Public Input No. 1-NFPA 497-2020 [Section No. 3.3]

3.3 General Definitions.

3.3.1 Adequate Ventilation.

A ventilation rate that ~~affords six air changes per hour, 1 cfm per square foot of floor area (0.3 m ^{3} /min/m ^{2}), or other similar criterion that~~ prevents ~~the accumulation of significant quantities of~~ vapor-air concentrations from exceeding 25 percent of the lower flammable limit (LFL).

3.3.2* 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~~ , dispersed in air, without a specific ignition source .

3.3.3 CAS.

Chemical Abstract Service.

3.3.4 Combustible Liquid.

Any liquid-phase combustible material that cannot be categorized as flammable, i.e. has a closed-cup flash point at or above 100°F (37.8°C), as determined by the test procedures and apparatus set forth in NFPA 30.

Combustible liquids are classified in accordance with the following:

(1) Class II Liquid — Any liquid that has a flash point at or above 100°F (37.8°C) and below 140°F (60°C);

(2) Class III Liquid — Any liquid that has a flash point at or above 140°F (60°C);

(a) Class IIIA Liquid — Any liquid that has a flash point at or above 140°F (60°C), but below 200°F (93°C);

(b) Class IIIB Liquid — Any liquid that has a flash point at or above 200°F (93°C). [**30,** 2018]

3.3.5 Combustible Material.

A generic term used to describe ~~a flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode.~~ any material that can react in the gaseous-state with oxygen (typically in air) and releases sufficient energy to sustain the combustion reaction. This includes gases (e.g. methane), vapor produced from volatile liquid (e.g. LPG), or vapors evolved from decomposition of solids (e.g. coal).

3.3.5.1* Combustible Material (Class I, Division).

Class I, Division combustible materials are divided into Groups A, B, C, and D.

3.3.5.1.1 Group A.

Acetylene.

3.3.5.1.2 Group B.

Flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40. Note: A typical Class I, Group B material is hydrogen.

3.3.5.1.3 Group C.

Flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current (MIC) ratio greater than 0.40 and less than or equal to 0.80. Note: A typical Class I, Group C material is ethylene.

3.3.5.1.4 Group D.

Flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current (MIC) ratio greater than 0.80. Note: A typical Class I, Group D material is propane.

3.3.5.2* Combustible Material (Zone).

Zone combustible materials are divided into Groups IIC, IIB, and IIA.

3.3.5.2.1 Group IIA.

Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.80.

3.3.5.2.2 Group IIB.

Atmospheres containing acetaldehyde, ethylene, or flammable gas, flammable liquid produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either maximum experimental safe gap (MESG) values greater than 0.50 mm and less than or equal to 0.90 mm or minimum igniting current ratio (MIC ratio) greater than 0.45 and less than or equal to 0.80.

3.3.5.2.3 Group IIC.

Atmospheres containing acetylene, hydrogen, or flammable gas, flammable liquid-produced vapor, or combustible liquid produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.50 mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.45.

3.3.6 Flammable Liquid.

Any combustible liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in NFPA 30, and a Reid vapor pressure that does not exceed an absolute pressure of 40 psi (276 kPa) at 100°F (37.8°C), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*.

Flammable liquids are classified as Class I liquids and further ~~subclassified~~ sub-classified in accordance with the following:

(1) Class IA Liquid — ~~Any~~ Any combustible liquid that has a flash point below 73°F (22.8°C) and boiling point below 100°F (37.8°C);

(2) Class IB Liquid — ~~Any~~ Any combustible liquid that has a flash point below 73°F (22.8°C) and boiling point at or above 100°F (37.8°C);

(3) Class IC Liquid — ~~Any~~ Any combustible liquid that has a flash point at or above 73°F (22.8°C), but below 100°F (37.8°C). [**30,** 2018]

3.3.7 Flash Point.

The minimum temperature at which ~~a liquid gives off~~ the vapor in ~~sufficient concentration to form an ignitible mixture with air near~~ air at the surface of ~~the liquid~~ a combustible liquid can be ignited by an ignition source (e.g. a flame or spark) , as specified by test.

