line, from the manufacturer's inventory, or from the open market.

3.3.21 Specimen. The conditioned ensemble, element, item, or component that is tested. Specimens are taken from samples. (*See also 3.3.20, Sample.*)

3.3.22 Surrogate Cylinder. A breathing air cylinder for testing only in which the mass of the breathing air is replaced by a substitute mass.

Chapter 4 Certification

4.1 General.

4.1.1 The certification process for PASS, as being compliant with NFPA 1982, shall include the requirements of Section 4.1, General; Section 4.2, Certification Program; Section 4.3, Inspection and Testing; Section 4.4, Recertification; Section 4.5, Manufacturers' Quality Assurance Program; Section 4.6, Hazards Involving Compliant Product; Section 4.7, Manufacturers' Investigation of Complaints and Returns; and Section 4.8, Manufacturers' Safety Alert and Product Recall Systems.

4.1.2 All PASS that are labeled as being compliant with this standard shall meet or exceed all applicable requirements specified in this standard and shall be certified. Manufacturers shall not claim compliance with a portion(s) or segment(s) of the requirements of this standard and shall not use the name or identification of this standard, NFPA 1982, in any statements about their respective products unless the product is certified to this standard.

Δ **4.1.3** All certification shall be performed by a certification organization that meets at least the **personal protective equipment (PPE)** requirements specified in Section 4.2, Certification Program, and that is accredited for PPE in accordance with ISO/IEC Guide 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*. The accreditation shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.1.4 All individual compliant PASS shall be labeled. All individual compliant PASS shall also have a product label or labels that meet the requirements specified in Section 5.1.

4.1.5 All compliant PASS shall be listed by the certification organization. The listing shall uniquely identify the certified product, for example, by style, model number, or part number.

4.1.6* The certification organization's label, symbol, or identifying mark shall be attached to the product label or shall be part of the product label.

4.1.7 The certification organization shall not certify any PASS to the 2013 edition of this standard on or after the NFPA effective date for the 2018 edition, which is November 30, 2017.

4.1.8 The certification organization shall not permit any manufacturer to label any PASS as compliant with the 2013 edition of this standard on or after November 30, 2018.

4.1.9 The certification organization shall require manufacturers to remove all certification labels and product labels indicating compliance with the 2013 edition of this standard from all PASS that are under the control of the manufacturer on or before November 30, 2018. The certification organization shall verify this action is taken.

4.2 Certification Program.

4.2.1* The certification organization shall not be owned or controlled by manufacturers or vendors of the product being certified.

4.2.2 The certification organization shall be primarily engaged in certification work and shall not have a monetary interest in the product's ultimate profitability.

Δ **4.2.3** The certification organization shall be accredited for PPE in accordance with ISO/IEC Guide 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*. The accreditation shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.2.4 The certification organization shall refuse to certify products to this standard that do not comply with all applicable requirements of this standard.

4.2.5* The contractual provisions between the certification organization and the manufacturer shall specify that certification is contingent on compliance with all applicable requirements of this standard.

4.2.5.1 The certification organization shall not offer or confer any conditional, temporary, or partial certifications.

4.2.5.2 Manufacturers shall not be authorized to use any label or reference to the certification organization on products that are not compliant with all applicable requirements of this standard.

4.2.6* The certification organization shall have laboratory facilities and equipment available for conducting proper tests to determine product compliance.

4.2.6.1 The certification organization laboratory facilities shall have in place a program and functioning for calibration of all instruments, and procedures shall be in use to ensure proper control of all testing.

4.2.6.2 The certification organization laboratory facilities shall follow good practice regarding the use of laboratory manuals, form data sheets, documented calibration and calibration routines, performance verification, proficiency testing, and staff qualification and training programs.

4.2.7 The certification organization shall require the manufacturer to establish and maintain a quality assurance program

that meets the requirements of Section 4.5, Manufacturers' Quality Assurance Program.

4.2.7.1* The certification organization shall require the manufacturer to have a product recall system as specified in Section 4.8, Manufacturers' Safety Alert and Product Recall Systems, as part of the manufacturer's quality assurance program.

4.2.7.2 The certification organization shall audit the manufacturer's quality assurance program to ensure that the quality assurance program provides continued product compliance with this standard.

4.2.8 The certification organization and the manufacturer shall evaluate any changes affecting the form, fit, or function of the compliant product to determine its continued certification to this standard.

4.2.8.1 The certification organization and the manufacturer shall evaluate replacement parts, components, and software to determine any changes affecting the form, fit, or function of PASS or RF PASS devices certified to earlier editions of this standard to permit incorporation of replacement parts, components, or software, leading to certification of devices to this edition of the standard.

4.2.9* The certification organization shall have a follow-up inspection program of the manufacturer's facilities of the compliant product with at least two random and unannounced visits per 12-month period to verify the product's continued compliance.

4.2.9.1 As part of the follow-up inspection program, the certification organization shall select sample compliant product at random from the manufacturer's production line, from the manufacturer's in-house stock, or from the open market.

4.2.9.2 Sample product shall be evaluated by the certification organization to verify the product's continued compliance in order to assure that the materials, components, and manufacturing quality assurance systems are consistent with the materials, components, and manufacturing quality assurance that were inspected and tested by the certification organization during initial certification and recertification.

