



UL 120101

STANDARD FOR SAFETY

Definitions and Information Pertaining
to Electrical Equipment in Hazardous
Locations

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UL Standard for Safety for Definitions and Information Pertaining to Electrical Equipment in Hazardous Locations, UL 120101

First Edition, Dated December 3, 2019

Summary of Topics

This First edition of ANSI/UL 120101 is an Adoption of ANSI/ISA-12.01.01, Definitions and Information Pertaining to Electrical Equipment in Hazardous Locations.

The requirements are substantially in accordance with Proposal(s) on this subject dated October 26, 2018 and August 16, 2019.

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UL 120101

Standard for Definitions and Information Pertaining to Electrical Equipment in Hazardous Locations

First Edition

December 3, 2019

This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 120101 as an American National Standard (ANSI) occurred on December 3, 2019. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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Preface (UL)

The following people served as members of STP 60079 and participated in the review of this standard:

NAME	COMPANY
*B. Zimmermann, Chair	R Stahl Inc.
*T. Adam	FM Approvals LLC
R. Allen	Honeywell Inc.
*J. Anderson	Thermon Inc.
D. Ankele	UL LLC
S. Bihler-Lopez	CML Inc.
S. Blais	Emerson/Appleton Group
K. Boegli	KBB Consulting
R. Brownlee	Pepperl + Fuchs Inc.
D. Burns	Shell P&T — Innovation / R&D
R. Chalmers	Industrial Scientific Corp.
*C. Coache	National Fire Protection Association
*M. Cole	Hubbell Canada LP
D. Cook	Shelby County Department of Development Services
M. Coppler	Det Norske Veritas Certification Inc.
*R. Deadman	UL LLC
M. Dona	Consultant
T. Dubaniewicz	NIOSH
G. Edwards	Det-Tronics
M. Egloff	Montana Tech, University of Montana
M. Ehrmann	R Stahl Inc
D. El Tawy	Siemens Energy
*A. Engler	Det Norske Veritas DNV
*W. Fiske	Intertek
Z. Fosse	DEKRA Certification Inc
G. Gurinder	Gurinder Garcha Consulting
D. Grady	Talema Group
R. Holub	DuPont
R. Hong	Solar Turbines Inc.
P. House	Thermon Mfg. Co.
D. Jang	National Research Council Canada
*B. Johnson	Thermon Mfg. Co.
R. Johnson	Source IEC
*P. Kelly	UL LLC
S. Kiddle	ABB Inc
A. Kreider	Phoenix Contact Development & Manufacturing Inc.
S. Lambaz	Littelfuse Inc.
W. Lawrence	FM Approvals LLC
E. Leubner	Eaton's Crouse-Hinds Business
W. Lowers	WCL Corp.
*N. Ludlam	FM Approvals Ltd.
R. Martin	USCG

NAME	COMPANY
E. Massey	ABB Motors and Mechanical Inc.
E. Massey	Baldor Electric Co.
W. McBride	Northern Electric Co.
T. Michalski	Killark Electric Mfg. Co.
J. Miller	Detector Electronics Corp.
*O. Murphy	Honeywell International Inc.
D. Nedorostek	Bureau of Safety & Environmental Enforcement (BSEE)
A. Page	Bud Page Consultant
R. Parks	National Instruments Corp.
L. Ricks	ExVeritas North America LLC
P. Rigling	MTL - Eaton Electric LLC
*K. Robinson	Occupational Safety and Health Adm.
J. Ruggieri	General Machine Corp.
*J. Scheller	ABB Motor and Mechanical Inc.
P. Schimmoeller	CSA Group
*T. Schnaare	Rosemount Inc.
*A. Schnuelle	CML Inc.
R. Seitz	ARTECH Engineering
S. Sharma	Lindsay Corp.
K. Singh	Ex Safet Services and Solutions
G. Sitnik	MET Laboratories
*J. Sotherden	Eatons Crouse-Hinds Business
G. Steinman	Thomas & Betts
*R. Teather	Det Norske Veritas Certification Inc.
L. Vlaga	General Monitors
D. Wechsler	American Chemistry Council
N. Weinhold	Rosemount Inc.
R. Wigg	E-x Solutions International Pty Ltd.
*K. Wolf	Intertek
T. Woods	Baker Hughes, A GE Co.
R. Zalosh	Firexplo

* Non-voting member

1 Purpose

1.1 This document provides definitions and information pertaining to protection techniques, terminology, and the installation of electrical equipment in hazardous (classified) locations and provides an introduction and basic background to the UL Standards Technical Panel (STP) 60079, Electrical Equipment for Hazardous (Classified) Locations, series of publications and committee activities.

1.2 This document provides a general review of applicable codes and standards, and it should not be used in lieu of those codes and standards for equipment design, manufacture, installation, maintenance and test criteria.

2 Scope

2.1 This document provides general guidance for safe design, installation, and maintenance of electrical equipment in hazardous (classified) locations using appropriate means to prevent ignition of flammable gases and vapors, flammable liquids, combustible dusts, or ignitable fibers or flyings.

2.2 This document covers only locations made hazardous, or potentially hazardous, due to the presence of flammable gases or vapors, flammable liquids, combustible dusts, or ignitable fibers or flyings. The document is not necessarily relevant to the hazards posed by pyrophoric materials, explosives or propellants containing their own oxidizers.

2.3 This document is concerned only with design, manufacture, installation, maintenance, and test criteria related to arcs, sparks, or hot surfaces produced by electrical and non-electrical* equipment that may cause ignition of flammable gas or vapor-in-air mixtures, clouds or blankets of combustible dust, or easily ignitable fibers or flyings. Equipment is also required to comply with the applicable ordinary location requirements (e.g., UL 508 and UL 61010-1) either by direct reference in hazardous locations standards or by other regulations.

* Under development (Mechanical and ESD for example). Some equipment may produce static electricity or cause high temperatures or sparks due to mechanical failure. The materials of construction of parts in such equipment will be an important consideration for application in hazardous locations.

2.4 This document does not cover mechanisms of ignition from external sources, such as static electricity or lightning. Some equipment may produce static electricity. The materials of construction of parts in such equipment will be an important consideration for application in hazardous locations. The extra precautions necessary for this are beyond the scope of this document.

2.5 This document does not consider the effects of installation in corrosive atmospheres and the resulting deleterious conditions to the original design integrity of the equipment. The additional precautions necessary for these conditions are outside the scope of this document.