3.3.8 ~~Ignitible~~ Ignitable Mixture.

A combustible material that is within its flammable range of gas/vapor concentrations - the minimum gas/vapor concentration is known as the Lower Flammable Limit (LFL) and the maximum gas/vapor concentration as the Upper Flammable Limit (UFL) .

3.3.9 Maximum Experimental Safe Gap (MESG).

The maximum clearance between two parallel metal surfaces that has been found, under specified test conditions, to prevent an explosion in a test chamber from being propagated to a secondary chamber containing the same gas or vapor at the same concentration.

3.3.10* Minimum Igniting Current (MIC) Ratio.

The ratio of the minimum current required from an inductive spark discharge to ignite the most easily ignitible mixture of a gas or vapor, divided by the minimum current required from an inductive spark discharge to ignite methane under the same test conditions.

3.3.11 Minimum Ignition Energy (MIE).

The minimum energy required from a capacitive spark discharge to ignite the most easily ignitible mixture of a gas or vapor.

3.3.12 Unclassified Locations.

Locations determined to be neither Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22; nor any combination thereof. [**70:**100]

3.3.13 Flame Point

The minimum temperature at which the vapor in air at the surface of a combustible liquid can be ignited by an ignition source (e.g. a flame or spark) and generate sufficient vapor to sustain the flame, as specified by test

Statement of Problem and Substantiation for Public Input

Clause 3.3.1 - The definition of adequate ventilation rates based on a number of "changes per hour" and air flowrates per sq m have been largely discredited by research work over the past decade. Current editions of other national and international HAC codes (e.g. API RP 505:2018 - Clause 6.6.2.1) no longer include these criteria.
Clause 3.3.4 - Clarify the definition of combustible liquid to show that this is a liquid-phase sub-set of the combustible material defined in 3.3.5 - this is typically used for those combustible liquids that are not defined as flammable liquids in 3.3.6
Clause 3.3.5 - Clarify the definition of a combustible material to cover all materials, in any phase, that can combust in air.
Clause 3.3.6 - Revise the definition of flammable liquid to clarify that this is a defined sub-set of the range of combustible liquids (defined in 3.3.4) which is categorised using defined flash-point temperatures
Clause 3.3.7 - Clarify the definition of "flash point" to be consistent with other codes.
Clause 3.3.8 - Extend the definition of ignitable mixture to include reference to flammability range (between LFL & UFL, which should also be defined).
Additional Clause 3.3.13 - Define Flame Point - for many combustible materials the flash and flame point temperatures are close, but for some combustible liquids (e.g. fuel oils produced by the pyrolysis of wood) this gap can be significant, These contain quantities of water and require an increased temperature to generate sufficient vapour to sustain the combustion (i.e. flame point) .

Correct the spelling of "ignitable" within the document
The other revisions are intended to improve the clarity and consistency of the text within the standard - I suggest that consistency with other national and international codes would also be useful.

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Committee: EEC-AAA

Committee Statement

Resolution: The change of spelling of ignitible would create unnecessary conflict with NFPA 70, as it is well established defined term. NFPA 30 Flammable and Combustible Liquids Code, also uses the spelling of ignitible. Flame Point is not used in the recommended practice, therefore it is not included in the definitions. The adequate ventilation prescriptive options are necessary for usability of the document. The committee is not aware of research that discredits the air changes per hour and the air flowrate per sq foot criteria. The definitions for flammable and combustible liquids are extracted from NFPA 30 Flammable and Combustible Liquids Code. The committee will review on extracting the definition of flash point from NFPA 30. This document handles flammable and combustible liquids and combustible solids or materials are not part of the scope of this document.

Public Input No. 2-NFPA 497-2020 [Chapter 4]

Chapter 4 Classification of Combustible Materials

4.1 ***National Electrical Code*** Criteria.

4.1.1

Articles 500 and 505 of the *NEC* classify a location in which a combustible material is or may be present in the atmosphere in sufficient concentrations to produce an ignitible mixture.