4.2.9.3 The certification organization shall be permitted to conduct specific testing to verify the product's continued compliance.

4.2.9.4 For products, components, and materials where prior testing, judgment, and experience of the certification organization have shown results to be in jeopardy of not complying with this standard, the certification organization shall conduct more frequent testing of sample product, components, and materials acquired in accordance with 4.2.9.1 against the applicable requirements of this standard.

4.2.10 The certification organization shall have in place a series of procedures, as specified in Section 4.6, Hazards Involving Compliant Product, that address reports of situations in which a compliant product is subsequently found to be hazardous.

4.2.11 The certification organization's operating procedures shall provide a mechanism for the manufacturer to appeal decisions. The procedures shall include the presentation of information from both sides of a controversy to a designated appeals panel.

4.2.12 The certification organization shall be in a position to use legal means to protect the integrity of its name and label. The name and label shall be registered and legally defended.

4.3 Inspection and Testing.

4.3.1 For both initial certification and recertification of compliant products, the certification organization shall conduct both inspection and testing as specified in this section.

4.3.2 All inspections, evaluations, conditioning, and testing for certification or for recertification shall be conducted by a certification organization's testing laboratory that is accredited in accordance with the requirements of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

4.3.2.1 The certification organization's testing laboratory's scope of accreditation to ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, shall encompass testing of **PPE**.

4.3.2.2 The accreditation of a certification organization's testing laboratory shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.3.3 A certification organization shall be permitted to utilize conditioning and testing results conducted by a product or component manufacturer for certification or recertification provided the manufacturer's testing laboratory meets the requirements specified in 4.3.3.1 through 4.3.3.5.

4.3.3.1 The manufacturer's testing laboratory shall be accredited in accordance with the requirements of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

4.3.3.2 The manufacturer's testing laboratory's scope of accreditation to ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, shall encompass testing of **PPE**.

4.3.3.3 The accreditation of a manufacturer's testing laboratory shall be issued by an accreditation body operating in accordance with ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*.

4.3.3.4 The certification organization shall approve the manufacturer's testing laboratory.

4.3.3.5 The certification organization shall determine the level of supervision and witnessing of the conditioning and testing for certification or recertification conducted at the manufacturer's testing laboratory.

4.3.4 Sampling levels for inspection to determine compliance with this standard shall be established by the certification organization and the manufacturer to ensure a reasonable and acceptable reliability at a reasonable and acceptable confidence level that products certified as being compliant with the standard are compliant.

4.3.5 Inspection by the certification organization shall include a review of all product labels to ensure that all required label attachments, compliance statements, certification statements, and other product information are at least as specified in Section 5.1, Product Labeling Requirements.

4.3.6 Inspection by the certification organization shall include an evaluation of any symbols and pictorial graphic representations used on product labels or in user information, as permitted in 5.1.4, to ensure that the symbols are clearly explained in the product's user information package.

4.3.7 Inspection by the certification organization shall include a review of the user information required by Section 5.2, User Information, to ensure that the information has been developed and is available.

4.3.8 Inspection by the certification organization for determining compliance with the design requirements specified in Chapter 6 shall be performed on whole and complete PASS.

4.3.9* Testing conducted by the certification organization in accordance with the testing requirements of Chapter 8, for determining product compliance with the applicable performance requirements specified in Chapter 7, shall be performed on whole and complete PASS. Where the PASS is an integral part of another item of protective clothing or protective equipment, that item with the PASS incorporated shall be tested as a whole, unless otherwise specified herein.

4.3.10 PASS shall be tested for initial certification to this edition of NFPA 1982 and shall meet the performance requirements of the test series specified in the test matrix in Table 4.3.10(a) and Table 4.3.10(b) as applicable, for the type of PASS being certified.

4.3.10.1 Where there is more than one test for a single test specimen required by Table 4.3.10(a) or Table 4.3.10(b), the order of testing shall be from top to bottom of the test specimen column as shown in the table.

4.3.10.2 When testing removable integrated PASS, test specimens 1, 2, and 3, as identified in Table 4.3.10(a), shall be in the integrated PASS configuration.

4.3.10.3 When testing specimen PASS in accordance with Section 8.3, Electronic Temperature Stress Test; Section 8.4, Corrosion Resistance Test; Section 8.5, Heat and Immersion Leakage Test; Section 8.6, Case Integrity Test; Section 8.8, Impact Acceleration Resistance Test; and Section 8.13, Heat and Flame Test, one specimen PASS, instead of all three specimens tested in each test series, shall be selected to be used for evaluation of the requirements of 7.1.2. The one specimen PASS that is selected shall be chosen at random from each of the respective series of three specimens for each test.

4.3.11 Any change in the design, construction, or material of a compliant PASS shall necessitate new inspection and testing to verify compliance to all applicable requirements of this standard that the certification organization determines can be affected by such change. This recertification shall be conducted before labeling the modified PASS as being compliant with this standard.