2.6 This document is not an instruction manual. However, it is intended to provide introductory guidance to those involved with the design, manufacture, installation, and maintenance of equipment used in hazardous (classified) locations. It is also intended to promote uniformity of practice among those skilled in the art. Nothing contained in this document is to be construed as a fixed rule without regard to sound engineering judgment.

2.7 For hazardous location equipment, atmospheric conditions are generally considered to be:

- a) an ambient temperature range of -20 °C (-4 °F) to 40 °C (104 °F) for zones and to -25 °C (-13 °F) to +40 °C (104 °F) for divisions;
- b) air with normal oxygen content, typically 21 percent by volume; and

c) a pressure of 80 kPa (11.6 psia) to 110 kPa (16 psia).

NOTE Equipment specified for atmospheric conditions beyond the above is generally permitted but may be subjected to additional requirements.

2.8 Specialized industries such as, but not limited to, mining and shipping may be regulated by the specific authority having jurisdiction. This document does not include specific requirements or the rules and regulations unique to any specific industry.

2.9 Various organizations have developed codes, guides, and standards that have substantial acceptance by industry and governmental bodies. Codes, guides, and standards useful in the design and installation of electrical instruments in hazardous (classified) locations are listed in Annex C. These are not considered to be a part of this document except for those specific sections of documents referenced elsewhere in this document.

2.10 In accordance with the purpose of this document, an attempt was made to avoid originality in principles whenever possible, but rather to utilize definitions, explanations, etc., from accepted publications. As a result, much of the material, except for minor changes, is directly as published by others. While specific credit is not given for each reference, all references are included in Annex B.

3 Definitions

The following are terms and definitions commonly used for hazardous (classified) locations.

NOTE The list is not intended to be all inclusive. Throughout this document, reference is made to areas, spaces, locations, and zones. These terms should be considered interchangeable terms designating a three-dimensional space. Additional definitions may be found in IEC 60050-426 (The International Electrotechnical Vocabulary (IEV 426-04-07)).

3.1 ABNORMAL OPERATION – process-linked malfunctions that occur infrequently. (IEV 426-03-29)

3.2 ADEQUATELY VENTILATED AREA – an adequately ventilated area is an area that has a ventilation system (natural or artificial) that, as a minimum, prevents the accumulation of gases or vapors to an explosive level. Most standards and recommended practices recommend preventing levels in excess of 25 percent of the Lower Flammable Limit, LFL.

NOTE Adequate ventilation of an area alone is not an effective means for the prevention of dust explosions.

3.3 AEx – required marking prefix for equipment meeting one or more types of protection in UL 60079-0 or previously in ANSI/ISA-61241-0.

3.4 AMBIENT TEMPERATURE – temperature of the air or other media, in the immediate vicinity of the equipment or component. (IEV 426-04-09)

NOTE 1 This does not refer to the temperature of any process media, unless the equipment or component is totally immersed in the process media.

NOTE 2 If Ex Equipment or an Ex Component is located inside or adjacent to another piece of equipment, the "ambient temperature" is the temperature of the air or other media surrounding the Ex Equipment or Ex Component and may be higher than the ambient air surrounding the complete equipment due to the additional heat dissipated within the complete equipment.

NOTE 3 The ambient temperature referred to in the UL 60079 series, CSA 60079 series and IEC 60079 series is only related to the explosion safety and not the performance of the Ex Equipment or Ex Component.

3.5 APPROVED – acceptable to the authority having jurisdiction.

NOTE 1 See AUTHORITY HAVING JURISDICTION.

NOTE 2 In determining the acceptability of installations or procedures, equipment, or material, the authority having jurisdiction may base acceptance on compliance with appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listing or labeling practices of product-testing organizations. These organizations are in a position to determine compliance with appropriate standards for the current production of listed or labeled items.

3.6 AREA – three-dimensional region or space. (IEV 426-03-28).

3.7 ASSOCIATED APPARATUS – electrical apparatus which contains both intrinsically safe circuits and non-intrinsically safe circuits and is constructed so that the non-intrinsically safe circuits cannot adversely affect the intrinsically safe circuits. (IEV 426-11-03)

NOTE Associated apparatus is either:

- a) additionally protected by a type of protection suitable for use in the appropriate explosive atmosphere; or
- b) not protected by a type of protection suitable for use in the appropriate explosive atmosphere and therefore is not to be used within an explosive atmosphere.

See also INTRINSIC SAFETY.

3.8 ATEX, ATEX Directive – European Directive 2014/34/EU related to equipment and protective systems intended for use in potentially explosive atmospheres. A parallel directive for use, 1999/92/EC (also referred to as ATEX 137 Directive) requires area classification and risk assessment in the workplace.

3.9 AUTHORITY HAVING JURISDICTION (AHJ) – the organization, office, or individual that has the responsibility and authority for approving equipment, installations, or procedures.

NOTE The term authority having jurisdiction is used in a broad manner since jurisdiction and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state/provincial, local, other regional department, or an individual such as an inspector from a labor or health department, electrical inspector, or others having statutory authority. An insurance inspection agency, rating bureau, or other insurance company representative may be the authority having jurisdiction. An owner or his designated agent may also assume the role. At government-owned installations, the commanding officer, departmental official, or designated agent may be the authority having jurisdiction.

3.10 AUTO-IGNITION TEMPERATURE (AIT) – the minimum temperature required to initiate or cause self-sustained combustion of a solid, liquid, or gas independently of the heating or heating elements.

NOTE 1 For additional information refer to NFPA Fire Protection Handbook.

NOTE 2 A distinction is made between ignition temperature and flash point. See FLASH POINT.

3.11 AUTOMATIC – self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature, or mechanical configuration.

3.12 BONDING – connecting to establish electrical continuity and conductivity.

3.13 CABLE GLAND – a device permitting the introduction of one or more electric and/or fibre optics cables into an electrical Ex Equipment enclosure so as to maintain the relevant Type of Protection, and provide a degree of strain relief. (IEV 426-04-18)

3.14 CERTIFICATE – document that conveys the assurance of the conformity of a product, process, system, person, or organization with specified requirements. (IEV 426-04-23)

NOTE The certificate may be either the supplier's declaration of conformity or the purchaser's recognition of conformity or certification (as a result of action by a third party) as defined in ISO/IEC 17000.

3.15 **CERTIFIED** – generic term referring to equipment that has been evaluated by a recognized testing agency and confirmed to be in compliance with the applicable standard(s).

NOTE Some agencies use the terms *approved*, *listed*, or *labeled equipment* to indicate compliance with the applicable standard.

