

NFPA®

496

Standard for
Purged and Pressurized
Enclosures for
Electrical Equipment

2021



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NFPA® 496

Standard for

Purged and Pressurized Enclosures for Electrical Equipment

2021 Edition

This edition of NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*, was prepared by the Technical Committee on Electrical Equipment in Chemical Atmospheres. It was issued by the Standards Council on March 15, 2020, with an effective date of April 4, 2020, and supersedes all previous editions.

This edition of NFPA 496 was approved as an American National Standard on April 4, 2020.

Origin and Development of NFPA 496

This standard was developed in two parts by the Technical Committee on Electrical Equipment in Chemical Atmospheres. The first part, addressing purged enclosures for electrical equipment in Class I hazardous (classified) locations, was adopted as a tentative standard at the 1966 NFPA Annual Meeting and as an official standard at the 1967 NFPA Annual Meeting. The second part, addressing pressurized enclosures for electrical equipment in Class II hazardous (classified) locations, was tentatively adopted at the 1970 NFPA Annual Meeting and officially adopted at the 1971 NFPA Annual Meeting.

The Technical Committee on Electrical Equipment in Chemical Atmospheres presented a complete revision of the entire standard for the 1974 edition. In 1980, the committee began another complete revision, which culminated in the 1982 edition.

In 1983, the technical committee recognized the need for specific requirements applicable to process control analyzers that have internal sources of a flammable or combustible material, such as a direct connection to the process stream. Two chapters were added to address analyzer enclosures and analyzer rooms or buildings. Additional changes were also made to certain existing portions of the text specifically to address problems in the interpretation of the existing text. The 1986 edition of NFPA 496 was the result of that effort.

In 1987, the technical committee recognized a need for editorial revisions to the figures in Chapter 2 as well as some minor editorial changes in Chapters 2 and 9 and Appendix A. The 1989 edition was the result of that effort.

Beginning in 1990, an ad hoc committee consisting of members of the Technical Committee on Electrical Equipment in Chemical Atmospheres started a major rewrite of the document to develop a more comprehensive standard and to reduce redundancy in the text. Definitions were added for further clarity, and references to Class III were deleted, since the standard did not cover that application and could create some confusion. The term *purging* was replaced with *pressurizing*, and *protective gas* was introduced as a new term. The requirements based on gross internal volume were deleted and replaced with general and specific requirements for all pressurized enclosures used in Class I and Class II locations. The result of the rewrite was the 1993 edition.

In 1997, the technical committee entered NFPA 496 into the revision cycle to update the requirements. The standard was updated to include definitions and references to Article 505 in *NFPA 70®*, *National Electrical Code®*, which deals with Class I, Zone 1, and Zone 2 locations. It also was changed to provide an exception for control rooms, where doors and other openings used solely for equipment relocation are permitted to be excluded from the calculation for outward air velocity from the central room.

In 2001, the Technical Committee on Electrical Equipment in Chemical Atmospheres entered NFPA 496 into the May 2003 revision cycle. The 2003 edition was significantly revised and reorganized for conformance with the 2000 *Manual of Style for NFPA Technical Committee Documents*. Additionally, technical changes included revision of the term *alarm* to clarify its function with



protected enclosures, and a revision that permits the use of a means other than a timing device to ensure that electrical equipment within a protected enclosure is not energized until the specified amount of protective gas has passed through the enclosure.

The 2008 edition was the culmination of a revision cycle that began with the document being entered into cycle in January 2006. NFPA 496 contains requirements on a protection technique for electrical and electronic equipment recognized by *NFPA 70, National Electrical Code*, for installations in hazardous (classified) locations. To ensure correlation with revisions occurring in the 2008 *NEC*, the Technical Committee on Electrical Equipment in Chemical Atmospheres requested and was granted permission by the NFPA Standards Council to enter into a three-year (Fall 2007) revision cycle. Significant revisions to the 2008 edition included the following: (1) a new requirement to mark purged and pressurized enclosures with an asphyxiation hazard warning where the protective gas is other than air and (2) deletion of 6.2.5, Table 6.2.5, and A.6.2.5 on Class II temperatures because the temperature class ratings for equipment in 4.5.3 correlate with the current temperature rating requirements for new equipment in Class I and Class II locations contained in 500.8(D)(1) and 500.8(D)(2) of the *NEC*.

The 2013 edition was revised to ensure correlation with the 2011 edition of *NFPA 70, National Electrical Code*. The definition of *energized* and *identified* were extracted from *NFPA 70*. Equipment was required to be identified for use in a classified area, and the requirements for determining the suitability of identified equipment were clarified. The definitions of *Type X*, *Type Y*, and *Type Z pressurizing* were clarified to more clearly define their usage.

The 2017 edition was revised to no longer include unenforceable language such as *near*, *close to*, and *significant portion*. Such terms cannot be quantified in the design or evaluation of an installation designed to the standard.