4.3.12 The certification organization shall not allow any modifications, pretreatment, conditioning, or other such special processes of the PASS or any PASS component, prior to the

Table 4.3.10(a) Test Matrix for Stand-Alone PASS and Removable Integrated PASS

Test Order	Specimens 1-3	Specimens 4-6	Specimens 7-9	Specimens 10-12	Specimens 13-15	Specimens 16-18	Specimens 19-21	Specimens 22-24
1	Sound pressure (Section 8.2), specimens 1-3	Shock sensitivity (Section 8.7), specimens 4-6	Electronic temperature stress — elevated (8.3.5), specimens 7-9	Water drainage (Section 8.11), specimens 10-12	Case integrity (Section 8.6), specimens 13-15	Vibration test (Section 8.9), specimens 16-18	Tumble vibration (Section 8.17), specimens 19-21	Signal frequencies (Sections 8.14 and 8.15), specimens 22-24
2	Alarm signal muffle (Section 8.18), specimens 1-3	Impact acceleration — ambient (Section 8.8), specimen 4	Electronic temperature stress — low (8.3.6), specimens 7-9	Corrosion (Section 8.4), specimens 10-12	Retention system (Section 8.10), specimens 13-15		Point-to-point RF attenuation test (Section 8.19), specimens 19-21	
3		Impact acceleration — cold (Section 8.8), specimen 5	Electronic temperature stress — shock (8.3.7), specimens 7-9	Product label durability (Section 8.16), specimens 10-12	High temperature functionality (Section 8.12), specimens 13-15		Loss-of-signal alarm test (Section 8.20), specimens 19-21	
4	Heat/flame test 1 (8.13.5.8), specimen 1	Impact acceleration — elevated (Section 8.8), specimen 6	Product label durability (Section 8.16), specimens 7-9				RF interference test (Section 8.21), specimens 19-21	
5	Heat/flame test 2 (8.13.5.9), specimen 2		Heat and immersion leakage (Section 8.5), specimens 7-9				RF Multipath Test (Section 8.22) specimens 19-21	
6	Heat/flame test 3 (8.13.5.10), specimen 3		Product label durability (Section 8.16), specimens 7-9				RF Multi-hop Test (Section 8.23) specimens 19-21	

Shaded text = Revisions. **Δ** = Text deletions and figure/table revisions. • = Section deletions. **N** = New material



Table 4.3.10(b) Test Matrix for Nonremovable Integrated PASS

Test Order	Specimens 1–3	Specimens 4–6	Specimens 7–9	Specimens 10–12	Specimens 13–15	Specimens 16–18	Specimens 19–21
1	Sound pressure (Section 8.2), specimens 1–3	Shock sensitivity (Section 8.7), specimens 4–6	Electronic temperature stress — elevated (8.3.5), specimens 7–9	Water drainage (Section 8.11), specimens 10–12	Case integrity (Section 8.6), specimens 13–15	Tumble vibration (Section 8.17), specimens 16–18	Signal frequencies (Sections 8.14 and 8.15), specimens 19–21
2	Alarm signal muffle (Section 8.18), specimens 1–3	Vibration test (Section 8.9), specimens 4–6	Electronic temperature stress — low (8.3.6), specimens 7–9	Corrosion (Section 8.4), specimens 10–12	High temperature functionality (Section 8.12), specimens 13–15	Point-to-point RF attenuation test (Section 8.19), specimens 16–18	
3			Electronic temperature stress — shock (8.3.7), specimens 7–9	Product label durability (Section 8.16), specimens 10–12		Loss-of-signal alarm test (Section 8.20), specimens 16–18	
4	Heat/flame test 1 (8.13.5.8), specimen 1		Product label durability (Section 8.16), specimens 7–9			RF interference test (Section 8.21), specimens 16–18	
5	Heat/flame test 2 (8.13.5.9), specimen 2		Heat and immersion leakage (Section 8.5), specimens 7–9			RF Multipath Test (Section 8.22) specimens 16–18	
6	Heat/flame test 3 (8.13.5.10), specimen 3		Product label durability (Section 8.16), specimens 7–9			RF Multi-hop Test (Section 8.23) specimens 16–18	

product's submission for evaluation and testing by the certification organization. The certification organization shall accept, from the manufacturer for evaluation and testing for certification, only PASS or PASS components that are the same in every respect to the actual final product or component. Other than as specifically permitted herein, the certification organization shall not allow the substitution, repair, or modification of any PASS or any PASS component during testing.

4.3.13* All testing and inspection shall be performed utilizing the power source(s) specified on the PASS in accordance with 5.1.7(6).

4.4 Recertification.

4.4.1 After initial certification to this edition of NFPA 1982, compliant PASS shall be tested annually for recertification within 12 months from the previous certification or recertification.

4.4.2 Recertification shall occur each year of the 4 years following initial certification. If there is no revision to this edition of NFPA 1982 by the fifth year following initial certification, compliant PASS shall be required to undergo full certification testing as specified in 4.3.10 in the fifth year.

4.4.3 Unless otherwise indicated, only one test specimen shall be required for each test specified in Table 4.3.10(a) or Table 4.3.10(b), as applicable for the type of PASS being recertified.

4.4.4 Where there is more than one test for a single test specimen PASS required by Table 4.3.10(a) or Table 4.3.10(b), the order of testing shall be from top to bottom of the test specimen column as shown in the tables.

4.5 Manufacturers' Quality Assurance Program.

4.5.1 The manufacturer shall provide and operate a quality assurance program that meets the requirements of this section and that includes a product recall system as specified in 4.2.7.1, and Section 4.8, Manufacturers' Safety Alert and Product Recall Systems.