3.16 **CLASS I LOCATION** – a location in which flammable gases, flammable liquid – produced vapors, or combustible liquid – produced vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. (NEC 500.5 (B))

NOTE Class I locations can include those rated Division 1 or 2 and Zone 0, 1 or 2.

3.17 **CLASS I, DIVISION 1 LOCATION** – 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. (NEC 500.5 (B) (1))

NOTE In some Division 1 locations, ignitable concentrations of flammable gases or vapors may be present continuously or for long periods of time. Examples include the following:

- (1) The inside of inadequately vented enclosures containing instruments normally venting flammable gases or vapors to the interior of the enclosure
- (2) The inside of vented tanks containing volatile flammable liquids
- (3) The area between the inner and outer roof sections of a floating roof tank containing volatile flammable fluids
- (4) Inadequately ventilated areas within spraying or coating operations using volatile flammable fluids
- (5) The interior of an exhaust duct that is used to vent ignitable concentrations of gases or vapors

Experience has demonstrated the prudence of avoiding the installation of instrumentation or other electrical equipment in these particular areas altogether or where it cannot be avoided because it is essential to the process and other locations are not feasible, using electrical equipment or instrumentation approved for the specific application or consisting of intrinsically safe systems.

3.18 **CLASS I, DIVISION 2 LOCATION** – 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 mechanical 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. (NEC 500.5 (B) (2))

3.19 **CLASS II LOCATION** – a location that is hazardous because of the presence of combustible dust. (NEC 500.5 (C))

NOTE Class II locations can include those rated Division 1 or 2 and Zone 20, 21 or 22.

3.20 CLASS II, DIVISION 1 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 electrical 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. (NEC 500.5 (C) (1))

3.21 CLASS II, DIVISION 2 LOCATION – 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. (NEC 500.5 (C) (2))

3.22 CLASS III LOCATION – a location that is hazardous because of the presence of easily ignitable fibers or where materials producing combustible flyings are handled, manufactured, or used, but in which such fibers/flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. (NEC 500.5 (D))

NOTE Class III locations can include those rated Division 1 or 2 and Zone 20, 21 or 22.

3.23 CLASS III, DIVISION 1 LOCATION – a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used. (NEC 500.5 (D) (1))

3.24 CLASS III, DIVISION 2 LOCATION – a location in which easily ignitable fibers are stored or handled other than in the process of manufacture). (NEC 500.5 (D) (2))

3.25 COMPOUND – any thermosetting, thermoplastic, epoxy resin or elastomeric materials with or without fillers and/or additives, in their solid state. (IEV 426-04-41)

3.26 CONNECTION FACILITIES – terminals, screws or other parts, used for the electrical connection of conductors. (IEV 426-04-25)

3.27 CONTINUOUS DILUTION – the technique of supplying a protective gas flow continuously to an enclosure containing an internal potential source of flammable gas or vapor release for the purpose of diluting any flammable gas or vapor that could be present to a level below its LFL. Refer to [6.2.2](#).

3.28 CONTROL DRAWING – drawing or other document that is prepared by the manufacturer for the intrinsically safe or associated apparatus, detailing the electrical parameters to allow for interconnections to other circuits or apparatus. (IEV 426-11-46)

NOTE Refer to UL 120202 for the applicable ANSI recommendations for the preparation, content, and organization of control drawings.

3.29 DEGREE OF PROTECTION (IP) – numerical classification according to IEC 60529 or IEC 60034-5 (as applicable) preceded by the symbol IP applied to the enclosure of equipment to provide:

- protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure;
- protection of the equipment against ingress of solid foreign objects; and

- where indicated by the classification, protection of the equipment against harmful ingress of water. (IEV 426-04-02)

NOTE 1 The detailed test requirements for rotating electric machines are in IEC 60034-5.

NOTE 2 The enclosure which provides the degree of protection IP is not necessarily the same as the equipment enclosure providing the Type of Protection.

NOTE 3 An enclosure which provides the degree of protection required by one of the types of protection will have been subjected to other tests prior to the tests for degree of protection.

NOTE 4 See also enclosure type.

3.30 DUST, COMBUSTIBLE – finely divided solid particles, 500 µm or less in nominal size, which may form explosive mixtures with air at standard atmospheric pressure and temperatures. (IEV 426-02-18)

NOTE See ASTM E 1226-12a, Standard Test Method for Explosibility of Dust Clouds, or ISO 6184-1, Explosion protection systems – Part 1: Determination of explosion indices of combustible dusts in air, for procedures for determining the explosibility of dusts.

3.31 DUST-IGNITIONPROOF – under the division system, a term used to describe an enclosure that will exclude dust and that, when installed in accordance with the original design intent, will not permit arcs, sparks, or heat otherwise generated or liberated inside the enclosure to cause ignition of exterior accumulations or atmosphere suspensions of a specified dust in the vicinity of the enclosure.

NOTE Refer to UL 1203 or CSA 25 for applicable ANSI and CAN certification requirements respectively.

3.32 DUST LAYER, COMBUSTIBLE – any surface accumulation of combustible dust that is thick enough to propagate flame or will degrade and ignite.

3.33 DUST-PROTECTED ENCLOSURE – for ordinary locations ingress protection, enclosure in which the ingress of dust is not totally excluded, but is unlikely to enter in sufficient quantity to interfere with the safe operation of the equipment and does not accumulate in a position within the enclosure where it is liable to cause an ignition hazard. (IEV 426-04-35)

NOTE Refer to NEMA 250 or IEC 60529 for the applicable ANSI and IEC ingress protection requirements respectively.

3.34 DUST-TIGHT ENCLOSURE – under the Division System or for ordinary locations ingress protection, enclosure capable of excluding the ingress of observable dust particle deposits. (IEV 426-04-34)

NOTE Refer to UL 121201, CSA 213, NEMA 250 or IEC 60529 for the applicable ANSI, CAN and IEC ingress protection requirements respectively.

3.35 ELECTRICAL EQUIPMENT – items applied as a whole or in part for the utilization of electrical energy. These include, among others, equipment for the generation, transmission, distribution, storage, measurement, regulation, conversion, and consumption of electrical energy and items for telecommunication.

3.36 ENCLOSURE – all of the walls, doors, covers, cable glands, rods, spindles, and shafts, etc. which contribute to the Type of Protection or the degree of protection IP of the equipment. (IEV 426-04-01)

3.37 ENCLOSURE TYPE – for ordinary locations ingress protection, a North American system of rating standard levels of protection provided to electrical equipment by enclosures for 1) the protection of persons against contact with live or moving parts inside the enclosure, 2) the protection provided by the enclosure against ingress of solids and/or liquids, 3) the protection provided by the enclosure against the deleterious effects of corrosion, and 4) the protection provided by the enclosure against damage due to

the formation of external ice. This enclosure type is in addition to (and not an alternative to) the types of protection necessary to ensure protection against ignition in hazardous (classified) locations.