4.1.2*

In a Class I hazardous (classified) location, the combustible material present is a flammable gas, flammable liquid–produced vapor, or combustible liquid–produced vapor mixed with air that could burn or explode.

4.2 Behavior of Class I (Combustible Material) Gases, Vapors, and Liquids.

4.2.1 Lighter-than-Air (~~Vapor Density~~ Relative Density Less than 1.0) Gases.

These gases tend to dissipate rapidly in the atmosphere. They will not affect as great an area as will heavier-than-air gases or vapors. Except in enclosed spaces, such gases seldom accumulate to form an ignitible mixture near grade level, where most electrical installations are located. A lighter-than-air gas that has been cooled sufficiently could behave like a heavier-than-air gas until it absorbs heat from the surrounding atmosphere.

4.2.2 Heavier-than-Air (~~Vapor Density~~ Relative Density Greater than 1.0) Gases.

These gases tend to fall to grade level when released and flow down-slope to low-points in the terrain . The gas could remain for a significant period of time (particularly within drainage systems) , unless dispersed by natural or forced ventilation. A heavier-than-air gas that has been heated sufficiently to decrease its density could behave like a lighter-than-air gas until cooled by the surrounding atmosphere, at which point it may descend to the ground at some distance from its release point ..

4.2.3 Applicable to All Densities.

As the gas diffuses into the surrounding air, the density of the mixture approaches that of air - gases at LFL concentrations effectively have neutral buoyancy . .

4.2.4 Compressed Liquefied Gases.

These gases are ~~stored~~ stored in the liquid state under pressure as ambient temperatures are well above their ~~normal boiling point but are kept in the liquid state by pressure. When released, the liquid immediately expands and vaporizes, creating large volumes of cold gas. The cold gas behaves like a heavier-than-air gas.~~ atmospheric boiling point, i.e. the vapor pressure at ambient temperature. When the vessel is depressurized by a rapid vapor release, some of the liquid immediately flashes to vapor, taking heat from the bulk liquid and cooling to its atmospheric boiling point. Further vapor releases will be limited by the heat flow to the remaining liquid from the surroundings.

4.2.5 Cryogenic Flammable Liquids and Other Cold Liquefied Combustible Materials.

~~Cryogenic liquids are generally handled below −150°F (−101°C). These behave like flammable liquids when they are spilled. Small liquid spills will immediately vaporize~~ These are liquids cooled by refrigeration and stored in insulated tanks at atmospheric pressure. Small liquid spills will rapidly vaporize , but larger spills may remain in the liquid state for an extended time~~. As the liquid absorbs heat, it vaporizes and could form an ignitible mixture.~~ , depending on the rate of heat flow from the surface. The cold vapor could form a significant cloud of ignitaible mixture.

Some liquefied combustible materials (not cryogenic) are stored at low temperatures and at pressures close to atmospheric pressure; these include anhydrous ammonia, propane, ethane, ethylene, and propylene.~~ These materials will behave as described in 4.2.1 or 4.2.2 .~~

Cryogenic liquids are generally handled below -150°F (-101°C).

4.2.6 Flammable Liquids.

When released in appreciable quantity, a Class I liquid will begin to evaporate at a rate that depends on its volatility: the lower the flash point, the greater the volatility; hence, the faster the evaporation. The vapors of Class I liquids form ignitible mixtures with air at ambient temperatures more or less readily. Even when evolved rapidly, the vapors tend to disperse rapidly, becoming diluted to a concentration below the lower flammable limit (LFL). Until this dispersion takes place, however, these vapors will behave like heavier-than-air gases. Class I liquids normally will produce ignitible mixtures that will travel a finite distance from the point of origin; thus, they will normally require area classification for proper electrical system design.

4.2.7 Combustible Liquids.

A combustible liquid will form an ignitible mixture only when heated above its flash point.