4.5.2 The operation of the quality assurance program shall evaluate and test compliant product production to the requirements of this standard to assure production remains in compliance.

4.5.3 The manufacturer shall be registered to ISO 9001, *Quality management systems — Requirements*.

4.5.3.1 Registration to the requirements of ISO 9001, *Quality management systems — Requirements*, shall be conducted by a registrar that is accredited for PPE.

4.5.3.2 Registrars specified in 4.5.3.1 shall be accredited for PPE in accordance with ISO/IEC 17021-1, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

▲ 4.5.3.3 Any new accreditations for registrars specified in 4.5.3.1 for PPE shall only be in accordance with ISO/IEC 17021-1, *Conformity assessment — Requirements for bodies providing audit and certification of management systems*.

4.5.4* Any entity that meets the definition of *manufacturer* specified in Section 3.3, General Definitions, and therefore is considered to be the “manufacturer” but does not manufacture or assemble the compliant product, shall meet the requirements specified in this Section 4.5.

4.5.5* Where the manufacturer uses subcontractors in the construction or assembly of the compliant product, the locations and names of all subcontractor facilities shall be documented, and the documentation shall be provided to the manufacturer’s ISO registrar and to the certification organization.

4.6 Hazards Involving Compliant Product.

4.6.1* The certification organization shall establish procedures to be followed where situation(s) are reported in which a compliant product is subsequently found to be hazardous. These procedures shall comply with the provisions of ISO Guide 27, *Guidelines for corrective action to be taken by a certification body in the event of misuse of its mark of conformity*, and as modified herein.

4.6.2* Where a report of a hazard involved with a compliant product is received by the certification organization, the validity of the report shall be investigated.

4.6.3 With respect to a compliant product, a hazard shall be a condition or create a situation that results in exposing life, limb, or property to an imminently dangerous or dangerous condition.

4.6.4 Where a specific hazard is identified, the determination of the appropriate action for the certification organization and the manufacturer to undertake shall take into consideration the severity of the hazard and its consequences to the safety and health of users.

4.6.5 Where it is established that a hazard is involved with a compliant product, the certification organization shall determine the scope of the hazard including products, model numbers, serial numbers, factory production facilities, production runs, and quantities involved.

4.6.6 The certification organization’s investigation shall include, but not be limited to, the extent and scope of the problem as it might apply to other compliant product or compliant product components manufactured by other manufacturers or certified by other certification organizations.

4.6.7 The certification organization shall also investigate reports of a hazard where compliant product is gaining widespread use in applications not foreseen when the standard was written, such applications in turn being ones for which the product was not certified, and no specific scope of application has been provided in the standard, and no limiting scope of application was provided by the manufacturer in written material accompanying the compliant product at the point of sale.

4.6.8 The certification organization shall require the manufacturer of the compliant product, or the manufacturer of the compliant product component if applicable, to assist the certification organization in the investigation and to conduct its own

investigation as specified in Section 4.7, Manufacturers’ Investigation of Complaints and Returns.

4.6.9 Where the facts indicating a need for corrective action are conclusive and the certification organization’s appeal procedures referenced in 4.2.11 have been followed, the certification organization shall initiate corrective action immediately, provided there is a manufacturer to be held responsible for such action.

4.6.10 Where the facts are conclusive and corrective action is indicated, but there is no manufacturer to be held responsible, such as when the manufacturer is out of business or the manufacturer is bankrupt, the certification organization shall immediately notify relevant governmental and regulatory agencies and issue a notice to the user community about the hazard.

▲ 4.6.11* Where the facts are conclusive and corrective action is indicated, the certification organization shall take one or more of the following corrective actions:

- (1) Notification of parties authorized and responsible for issuing a safety alert when, in the opinion of the certification organization, such a notification is necessary to inform the users.
- (2) Notification of parties authorized and responsible for issuing a product recall when, in the opinion of the certification organization, such a recall is necessary to protect the users.
- (3) Removing the mark of certification from the product.
- (4) Where a hazardous condition exists and it is not practical to implement 4.6.11(1), 4.6.11(2), or 4.6.11(3); or the responsible parties refuse to take corrective action, the certification organization shall notify relevant governmental and regulatory agencies and issue a notice to the user community about the hazard.

4.6.12 The certification organization shall provide a report to the organization or individual identifying the reported hazardous condition and notify them of the corrective action indicated, or that no corrective action is indicated.

4.7 Manufacturers’ Investigation of Complaints and Returns.

4.7.1 Manufacturers shall provide corrective action in accordance with ISO 9001, *Quality management systems — Requirements*, for investigating written complaints and returned products.

4.7.2 Manufacturers’ records of returns and complaints related to safety issues shall be retained for at least 5 years.

4.7.3 Where the manufacturer discovers, during the review of specific returns or complaints, that a compliant product or compliant product component can constitute a potential safety risk to end users that is possibly subject to a safety alert or product recall, the manufacturer shall immediately contact the certification organization and provide all information about their review to assist the certification organization with their investigation.