NOTE 1 Refer to Definitions found in UL 50, UL 50E, CSA 94.1, CSA 94.2 or NEMA 250 for the applicable ANSI, CAN or IEC definitions.

NOTE 2 See also DEGREE OF PROTECTION.

3.38 ENCAPSULATION – under the Zone system, a type of protection in which the parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited. This type of protection is referred to as “ma”, “mb”, or “mc”.

Also: process of applying a compound to enclose an electrical device(s) by suitable means. (IEV 426-04-77)

NOTE Refer to UL 60079-18, CSA 60079-18 or IEC 60079-18 for the applicable ANSI, CAN or IEC certification requirements.

3.39 ENERGIZED – electrically connected to a source of potential difference.

3.40 ENTITY CONCEPT – method used to determine acceptable combinations of intrinsically safe apparatus and associated apparatus through the use of intrinsically safe parameters assigned to connection facilities. (IEV 426-11-47)

The criteria for interconnection is that the voltage ($V_{\max}$ or U_i) current ($I_{\max}$ or I_i) and power ($P_{\max}$ or P_i) which intrinsically safe equipment can receive and remain intrinsically safe, considering faults, must be equal to or greater than the voltage (V_{oc} or V_o), and current (I_{sc} or I_o) and power (P_o) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and inductance (L_i) of the intrinsically safe equipment, including interconnecting wiring, must be equal to or less than the capacitance (C_a or C_o) and inductance (L_a or L_o) that can safely be connected to the associated apparatus. If these criteria are met, then the combination may be connected without compromising intrinsic safety.

NOTE Refer to ANSI/ISA-RP12.06.01, UL 60079-25, CSA 60079-25 and IEC 60079-25 for additional ANSI, CAN and IEC information.

3.41 ENTRY, DIRECT – a method of connection of an electrical equipment to the external circuits by means of the connecting facilities inside the main enclosure or in a terminal compartment having a free opening to the main enclosure. (IEV 426-04-07)

3.42 ENTRY, INDIRECT – a method of connection of an electrical equipment to the electrical circuits by means of a terminal box or a plug and socket connection which is external to the main enclosure.

3.43 EQUIPMENT – apparatus, fittings, devices, and the like used as part of, or in connection with, an installation.

NOTE When specific measures of a Type of Protection are applied to equipment to provide explosion protection, it can be “Ex Equipment” or an “Ex Component”.

3.44 EQUIPMENT GROUPING – classification system of equipment related to the explosive atmosphere for which they are intended to be used:

NOTE UL 60079-0, CSA 60079-0 and IEC 60079-0 identify three equipment groups:

- Group I, equipment for mines susceptible to fire damp.

- Group II, which is divided into sub-groups, equipment for all places with an explosive gas atmosphere other than mines susceptible to fire damp; and
- Group III, which is divided into sub-groups, equipment for all places with an explosive dust atmosphere other than mines susceptible to fire damp.

3.45 EQUIPMENT PROTECTION LEVEL EPL – level of protection assigned to equipment based on its likelihood of becoming a source of ignition and distinguishing the differences between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp. (IEV 426-01-15)

NOTE Although the markings identifying the equipment protection level (EPL) may appear on equipment, they are not yet recognized in NFPA 70.

3.46 Ex – designation of explosion-protected electrical equipment in accordance with the IEC 60079 series standards or national adoptions.

NOTE EEx designation was used for explosion-protected electrical equipment complying with EN50014. The publication of EN60079 was just the next edition of EN50014 and does not indicate that the equipment certified to EN50014 was immediately made obsolete, but might not comply with the latest requirements. See also [3.3](#).

3.47 Ex COMPONENT – equipment intended to be part of Ex Equipment, marked with symbol "U", which is not intended to be used alone, and requires additional consideration when incorporated into Ex Equipment. (IEV 426-01-13)

3.48 Ex EQUIPMENT – equipment with explosion protection. (IEV 426-01-14)

3.49 EXPECTED MALFUNCTION – disturbances or equipment malfunctions which normally occur in practice. (IEV 426-04-57)

3.50 EXPLOSIONPROOF – under the Division system, a term used to describe an enclosure that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby. (NEC)

NOTE 1 See also "explosionproof" and "flameproof" are similar concepts, but the performance and technical requirements are not the same.

NOTE 2 Refer to UL 1203 or CSA 30 for the applicable ANSI and CAN certification requirements respectively.

3.51 EXPLOSIVE ATMOSPHERE – a mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapor, mist, or dust in which, after ignition, permits self-sustaining propagation. (IEV 426-01-06)

3.52 EXPLOSIVE DUST ATMOSPHERE – a mixture with air, under atmospheric conditions, of flammable substances in the form of dust which, after ignition, permits self-sustaining propagation.

3.53 EXPLOSIVE GAS ATMOSPHERE – a mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour which, after ignition, permits self-sustaining propagation. (IEV 426-01-07)

3.54 FAULT (as applicable to intrinsically safe systems) – a defect or electrical breakdown of any component, spacing, or insulation that alone or in combination with other defects or breakdowns may adversely affect the electrical or thermal characteristics of the intrinsically safe system. If a defect or breakdown leads to defects or breakdowns in other components, the primary and subsequent defects and

breakdowns are considered to be a single fault. Certain components may be considered not subject to fault when analyses or tests for intrinsic safety are made. See also PROTECTIVE COMPONENT.

3.55 FIBERS AND FLYINGS – these are materials not normally in suspension in air; and are of larger particle size than dusts. Fibers and flyings include materials such as cotton linters, sawdust, textile fibers, and other large particles that are usually more a fire hazard than an explosion hazard.

3.56 FIREDAMP – flammable mixture of gases naturally occurring in a mine.

NOTE Firedamp consists mainly of methane, but always contains small quantities of other gases, such as nitrogen, carbon dioxide, and hydrogen, and sometimes ethane and carbon monoxide. The terms firedamp and methane are used frequently in mining practice as synonyms. (IEV 426-02-24)

3.57 FLAMEPROOF – under the Zone system, a type of protection of electrical equipment in which an enclosure will withstand an internal explosion of a flammable mixture which has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive atmosphere consisting of one or more of the gases or vapors for which it is designed. This type of protection is referred to as "da", "db" or "dc".