The 2021 edition has been revised to include changes mostly in the annexes. Annex 4.3.1 has been updated to clarify that components that complete the enclosure are subject to the same considerations as the enclosure itself. Methods to prevent the enclosure from excessive protective gas pressure have been detailed in A.4.3.1.1. Methods to prevent the discharge of ignition-capable particles to a Division 1 location have been provided in A.4.3.1.2. Annexes for 4.3.1 and its subsections have been included to correlate with ANSI/ISA-12.04.04-2012, *Pressurized Enclosures*. Requirements for alarms on pressurizing system bypasses and safety measures to prevent their accidental opening have been added to 4.4.5, because pressurization systems with this function are available. French translations of required markings have been added throughout the document. Guidance, including a possible test, to confirm that enclosures do not contain trapped flammable gases has been provided in A.5.2.3. A.5.2.6 has been revised to indicate that internal components in or through enclosure walls might not be properly protected by purge/pressurization. A.5.2.6.1 has been added for internal components with a small internal volume that might not require protection. Area electrical classifications have been revised throughout the document to correlate with the *NEC*® electrical classification.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on (1) developing data on the properties of chemicals enabling proper selection of electrical equipment for use in atmospheres containing flammable gases, vapors or dusts; (2) making recommendations for the prevention of fires and explosions through the use of continuously purged, pressurized, explosion-proof, or dust-ignition-proof electrical equipment where installed in such chemical atmospheres.

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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. 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 and extracted publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard applies to purging and pressurizing for the following:

- (1) Electrical equipment located in areas classified as hazardous by Article 500 or Article 505 of NFPA 70®
- (2) Electrical equipment containing sources of flammable vapors or gases and located in either classified or unclassified areas
- (3) Control rooms or buildings located in areas classified as hazardous by Article 500 or Article 505 of NFPA 70
- (4) Analyzer rooms containing sources of flammable vapors or gases and located in areas classified as hazardous by Article 500 or Article 505 of NFPA 70

Δ 1.1.2* This standard does not apply to electrical equipment located in any of the following:

- (1) Areas classified as Zone 0
- (2) Areas classified as Class III

- (3) Areas where flammable liquids might be splashed or spilled on the electrical equipment

1.2 Purpose. This standard provides information on the methods for purging and pressurizing enclosures to prevent ignition of a flammable atmosphere that could be introduced into the enclosure by a surrounding external atmosphere or by an internal source. By these means, electrical equipment that is not otherwise acceptable for a flammable atmosphere can be utilized in accordance with Article 500 or Article 505 of NFPA 70.

1.3 Application.

1.3.1 Chapters 4, 5, and 6 of this standard apply to electrical instrument and process control equipment, motors, motor controllers, electrical switchgear, and similar equipment that is installed in hazardous (classified) locations and that does not contain an internal source of flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor.

1.3.2 Chapter 7 of this standard applies to control rooms that are located in hazardous (classified) locations and that do not contain an internal source of flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor.

1.3.3* Chapter 8 of this standard applies to electrical instruments, process control equipment, and similar enclosed equipment that contains an internal source of flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor.

1.3.4 Chapter 9 of this standard applies to analyzer rooms and buildings.

1.4 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.4.1 Where required by the authority having jurisdiction, technical documentation shall be submitted to demonstrate equivalency.

1.4.2 The system, method, or device requires approval for the intended purpose by the authority having jurisdiction.

1.5 Units of Measurement.

1.5.1 SI Units. Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI).

1.5.2 Compliance. Compliance with the numbers shown in either the SI system or the inch-pound system constitutes compliance with this standard.

1.6 Mandatory Rules, Permissive Rules, and Explanatory Material.

1.6.1 Mandatory Rules. Mandatory rules of this standard are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms *shall* or *shall not*.

1.6.2 Permissive Rules. Permissive rules of this standard are those that identify actions that are allowed but not required, are normally used to describe options or alternative methods, and are characterized by the use of the terms *shall be permitted* or *shall not be required*.

1.6.3 Explanatory Material. Explanatory material is located in Annex A. The information contained in Annex A is explanatory only and is not enforceable as part of this standard.

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 70®, *National Electrical Code®*, 2020 edition.

2.3 Other Publications.

Δ 2.3.1 ISA Publications. International Society of Automation, 67 T.W. Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709.

ANSI/ISA 60079-29-1, *Explosive Atmospheres — Part 29-1: Gas detectors — Performance requirements of detectors for flammable gases*, 2019.

2.3.2 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 70®, *National Electrical Code®*, 2020 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.

N 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. A piece of equipment that generates a visual or audible signal that is intended to attract attention.

3.3.2 Analyzer Room or Building. A specific room or building containing analyzers, **with one or more of the analyzers** piped to the process.