4.8 Manufacturers’ Safety Alert and Product Recall Systems.

4.8.1 Manufacturers shall establish a written safety alert system and a written product recall system that describes the procedures to be used in the event that it decides, or is directed by the certification organization, to either issue a safety alert or to conduct a product recall.

4.8.2 The manufacturers’ safety alert and product recall system shall provide:

- (1) The establishment of a coordinator and responsibilities by the manufacturer for the handling of safety alerts and product recalls
- (2) A method of notifying all dealers, distributors, purchasers, users, and the NFPA about the safety alert or product recall that can be initiated within a 1-week period following the manufacturer's decision to issue a safety alert or to conduct a product recall, or after the manufacturer has been directed by the certification organization to issue a safety alert or conduct a product recall
- (3) Techniques for communicating accurately and understandably the nature of the safety alert or product recall and, in particular, the specific hazard or safety issue found to exist
- (4) Procedures for removing product that is recalled and for documenting the effectiveness of the product recall
- (5) A plan for either repairing, or replacing, or compensating purchasers for returned product

Chapter 5 Labeling and Information

5.1 Product Labeling Requirements.

5.1.1 Each PASS shall have a product label(s) permanently and conspicuously attached. In all cases, the PASS shall bear at least one product label with the marking requirements specified in 5.1.5 through 5.1.8.

5.1.1.1 Where various components of PASS are not mounted or contained in a single location, case, or enclosure, additional product labels shall be permanently and conspicuously attached to major dispersed components.

5.1.1.2 The text of the product labels for dispersed PASS components shall be permitted to be limited to the marking requirements specified in 5.1.5 and 5.1.6.

5.1.2 Multiple label pieces shall be permitted in order to carry all statements and information required to be on the product label.

5.1.3 All worded portions of the required product label(s) shall be printed at least in English.

5.1.4 Symbols and other pictorial graphic representations shall be permitted to be used to supplement worded statements on the product label(s).

5.1.5* The certification organization's label, symbol, or identifying mark shall be attached to the product label or shall be part of the product label. The label, symbol, or identifying mark shall be at least 6 mm ($\frac{1}{4}$ in.) in height and shall be placed in a conspicuous location.

5.1.6 One of the following statements, as applicable, shall be legibly printed on the product label(s) and placed in a conspicuous location. All letters shall be at least 2 mm ($\frac{1}{16}$ in.) in height.

N 5.1.6.1 For PASS devices without RF capability, the label shall read:

THIS PASS MEETS THE REQUIREMENTS OF NFPA 1982,
STANDARD ON PERSONAL ALERT SAFETY SYSTEMS
(PASS), 2018 EDITION. DO NOT REMOVE THIS LABEL.

N 5.1.6.2 For PASS devices with RF capability, the label shall read:

THIS RF PASS MEETS THE REQUIREMENTS OF NFPA 1982,
STANDARD ON PERSONAL ALERT SAFETY SYSTEMS
(PASS), 2018 EDITION. DO NOT REMOVE THIS LABEL.

N 5.1.6.3 For RF PASS with repeating capability, the label shall read:

THIS RF PASS (RPT) MEETS THE REQUIREMENTS OF
NFPA 1982, STANDARD ON PERSONAL ALERT SAFETY
SYSTEMS (PASS), 2018 EDITION. DO NOT REMOVE THIS
LABEL.

N 5.1.6.4

PASS or RF PASS devices certified to previous editions of this standard that have been upgraded to meet this edition shall have the following statement legibly printed. All letters shall be at least 2 mm ($\frac{1}{16}$ in.) in height. The label is not restricted to one line. The original NFPA required labeling shall not be removed or covered by the upgrade label.

UPGRADED TO NFPA 1982, 2018 EDITION.

5.1.7 At least the following information shall also be legibly printed on the product label(s) and placed on each PASS in a user-accessible location, and all letters shall be at least 2 mm ($\frac{1}{16}$ in.) in height:

- (1) Manufacturer name, identification, or designation
- (2) Country of manufacture
- (3) Model name, number, or design
- (4) Identification/lot/serial number
- (5) Month and year of manufacture, not coded
- (6) Recommended power source type and size if user replaceable

5.1.8 PASS also shall be labeled as certified at least to the requirements for Class I, Groups C and D; and Class II, Groups E, F, and G; Division 1 hazardous locations specified in ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations*.

5.1.9 All product labels also shall meet the requirements specified in Section 7.13, Product Label Durability.

5.1.10 The base station component of an RF PASS system shall identify the maximum number of RF PASS alarm signals that the base station can process. This number shall be clearly printed on the product label.

5.1.11 The base station and RF PASS units shall contain the appropriate product label specified by FCC guidelines, if any, for the radio system technology used.

5.2 User Information.

5.2.1 The PASS manufacturer shall provide with each PASS at least the user information that is specified in 5.2.4.

5.2.2 The PASS manufacturer shall attach the required user information or packaging containing the user information to the PASS in such a manner that it is not possible to initially use the PASS without being aware of the information.

5.2.3 The required user information or packaging containing the user information shall be attached to the PASS so that a deliberate action is necessary to remove it. The PASS manufacturer shall provide notice that the user information is to be removed only by the end user.