NOTE See also "explosionproof" and "flameproof" are similar concepts, but the performance and technical requirements are not the same.

3.58 FLAMMABLE LIMITS – the flammable limits of a gas or vapor are the lower (LFL) and upper (UFL) flammable limit, stated in percent by volume of gas in a gas-air mixture, between which a flammable mixture is formed.

NOTE 1 For additional information refer to NFPA Fire Protection Handbook and IEC 80079-20-1.

NOTE 2 In the past, flammable and explosive have been used interchangeably in many texts, but the trend is to avoid the confusion that this causes. The term flammable relates to the properties of the material that determine its ability to produce self-sustaining flame propagation in any direction (upwards, sideways or downwards). The term explosive relates to flame propagation that is accompanied by pressure rise and noise (usually higher-speed propagation) and is significantly affected by (non-material related) test-chamber conditions (geometry, degree of confinement...). LFL concentrations are typically lower than LEL concentrations for the same material and UFL concentrations are typically higher than UEL concentrations for the same material.

3.59 FLAMMABLE LIQUID – liquid capable of producing a flammable vapour under any foreseeable operating conditions. (IEV 426-02-33)

NOTE For additional information, refer to NFPA Fire Protection Handbook.

3.60 FLAMMABLE GAS OR VAPOR – a gas or vapor which, when mixed with air in certain proportions, will form a flammable gas atmosphere. (IEV 426-02-34)

3.61 FLAMMABLE SUBSTANCE – gases, vapours, liquids or mixtures thereof that are capable of being ignited. (IEV 426-09-10)

3.62 FLASH POINT – lowest liquid temperature at which, under specified test conditions, a liquid gives off vapours in quantity such as to be capable of forming an ignitable vapour/-air mixture. (IEV 426-02-14)

NOTE For additional information, refer to NFPA Fire Protection Handbook.

3.63 GAS – gaseous phase of a substance that cannot reach equilibrium with its liquid or solid state in the temperature and pressure range of interest. (IEV 426-02-26)

3.64 GROUND – a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

3.65 GROUND (EARTHED) – connected to earth or to some conducting body that serves in place of earth.

3.66 GROUP – a classification of combustible materials.

NOTE Refer to Clause 4 for additional information.

3.67 HAZARDOUS AREA – area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical equipment. (IEV 426-03-01). See also hazardous (classified) locations.

NOTE 1 IEC 60079-10-1 gives a classification of hazardous areas containing explosive gas atmospheres.

NOTE 2 IEC 60079-10-2 gives a classification of hazardous areas containing explosive dust.

3.68 HAZARDOUS (CLASSIFIED) LOCATIONS – locations where fire or explosion hazards may exist due to flammable gases, flammable liquid-produced vapors, combustible liquid-produced vapors, combustible dusts, or ignitable fibers/flyings. Commonly abbreviated "HazLoc". See also hazardous area.

3.69 HERMETICALLY SEALED DEVICE – under the Division and Zone systems, device which is so constructed that the external atmosphere cannot gain access to the interior and in which any seal is made by fusion. (IEV 426-09-11). Under the Zone system, this type of protection is referred to as type of protection "nC".

NOTE 1 The seal is made by fusion of metal to metal, ceramic to metal, or glass to metal.

NOTE 2 Refer to UL 121201 or CSA 213 under the Division system and UL 60079-15, CSA 60079-15 or IEC 60079-15 under the Zone system for the applicable ANSI, CAN and IEC certification requirements respectively.

3.70 HIGH TEMPERATURE EQUIPMENT – as specified by NEC, Articles 501.15 and 505.16, the term "high temperatures" is to be interpreted as those where the maximum operating temperature (including ambient temperature effect) exceeds 80 percent of the auto-ignition temperature in degrees Celsius (°C) of the gas or vapor involved.

3.71 IECEX SYSTEM – under the Zone system, an international system for certification to standards relating to equipment for use in explosive atmospheres. The objective is to facilitate international trade in equipment and services for use in explosive atmospheres, while maintaining the required level of safety. More information can be found at www.iecex.com.

3.72 IDENTIFIED (as applied to equipment) – recognizable as suitable for the specific purpose, function, use, environment, application, etc., where described in a particular requirement, e.g. NEC.

NOTE Suitability of equipment for a specific purpose, environment, or application may be determined by a qualified testing laboratory, inspection agency, or other organization concerned with product evaluation. Such identification may include labeling or listing. For additional information see *labeled* and *listed*.

3.73 IGNITION CAPABLE EQUIPMENT – equipment which in normal operation constitutes a source of ignition for a specified explosive atmosphere (electrical or thermal energy including electrostatic, frictional sparking or hot surfaces).

3.74 INCREASED SAFETY – under the Zone system, a type of protection applied to electrical equipment or Ex Component in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks. (IEV 426-08-01) This type of protection is referred to as "eb" or "ec".

NOTE Refer to UL 60079-7, CSA 60079-7 or IEC 60079-7 for the ANSI, CAN and IEC certification requirements respectively.

3.75 INTERNAL WIRING – wiring and electrical connections that are made within equipment by the manufacturer. Within racks or panels, interconnections between separate pieces of equipment made in accordance with detailed instructions from the equipment manufacturer are also considered to be internal wiring.

3.76 INTRINSIC SAFETY – under the Division and Zone system, a type of protection in which a portion of the electrical system contains only intrinsically safe equipment, circuits, and wiring that is incapable of causing ignition in the surrounding atmosphere. No single device or wiring is intrinsically safe by itself (except for battery-operated, self-contained equipment such as portable pagers, transceivers, gas detectors, etc., which are specifically designed as intrinsically safe self-contained devices) but is intrinsically safe only when employed in a properly designed intrinsically safe system. Under the Zone system, this type of protection is referred to as "ia", "ib" or "ic".

NOTE 1 See also ASSOCIATED APPARATUS.

NOTE 2 Refer to UL 913 or CSA 157 under the Division systems or UL 60079-11, CSA 60079-11 or IEC 60079-11 under the Zone systems for the ANSI, CAN and IEC certification requirements respectively.

3.77 INTRINSIC SAFETY BARRIER – a component containing a network designed to limit the energy (voltage and current) available to the protected circuit in the hazardous (classified) location under specified fault conditions.

3.78 INTRINSICALLY SAFE CIRCUIT – a circuit in which any spark or thermal effect, produced either normally or in specified fault conditions, is incapable, in the specified test conditions, of causing ignition of a given explosive atmosphere.