3.3.3* Autoignition Temperature (AIT). The **minimum temperature required to initiate or cause self-sustained combustion of a solid, liquid, or gas independently of the heating or heated element.**

N 3.3.4 Bypass Function. A mode for pressurization systems to maintain power on the protected equipment to allow for maintenance and service of the equipment without maintaining pressurization.

Δ 3.3.5 Enclosure Volume (Other Than Rotating Electric Machinery). The volume of the empty enclosure without internal equipment.

N 3.3.6 Enclosure Volume (Rotating Electric Machinery). The enclosure volume for motors, generators, and other rotating electric machinery is the volume within the enclosure minus the volume of the rotor, stator, and field coils.

3.3.7 Ignition-Capable Equipment. Equipment that, under normal operation, produces sparks, hot surfaces, or a flame that can ignite a specific flammable atmosphere.

3.3.8 Indicator. A piece of equipment that shows flows or pressure and is monitored periodically, consistent with the requirement of the application.

3.3.9 Power Switching Equipment. Equipment that **switches greater than 2500 VA per contact.**

3.3.10 Pressurization. The process of supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitable fiber.

3.3.10.1 Type X Pressurizing. Enables use of equipment suitable for unclassified locations within the protected enclosure where the equipment would otherwise be required to be suitable for Division 1 or Zone 1 locations.

3.3.10.2 Type Y Pressurizing. Enables use of equipment suitable for Division 2 or Zone 2 locations within the protected enclosure where the equipment would otherwise be required to be suitable for Division 1 or Zone 1 locations.

3.3.10.3 Type Z Pressurizing. Enables use of equipment suitable for unclassified locations within the protected enclosure where the equipment would otherwise be required to be suitable for Division 2 or Zone 2 locations.

3.3.11* Pressurizing System. A grouping of components used to pressurize and monitor a protected enclosure.

3.3.12 Protected Enclosure. An enclosure pressurized by a protective gas.

3.3.13 Protected Equipment. The electrical equipment internal to the protected enclosure.

3.3.14 Protective Gas. The gas used to maintain pressurization or to dilute a flammable gas or vapor.

3.3.15 Protective Gas Supply. The compressor, blower, or compressed gas container that provides the protective gas at a positive pressure, including inlet pipes or ducts, pressure regulators, outlet pipes or ducts, and any supply valves that are not adjacent to the pressurized enclosure.

3.3.16 Purging. The process of supplying an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level.

3.3.17* Specific Particle Density. The density of individual dust particles, as opposed to the bulk density of the material.

▲ 3.3.18* Ventilated Equipment. Equipment that requires airflow for heat dissipation in addition to pressurization to prevent entrance of flammable gases, vapors, or dusts.

3.4 NEC Extracted Definitions.

3.4.1 Class I, Division 1. A Class I, Division 1 location is a location: (1) In which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors can exist under normal operating conditions, or (2) In which ignitable concentrations of such flammable gases, flammable liquid-produced vapors, or combustible liquids above their flash points may exist frequently because of repair or maintenance operations or because of leakage, or (3) In which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition. [70:500.5(B)(1)]

3.4.2 Class I, Division 2. A Class I, Division 2 location is a location: (1) In which volatile flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or (2) In which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are normally prevented by positive mechan-

cal ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment, or (3) That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors above their flash points might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [70:500.5(B)(2)]

3.4.3 Class II, Division 1. A Class II, Division 1 location is a location: (1) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures, or (2) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, through operation of protection devices, or from other causes, or (3) In which Group E combustible dusts may be present in quantities sufficient to be hazardous in normal or abnormal operating conditions. [70:500.5(C)(1)]

3.4.4 Class II, Division 2. A Class II, Division 2 location is a location: (1) In which combustible dust due to abnormal operations may be present in the air in quantities sufficient to produce explosive or ignitable mixtures; or (2) Where combustible dust accumulations are present but are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but could as a result of infrequent malfunctioning of handling or processing equipment become suspended in the air; or (3) In which combustible dust accumulations on, in, or in the vicinity of the electrical equipment could be sufficient to interfere with the safe dissipation of heat from electrical equipment, or could be ignitable by abnormal operation or failure of electrical equipment. [70:500.5(C)(2)]

▲ 3.4.5 Zone 0. A Zone 0 location is a location in which one of the following conditions exists: (1) Ignitable concentrations of flammable gases or vapors are present continuously, or (2) Ignitable concentrations of flammable gases or vapors are present for long periods of time. [70:505.5(B)(1)]

▲ 3.4.6 Zone 1. A Zone 1 location is a location: (1) In which ignitable concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or (2) In which ignitable concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) In which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitable concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or (4) That is adjacent to a Zone 0 location from which ignitable concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [70:505.5(B)(2)]

▲ 3.4.7 Zone 2. A Zone 2 location is a location: (1) In which ignitable concentrations of flammable gases or vapors are not likely to occur in normal operation and, if they do occur, will exist only for a short period; or (2) In which volatile flammable