5.2.4 The PASS manufacturer shall provide at least the following instructions and information with each PASS:

- (1) Pre-use information as follows:
 - (a) Safety considerations
 - (b) Limitations of PASS
 - (c) Marking recommendations and restrictions
 - (d) Warranty information
- (2) Preparation for use as follows:
 - (a) Preferred mounting position and orientation for optimal performance
 - (b) Training instructions
 - (c) Recommended storage practices
- (3) Inspection frequency and details
- (4) Proper use
- (5) Maintenance and cleaning as follows:
 - (a) Cleaning instructions and precautions
 - (b) Power source testing and replacement
 - (c) Adjustments, if applicable
 - (d) Maintenance criteria
 - (e) Painting
 - (f) Decontamination procedures
- (6) Retirement criteria and considerations
- (7) Procedure for reporting PASS problems to the manufacturer and to the certification organization

Chapter 6 Design Requirements

6.1 General Design Requirements for PASS.

6.1.1 PASS shall have at least the applicable design requirements specified in this section where inspected and evaluated by the certification organization as specified in Section 4.3, Inspection and Testing.

6.1.2 In all instances, the design of PASS shall provide for the safety and security of the functioning of the PASS.

6.1.2.1 PASS that is designed as a self-contained, independent device contained in a single case, housing, or enclosure and that is not an integral part or parts of any item or multiple items of protective clothing, protective equipment, or both shall be designated as “stand-alone PASS.”

6.1.2.2 PASS that is designed with dispersed components as part or parts of any item or multiple items of protective clothing, protective equipment, or both and the dispersed components are not mounted, grouped, or contained in a single location nor in a single case, housing, or enclosure, but with multiple cases, housings, or enclosures, shall be designated as “integrated PASS.”

6.1.2.3 Where integrated PASS is designed and intended to be readily removed from the item or multiple items of protective clothing, protective equipment, or both, so that it can also be used independently, such integrated PASS shall be designated as “removable integrated PASS.”

6.1.2.4 Where integrated PASS is not designed and not intended to be readily removed from the item or multiple items of protective clothing, protective equipment, or both so that it cannot be used independently, such integrated PASS shall be designated as “nonremovable integrated PASS.”

6.1.2.5 Where the PASS device is equipped with an RF PASS in addition to emitting an alarm signal, it shall also transmit and

receive other alarm signals through the use of a modulated radio-frequency carrier. The RF PASS system shall consist of a wireless RF transceiver contained within or linked to the RF PASS, and a base station RF transceiver that might be self-contained or designed to operate in conjunction with a portable computer. The base station unit shall be capable of battery operation for up to 1 hour under alarm conditions. The use of repeaters is not precluded.

6.1.2.5.1 The base station shall be designed to emit a **visual alarm** when the alarm signal described in 6.4.3 is activated by the RF PASS unit, when the evacuation alarm is initiated, and/or when the loss-of-signal alarm is triggered.

6.1.2.5.2 Both the RF PASS unit and base station shall comply with FCC regulations for radio-frequency transmissions for the transmission format chosen by the manufacturer.

6.1.2.5.3 Antennas and/or other peripheral electronic components designed for use with RF PASS shall not interfere with or impede fire-fighting operations.

6.1.2.5.4 Software used in conjunction with RF PASS and base stations shall be updated as necessary within 6 months by the manufacturer for newly released versions of the computer operating system for which the software was designed.

6.1.3* PASS shall incorporate data logging in nonvolatile memory and, at a minimum, the following events shall be identified and recorded with the data log and shall also have a date and time stamp for each event in the data log:

- (1) When the PASS is turned on
- (2) When the PASS activates any alarm or pre-alarm
- (3) When the PASS alarm is activated by the user
- (4) When the PASS alarm was reset
- (5) When the PASS was turned off
- (6) When the PASS low power source warning signal activates

6.1.3.1 The data logging information shall be downloadable by the emergency services organization.

6.1.3.2 The data logging shall have a minimum capacity of logging 2000 events.

6.1.3.3 Data logging shall be permitted to be carried out via RF signals transmitted by an RF PASS and received by the base station.

6.1.4* Where PASS designated as stand-alone PASS or as integrated PASS are secured by a retention system in a wearing position, in accordance with the manufacturer's instructions, the retention system shall not affect the proper function of the mode selection device or devices specified in Section 6.2, Mode Selection Design Requirements for PASS, and shall not affect the performance of the PASS when tested to the performance requirements specified in Chapter 7.

6.1.5* PASS power source(s) shall be isolated from the operating components to prevent damage to the components.

6.1.6 All PASS hardware finishes shall be free of all rough spots, burrs, and sharp edges.

6.1.7 All sewing thread used in the construction of PASS shall be made of inherently flame-resistant fiber.

6.2 Mode Selection Design Requirements for PASS.

6.2.1 PASS shall allow for operation in at least three modes: (1) off, (2) alarm, (3) sensing.

6.2.2 The mode selection device(s) shall be designed to provide automatic activation from the off mode to the sensing mode without the user setting the mode selection device.

6.2.2.1 Such automatic activation shall include, but not be limited to, being linked to activation of SCBA, being linked to removal from storage or transportation positions, by pull-away tether to a fixed position, or by remote activation.

6.2.2.2 Such automatic activation shall be designed so that when PASS is automatically activated it shall be able to be manually switched from the sensing mode to the alarm mode with the mode selection device but shall not be able to be switched to the off mode until the automatic activation means is also intentionally deactivated.