3.79 INTRINSICALLY SAFE ELECTRICAL EQUIPMENT – electrical equipment in which all the circuits are intrinsically safe circuits.

3.80 INTRINSIC SAFETY GROUND BUS – a grounding system that has a dedicated conductor separate from the power system so that ground currents will not normally flow and that is reliably connected to a ground electrode.

NOTE For further information, refer to Article 504 of NEC, or Section 10 of CSA C22.1, or ANSI/ISA-RP12.06.01.

3.81 INTRINSICALLY SAFE SYSTEM – an assembly of interconnected intrinsically safe equipment, associated apparatus, other equipment, and interconnecting cables in which those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits.

3.82 LABELED: equipment or materials with 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 who's labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

NOTE Some agencies use the term *approved*, *listed*, or *certified* to indicate compliance with the applicable standard.

3.83 LIQUID, COMBUSTIBLE – a liquid having a flash point at or above 37.8 °C (100°F). Combustible liquids are subdivided as follows:

- a) Class II liquids include those having flash points at or above 37.8 °C (100 °F) and below 60 °C (140 °F).

b) Class IIIA liquids include those having flash points at or above 60 °C (140 °F) and below 93 °C (200 °F).

c) Class IIIB liquids include those having flash points at or above 93 °C (200 °F).

NOTE For additional information, refer to NFPA 30. It should also be noted that these classes have no relation to the hazardous location classes

3.84 LIQUID IMMERSION (formerly oil-immersion) – under the Zone system, type of protection in which the electrical equipment or parts of the electrical equipment are immersed in a protective liquid in such a way that an explosive atmosphere which may be above the liquid or outside the enclosure cannot be ignited. This type of protection is referred to as “ob” or “oc”.

NOTE Refer to UL 60079-6, CSA 60079-6 or IEC 60079-6 for the applicable ANSI, CAN and IEC certification requirements respectively.

3.85 LISTED – equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.

NOTE 1 The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

NOTE 2 Some agencies use the term approved, listed, or certified to indicate compliance with the applicable standard.

3.86 LOWER EXPLOSIVE LIMIT (LEL) – refer to [3.58](#) NOTE 2.

3.87 LOWER FLAMMABLE LIMIT (LFL) – refer to FLAMMABLE LIMITS.

3.88 MAINTENANCE, CORRECTIVE – any maintenance activity that is not normal in the operation of equipment and requires access to the equipment's interior. Such activities are expected to be performed by a qualified person. Such activities typically include locating causes of faulty performance, replacement of defective components, adjustment of internal controls, and the like.

3.89 MAINTENANCE, LIVE – any maintenance activity that occurs while power is still connected to the equipment.

3.90 MAINTENANCE, OPERATIONAL – any maintenance activity, excluding corrective maintenance, intended to be performed by the operator and required in order for the equipment to serve its intended purpose. Such activities typically include the correcting of *zero* on a panel instrument, changing charts, record keeping, adding ink, and the like.

3.91 MAKE/BREAK COMPONENT – components having contacts that can interrupt a circuit (even if the interruption is transient in nature). Examples of make/break components are relays, circuit breakers, servo potentiometers, adjustable resistors, switches, connectors, and motor brushes.

3.92 MALFUNCTION – situation where equipment or components do not perform their intended function with respect to explosion protection

NOTE This can happen due to a variety of reasons, including:

- failure of one (or more) of the component parts of the equipment or components;

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- external disturbances (e.g. shocks, vibration, electromagnetic fields);
- design error or deficiency (e.g. software errors);
- disturbance of the power supply or other services;
- loss of control by the operator (especially for portable equipment).

(IEV 426-04-56).

3.93 MAXIMUM EXPERIMENTAL SAFE GAP (MESG) – maximum gap of a joint of 25 mm in width which prevents any transmission of an explosion during 10 tests made under the conditions specified in ISO/IEC 80079-20-1.

3.94 MAXIMUM SURFACE TEMPERATURE – the highest temperature which is attained in service under the most adverse conditions (but within the specified tolerances) by any part or surface of Ex Equipment.

NOTE 1 For Ex Equipment in an explosive gas atmosphere, this temperature may occur on an internal component or on the external surface of the enclosure, depending upon the type of protection employed.

NOTE 2 For Ex Equipment in an explosive dust atmosphere, this temperature occurs on the external surface of the enclosure and may include a defined dust layer condition.

3.95 MINIMUM CLOUD IGNITION TEMPERATURE – the minimum temperature at which a combustible dust atmosphere will auto-ignite and propagate an explosion.

3.96 MINIMUM DUST LAYER IGNITION TEMPERATURE – the minimum temperature of a surface that will ignite a dust on it after a long time (theoretically, until infinity). In most dusts, free moisture has been vaporized before ignition.

3.97 MINIMUM EXPLOSIVE (DUST) CONCENTRATION – the minimum concentration of a dust cloud that, when ignited, will propagate a flame away from the source of ignition.

3.98 MINIMUM IGNITING CURRENT RATIO (MIC Ratio) – minimum current in the test circuit specified in ISO/IEC 80079-20-1 that causes ignition of the explosive test mixture in the spark test apparatus according to UL 60079-11 or IEC 60079-11.

NOTE For additional information, refer to UL 60079-11 or IEC 60079-11.

3.99 MINIMUM IGNITION ENERGY (MIE) – minimum energy that can ignite a mixture of a specified flammable material with air, measured by a standard procedure.

NOTE See ASTM E582 or IEC 80079-20-1 for gases and vapors and ISO/IEC 80079-20-2, ASTM E2019 and EN 13821 for dust clouds.

3.100 MIST – liquid released through a small opening, at temperatures below its flash point, resulting in extremely small droplets forming a cloud.

3.101 NONAUTOMATIC – non-self-acting – requiring personal intervention for control. As applied to an electric controller, nonautomatic control does not necessarily imply a manual controller, but only that personal intervention is necessary.

3.102 NONHAZARDOUS (UNCLASSIFIED) LOCATION – a location in which fire or explosion hazards are not expected to exist specifically due to the presence of flammable gases or vapors, flammable liquids, combustible dusts, or ignitable fibers or flyings. Such a location may also be referred to as a safe area.

3.103 NONINCENDIVE CIRCUIT – a circuit, other than field wiring, in which any arc or thermal effect produced, under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas-, vapor-, or dust-air mixture. See also NONINCENDIVE FIELD WIRING.