6.2.2.3 Base station units for RF PASS shall indicate on a visual display the presence of all RF PASS units that are in sensing mode.

6.2.3 All mode selection devices shall be protected against accidental change of operation and impact damage.

6.2.4 All mode selection devices shall be rated for a service life of not fewer than 50,000 cycles.

6.2.5 All mode selection devices shall be capable of being switched to the alarm or sensing mode by a single gloved hand. The fingers of gloves utilized for this function test shall have a thickness of 2.5 mm to 4 mm ($\frac{3}{32}$ in. to $\frac{5}{32}$ in.).

6.2.6 Only one action shall be required to switch the mode selection device(s) from any mode to alarm mode.

6.2.7 When PASS is sounding the alarm signal, it shall require at least two separate and distinct manual actions to silence the alarm signal.

6.2.7.1 Any action to silence the alarm signal and the actual silencing of the alarm signal shall not permit PASS to remain in the off mode.

6.2.7.2 The silencing of the alarm signal shall automatically reset PASS to the sensing mode.

6.2.7.3 Base station units for RF PASS shall indicate on a visual display the presence of all RF PASS units that are in alarm mode.

6.2.8 PASS shall be provided with a light source capable of providing a visual indication of mode status as well as an audible source capable of providing an aural indication of a change in the mode selection when switching from off to sensing, off to alarm, and alarm to sensing.

6.2.8.1 Base station units for RF PASS shall utilize a different visual display to indicate sensing and alarm modes.

6.3 Motion Sensing Design Requirements for PASS.

6.3.1 PASS shall incorporate motion sensing that shall detect motion and lack of motion of the person on whom the PASS is deployed and cause the activation of the sequence that leads to the sounding of the alarm signal when lack of motion is detected for the specified time.

6.3.2 PASS shall sound the alarm signal specified in 6.4.3 when the PASS does not sense movement for 30 seconds, +5/–0 seconds.

6.3.2.1 The base station associated with RF PASS shall receive the alarm signal within 30 seconds +5/–0 seconds of its transmission by the RF PASS, unless RF communication has been lost.

6.3.3 The alarm signal shall be preceded by a pre-alarm signal as specified in 6.4.2 that shall sound for 10 seconds +3/–0 seconds before the sounding of the alarm signal.

6.3.4 PASS motion sensing shall function regardless of the angle of deployment of the PASS.

6.3.5 PASS shall be designed so that any failure of the motion sensing function shall cause the PASS to sound the alarm signal as specified in 6.4.3 within 30 seconds +5/–0 seconds of such failure. The PASS manufacturer shall submit a failure modes and effects analysis (FMEA) to the certification organization for verification of this requirement.

6.3.6 For RF PASS, the evacuation alarm shall be received within 30 seconds +5/–0 seconds of its transmission by the base station unless RF communication has been lost.

N 6.3.7 Failure Mode and Effects Analysis (FMEA) for Personal Alert Safety Systems.

N 6.3.7.1* An FMEA shall be applied throughout the development process.

N 6.3.7.2 The FMEA shall address PASS and shall identify and prioritize those critical failures that could have a serious effect on the safety and reliability of a PASS in the anticipated operating environments.

N 6.3.7.3 The FMEA shall tabulate potential failure modes and their effects on the performance of a PASS. The failure mode shall describe how the system might fail.

N 6.3.7.4* The PASS manufacturer shall use the FMEA to address the reduction of risk of random and systematic failures of PASS by using as low as reasonably practical (ALARP) region activities, shown in Figure 6.3.7.4. The PASS manufacturer shall include the risk priority number (RPN) corresponding to the upper limit of the ALARP region in the FMEA report.

N 6.3.7.5 Where a PASS RPN as determined by the manufacturer is above the upper limit of the ALARP region as determined by the manufacturer, one or more of the practices specified in 6.3.7.5.1 shall be permitted.

N 6.3.7.5.1 Verification of the manufacturer's design and testing practices shall include documentation of at least temperature, vibration, and wetness exposure data, hours of operation, and management of change information.

N 6.3.7.6 The FMEA report shall be provided to the certification organization.

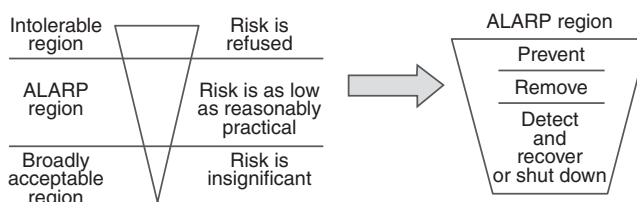


FIGURE 6.3.7.4 ALARP Region Activities. [1801: Figure 6.3.4]

6.4 Signal Design Requirements for PASS.

6.4.1 Operational Signal.

6.4.1.1 PASS shall emit an audible “operational signal” within 1 second of completing the required action to set PASS to the sensing mode, indicating to the user that the device is functioning properly.

6.4.1.2 When PASS is in the off mode and the power source is at or below the level specified in 6.4.4.1, the operational signal shall not sound when PASS is switched to the sensing mode.