3.104 NONINCENDIVE COMPONENT – under the Division and Zone systems, a component having contacts for making or breaking an ignition-capable circuit and in which the contacting mechanism is constructed so that the component is incapable of igniting the specified explosive atmosphere. The housing of a nonincendive component is not intended to (1) exclude the flammable atmosphere or (2) contain an explosion. Under the Zone system, this type of protection is referred to as “nC.”

NOTE Refer to UL 121201 or CSA 213 under the Division system and UL 60079-15, CSA 60079-15 or IEC 60079-15 under the Zone system for the applicable ANSI, CAN and IEC certification requirements respectively.

3.105 NONINCENDIVE EQUIPMENT – under the Division and Zone systems equipment having electrical/electronic circuitry and components that are incapable, under normal conditions, of causing ignition of the flammable gas-, vapor-, or dust-air mixture due to arcing or thermal effect. Under the Zone system, this type of protection is referred to as “nA,” “nC,” or “nR.”

NOTE Refer to UL 121201 or CSA 213 under the Division system and UL 60079-15, CSA 60079-15 or IEC 60079-15 under the Zone system for the applicable ANSI, CAN and IEC certification requirements respectively.

3.106 NONINCENDIVE FIELD WIRING – wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas-, vapor-, or dust-air mixture. Normal operation includes opening, shorting, or grounding the field wiring. See also NONINCENDIVE CIRCUIT.

3.107 NORMAL CONDITIONS, NORMAL OPERATION – equipment is generally considered to be under normal conditions or normal operation when it conforms electrically and mechanically with its design specifications and is used within the limits specified by the manufacturer.

3.108 OIL-IMMERSED – under the division system, equipment immersed in a protective liquid in such a way that an explosive gas atmosphere that can be above the liquid or outside the enclosure cannot be ignited.

NOTE Refer to UL 121201 or CSA 213 for the applicable ANSI or CAN certification requirements respectively.

3.109 POWDER FILLING – under the Zone system, a type of protection in which the parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material to prevent the ignition of an external explosive gas atmosphere. This type of protection is referred to as “q.”

NOTE 1 This type of protection may not prevent the surrounding explosive atmosphere from penetrating into the equipment and Ex components and being ignited by the circuits. However, due to the small free volumes in the filling material and due to the quenching of a flame that may propagate through the paths in the filling material, an external explosion is prevented.

NOTE 2 Refer to UL 60079-5, CSA 60079-5 or IEC 60079-5 for the applicable ANSI, CAN or IEC certification requirements respectively.

3.110 PRESSURE PILING – the results of an ignition, in a compartment or subdivision of an enclosure, of a gas mixture pre-compressed, for example, due to a primary ignition in another compartment or subdivision.

3.111 PRESSURIZATION – under the Division and Zone systems, type of protection guarding against the ingress of the external atmosphere into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere. Under the Division system, this type of protection is

referred to as "Type X", "Type Y" or "Type Z". Under the Zone system, This type of protection is referred to as "px", "py" or "pz". See [3.112](#), [3.113](#) and [3.114](#).

NOTE Refer to ANSI/NFPA 496 under the Division system and UL 60079-2, CSA 60079-2 or IEC 60079-2 under the Zone system for the applicable ANSI, CAN and IEC certification requirements respectively.

3.112 PRESSURIZATION, TYPE X – a method of reducing the classification within an enclosure from Division 1/Zone 1 to nonhazardous (unclassified). See [6.2.1](#).

3.113 PRESSURIZATION, TYPE Y – a method of reducing the classification within an enclosure from Division 1/Zone 1 to Division 2/Zone 2. See [6.2.1](#).

3.114 PRESSURIZATION, TYPE Z – a method of reducing the classification within an enclosure from Division 2/Zone 2 to nonhazardous (unclassified). See [6.2.1](#).

3.115 PROTECTIVE COMPONENT (as applied to intrinsic safety) – a component that is so unlikely to become defective in a manner that will lower the intrinsic safety of the circuit that it may be considered not subject to fault when analyses or tests for intrinsic safety are made.

3.116 PROTECTIVE GAS – the air or inert gas used for purging and maintaining an overpressure and, if required, dilution and purging of flammable gases to a level well below their lower explosive limit, usually below 25 percent LFL. The *protective gas* may be air, nitrogen, other nonflammable gas, or a mixture of such gases.

3.117 PURGING – in a pressurized enclosure, the operation of passing a quantity of protective gas through the enclosure and ducts, so that the concentration of the explosive gas atmosphere is brought to a safe level.

3.118 QUALIFIED PERSON – one familiar with the construction and operation of the equipment and the hazards involved

3.119 RARE MALFUNCTION – type of malfunction, which may happen, but only in rare instances. (IEV 426-04-58)

NOTE Two independent expected malfunctions which, separately, would not create a source of ignition, but which, in combination, do create a source of ignition, are regarded as a single rare malfunction.

3.120 RESTRICTED BREATHING – under the Zone system, a protection technique in which the tightness of an enclosure is assured so that short-term presence of a flammable gas or vapor cloud around the enclosure will not cause the concentration inside the enclosure to reach the LFL/LEL because of breathing or diffusion. This type of protection is referred to as "nR."

NOTE Refer to UL 60079-15, CSA 60079-15 or IEC 60079-15 for the applicable ANSI, CAN or IEC certification requirements respectively.

3.121 SAFE AREA – refer to NONHAZARDOUS (UNCLASSIFIED) LOCATION.

3.122 SEAL, CABLE, EXPLOSIONPROOF – a cable termination fitting filled with compound and designed to contain an explosion in the enclosure to which it is attached or to minimize passage of flammable gases or vapors from one location to another. A conduit seal in combination with a cable termination fitting may also be used as a cable seal.

3.123 SEAL, CONDUIT, EXPLOSIONPROOF – a sealing fitting, filled with a poured potting compound, designed to contain an explosion in the enclosure to which it is attached and to minimize passage of flammable gases or vapors from one location to another.

3.124 SEALED DEVICE – under the Division and Zone systems, a device so constructed that it cannot be opened during normal operational conditions or operational maintenance; it has a free internal volume less than 100 cubic centimeters (6.1 cubic inches) and is sealed to restrict entry of an external atmosphere. Under the Zone system, this type of protection is referred to as “nC.”

NOTE Refer to UL 121201 or CSA 213 under the Division system and UL 60079-15, CSA 60079-15 or IEC 60079-15 under the Zone system for the applicable ANSI, CAN or IEC certification requirements respectively.