6.4.2 Pre-Alarm Signal.

6.4.2.1 The PASS shall have at least an audible primary “pre-alarm signal.” The audible primary pre-alarm signal shall be a distinct and different sound from the alarm signal.

6.4.2.2 PASS shall be permitted to incorporate a supplementary pre-alarm signal or signals in addition to the audible primary pre-alarm signal to enhance the ability of the user to detect and identify the pre-alarm status. Supplementary pre-alarm signals shall be variable in a continuous pattern or shall be recurrent.

6.4.2.2.1 The supplementary pre-alarm signal shall alert senses other than hearing.

6.4.2.2.2 When activated, the supplementary pre-alarm signal shall not diminish the performance of the audible primary pre-alarm signal below the requirements of this standard.

6.4.2.2.3 The design of the supplementary pre-alarm signal shall be such that failure of the supplementary pre-alarm signal shall not affect the activation or operation of the audible primary pre-alarm signal.

6.4.2.3 PASS shall sound the pre-alarm signal(s) 12 seconds +/- 2 seconds prior to the sounding of the alarm signal.

6.4.2.4 During the pre-alarm signal(s) sounding, all other audible PASS signals, other than the alarm signal, shall be rendered inactive.

6.4.2.5 PASS shall be designed to have at least a motion-induced cancellation of functioning of the pre-alarm signal(s) prior to the sounding of the alarm signal.

6.4.2.6 Cancellation of the sounding of the audible primary pre-alarm signal and cancellation of functioning of the supplementary pre-alarm signal(s) shall not require the use of the user's hand(s).

6.4.2.7 PASS shall reset to the sensing mode upon cancellation of the pre-alarm signal.

6.4.2.8 Audible Primary Pre-Alarm Signal. The PASS annunciator shall be driven by a pre-alarm sequence consisting of the following three steps:

- (1) Step 1: A Type-1 tone pair, repeated in sequence as follows with each tone duration being 500 ms ± 20 ms:
 - (a) Tone 1..Tone 2..Tone 1..<silence 500 ms ± 20 ms>
 - (b) Tone 1..Tone 2..Tone 1..<silence 500 ms ± 20 ms> immediately followed by Step 2.
- (2) Step 2: A Type 2 tone pair, repeated in sequence as follows with each tone duration being 250 ms ± 10 ms:
 - (a) Tone 3..Tone 4..Tone 3..<silence 250 ms ± 10 ms>
 - (b) Tone 3..Tone 4..Tone 3..<silence 250 ms ± 10 ms>

- (c) Tone 3..Tone 4..Tone 3..<silence 250 ms ± 10 ms>
- (d) Tone 3..Tone 4..Tone 3..<silence 250 ms ± 10 ms> immediately followed by Step 3.

(3) Step 3: A Type 3 tone pair, repeated in sequence as follows with each tone duration being 125 ± 10 ms:

- (a) Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..<silence 125 ms ± 10 ms>
- (b) Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..<silence 125 ms ± 10 ms>
- (c) Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..<silence 125 ms ± 10 ms>
- (d) Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..Tone 6..Tone 5..<silence 125 ms ± 10 ms>

6.4.2.8.1 The total duration of the three steps shall comply with the time window for the pre-alarm specified in 6.3.3.

6.4.2.8.2 Tone pair definitions: The frequency of all tones shall be between 1000 Hz and 4000 Hz, with the second tone of each pair (Tone 2, Tone 4, and Tone 6) being 250 Hz + 250/-50 Hz higher than the first tone (Tone 1, Tone 3, and Tone 5) of the pair. It shall be permitted for each step's tone pair to be the same two tones or for them to rise to higher tones. If rising tone pairs are deployed, the frequency gap between Tone 2 and Tone 3 and between Tone 4 and Tone 5 shall be 250 Hz + 250/-50 Hz.

6.4.3 Alarm Signal.

6.4.3.1 PASS shall sound the alarm signal when switched to the alarm signal mode.

6.4.3.2 While in the motion sensing mode, PASS shall sound the alarm signal when activated by the motion sensing component when motion is not detected for 30 seconds.

6.4.3.2.1 For RF PASS, while in the sensing mode, the PASS shall sound an audible evacuation or other alarm within 30 seconds of the evacuation or other alarm being sent by the base station, unless the RF PASS is in alarm mode or the unit is out of range. Upon resetting the alarm condition, the RF PASS shall sound the evacuation or other alarm within 30 seconds. While the RF PASS is in alarm mode, no other audible alarms shall override or impede the alarm signal. For RF PASS with integrated repeating capability, the alarm shall be received within 30 seconds after two repeater hops, as specified by Section 8.23, Multi-hop RF Test.

6.4.3.3 When activated by the motion sensor, the alarm signal shall be preceded by the pre-alarm signal, which shall sound 10 seconds +3/-0 seconds before the sounding of the alarm signal.

6.4.3.4 During the alarm signal sounding, all other audible PASS signals shall be rendered inactive.

6.4.3.4.1 For RF PASS, during the alarm signal sounding, all other audible PASS signals shall be rendered inactive.

6.4.3.5 The alarm signal shall have a duration of at least 1 hour at the PASS.

6.4.3.5.1 For RF PASS, the alarm signal shall have a duration of at least 1 hour at the base station.

6.4.3.6 The alarm signal, once activated, shall not be deactivated by the motion detector.