3.125 SEAL, FACTORY – a construction where components capable of initiating an internal explosion due to arcing, sparking, or thermal effects under normal conditions are isolated from the wiring system by means of factory installed flameproof seal or joint for the purpose of eliminating the need for an external, field-installed conduit seal and, in some cases, a field-installed cable seal.

3.126 SIMPLE APPARATUS (as applied to intrinsic safety) – a device that will not generate or store more than 1.5 V, 0.1 A, or 25 mW. Examples are: switches, thermocouples, light-emitting diodes, and resistance temperature detectors (RTDs).

3.127 SOURCE OF RELEASE – point or location from which a flammable gas, vapor, mist, or liquid may be released into the atmosphere in such a way that an explosive gas atmosphere could be formed.

NOTE IEC 60079-10-1 gives a classification of sources of release.

3.128 SPECIAL PROTECTION – a protection technique other than those that have been standardized.

3.129 SYMBOL "U" – under the IEC Zone system, suffix to the certificate number used to denote an Ex Component.

NOTE The symbol "U" is used to identify that the equipment is incomplete and is not suitable for installation without further evaluation.

3.130 SYMBOL "X" – under the IEC Zone system, symbol used to denote specific conditions of use for Ex Equipment.

NOTE The symbol "X" is used to provide a means of identifying that essential information for the installation, use, and maintenance of the Ex equipment is contained within the certificate.

3.131 TEMPERATURE, AMBIENT – the temperature of air or other media where electrical equipment is to be used.

3.132 TEMPERATURE CLASS – classification system of equipment based on its maximum surface temperature, related to the specific explosive gas atmosphere for which it is intended to be used. See [Table 2](#). Also, referred to as "temperature classification" or "T-Code".

3.133 TYPE OF PROTECTION – specific measures applied to equipment to avoid ignition of a surrounding explosive atmosphere. Examples are "e" and "n".

3.134 UPPER EXPLOSIVE LIMIT (UEL) – refer to [3.58](#) NOTE 2.

3.135 UPPER FLAMMABLE LIMIT (UFL) – refer to FLAMMABLE LIMITS.

3.136 VAPOR – gaseous phase of a substance that can reach equilibrium with its liquid or solid state in the temperature and pressure range of interest.

3.137 VAPOR PRESSURE – pressure exerted when a solid or liquid is in equilibrium with its own vapor.

NOTE It is a function of the substance and of the temperature of the substance.

3.138 VENTILATION – movement of air and its replacement with fresh air due to the effects of wind, temperature gradients, or artificial means (for example, fans or extractors).

NOTE IEC 60079-10-1 gives types and degrees of ventilation.

3.139 ZONE – a method of specifying the probability that a location is made hazardous by the presence, or potential presence, of flammable concentrations of gases and vapors, or combustible mixtures of dusts.

3.140 ZONE 0 (IEC) – an area in which an explosive gas atmosphere is present continuously or for long periods, or frequently. (IEV 426-03-03).

3.141 ZONE 0, CLASS I (NEC) – a Class I, Zone 0 location is a location (1) in which ignitable concentrations of flammable gases or vapors are present continuously; or (2) in which ignitable concentrations of flammable gases or vapors are present for long periods of time. (NEC Section 505.5 (B) (1))

3.142 ZONE 1 (IEC) – an area in which an explosive gas atmosphere is likely to occur in normal operation occasionally. (IEV 426-03-04)

3.143 ZONE 1, CLASS I (NEC) – a Class I, 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 Class I, 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. (NEC Article 505.5 (B) (2))

3.144 ZONE 2 (IEC) – an area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, will persist for a short period only. (IEV 426-03-05)

3.145 ZONE 2, CLASS I (NEC) – a Class I, 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 liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers or closed systems from which they can escape only as a result of accidental rupture or breakdown of the containers or system, or as the result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or (3) in which ignitable concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as the result of failure or abnormal operation of the ventilation equipment; or (4) that is adjacent to a Class I, Zone 1 location from which ignitable concentrations of flammable gases or vapors could 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. (NEC Section 505.5 (B)(3))

3.146 ZONE 20 –

(IEC) – an area in which an explosive atmosphere in the form of a cloud of combustible dust in the air is present continuously, or for long periods or frequency. (IEV 426-03-23)

(NEC) – an area where (1) Ignitable concentrations of combustible dust or ignitable fibers/flyings are present continuously or (2) Ignitable concentrations of combustible dust or ignitable fibers/flyings are present for long periods of time. (NEC Section 506.5 (B)(1))

3.147 ZONE 21 –

(IEC) – an area in which an explosive atmosphere in the form of a cloud of combustible dust in the air is likely to occur, occasionally, in normal operation. (IEV 426-03-24)

(NEC) – an area where (1) Ignitable concentrations of combustible dust or ignitable fibers/flyings are likely to exist occasionally under normal operating conditions; or (2) Ignitable concentrations of combustible dust or ignitable fibers/flyings may exist frequently because of repair or maintenance operations or because of leakage; or (3) 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 combustible dust or ignitable fibers/flyings and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or (4) The location is adjacent to a Zone 20 location from which ignitable concentrations of dust or ignitable fibers/flyings could be communicated.

Exception: When communication from an adjacent Zone 20 location is minimized by adequate positive pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided. (NEC Section 506.5 (B)(2))

3.148 ZONE 22 –

(IEC) – an area in which an explosive atmosphere in the form of a cloud of combustible dust in the air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

NOTE The potential of creating an explosive dust cloud from a dust layer also needs to be considered. (IEV 426-03-24)

(NEC) – an area where (1) Ignitable concentrations of combustible dust or ignitable fibers/flyings are not likely to occur under normal operation and if they do occur, will only persist for a short period; or (2) Combustible dust or fibers/flying are handled, processed, or used but in which the dust or fibers/flyings are normally confined within closed containers or closed systems from which they can escape only as a result of the abnormal operation of the equipment with which the dust or fibers/flyings are handled, processed, or used; or (3) The location is adjacent to a Zone 21 location, from which ignitable concentrations of dust or fibers/flyings could be communicated.

Exception: When communication from an adjacent Zone 21 location is minimized by adequate positive pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided. (NEC Section 506.5 (B)(3))

4 Area (location) classification

Area classification schemes should specify the kind of flammable material that may be present and the probability that it will be present in ignitable concentrations. Area classification schemes and systems of material classification have been developed to provide a succinct description of the hazard so that appropriate safeguards may be selected. The type of protection technique selected and the level of protection it must provide depend upon the potential hazard caused by using electrical equipment in a location in which a combustible, flammable, or ignitable substance may be present.