4.2.7.1

With Class II liquids, the degree of hazard is lower because the vapor release rate is low at normal handling and storage temperatures. In general, these liquids will not form ignitible mixtures with air at ambient temperatures unless heated above their flash points. Also, the vapors will not travel as far because they tend to condense as they are cooled by ambient air. Class II liquids should be considered capable of producing an ignitible mixture near the point of release when handled, processed, or stored under conditions where the liquid could exceed its flash point.

4.2.7.2

Class IIIA liquids do not form ignitible mixtures with air at ambient temperatures unless heated above their flash points. Furthermore, the vapors cool rapidly in air and condense. Hence, the extent of the area requiring electrical classification will be very small or nonexistent.

4.2.7.3

Class IIIB liquids seldom evolve enough vapors to form ignitible mixtures even when heated, and they are seldom ignited by properly installed and maintained general purpose electrical equipment. A Class IIIB liquid will cool below its flash point very quickly when released. Therefore, area classification is seldom needed and Class IIIB liquids are not included in Table 4.4.2.

4.3 Conditions Necessary for Ignition.

In a Class I area, the following three conditions must be satisfied for the combustible material to be ignited by the electrical installation:

(1) A combustible material must be present at conditions under which a gas/vapor .
~~It must~~

(2) is produced

(3) This gas/vapor must be mixed with air in the proportions required to produce an ignitible mixture (i .e. between LFL and UFL).

(4) There must be ~~a release of~~ a source of sufficient energy to ignite the gas-air mixture.

4.4 Classification of Class I Combustible Materials.

4.4.1

Combustible materials are classified into four Class I, Division Groups: A, B, C, and D; or three Class I, Zone Groups: IIA, IIB, and IIC, depending on their properties.

4.4.2*

An alphabetical listing of selected combustible materials, with their group classification and relevant physical properties, is provided in Table 4.4.2.

Table 4.4.2 Selected Chemicals

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	Vapor Relative Density (Air = 1)	Va Pres (mr
Acetaldehyde	75-07-0	C[d]	I	−38	175	4.0	60.0	1.5	874.9
Acetic Acid	64-19-7	D[d]	II	39	426	-		19.9	2.1
Acetic Acid-tert-Butyl Ester	540-88-5	D	II	-	-			1.7	9.8
Acetic Anhydride	108-24-7	D	II	49	316	2.7	10.3	3.5	4.9
Acetone	67-64-1	D[d]	I	−20	465	2.5	12.8	2.0	230.7
Acetone Cyanohydrin	75-86-5	D	IIIA	74	688	2.2	12.0	2.9	0.3
Acetonitrile	75-05-8	D	I	6	524	3.0	16.0	1.4	91.1
Acetylene	74-86-2	A[d]	GAS	-		305	2.5	100	0.9
Acrolein (Inhibited)	107-02-8	B(C)[d]	I	-		235	2.8	31.0	1.9
Acrylic Acid	79-10-7	D	II	54	438	2.4	8.0	2.5	4.3
Acrylonitrile	107-13-1	D[d]	I	0	481	3	17	1.8	108.5
Adiponitrile	111-69-3	D	IIIA	93	550	-	-		
Allyl Alcohol	107-18-6	C[d]	I	22	378	2.5	18.0	2.0	25.4
Allyl Chloride	107-05-1	D	I	−32	485	2.9	11.1	2.6	366
Allyl Glycidyl Ether	106-92-3	B(C)[e]	II	-		57	-	-	
Alpha-Methyl Styrene	98-83-9	D	II	-		574	0.8	11.0	4.1
n-Amyl Acetate	628-63-7	D	I	25	360	1.1	7.5	4.5	4.2
sec-Amyl Acetate	626-38-0	D	I	23	-		1.1	7.5	4.5
Ammonia	7664-41-7	D[d,f]	GAS	-		651	15	28	0.6
Aniline	62-53-3	D	IIIA	70	615	1.2	8.3	3.2	0.7
Benzene	71-43-2	D[d]	I	−11	498	1.2	7.8	2.8	94.8
Benzyl Chloride	98-87-3	D	IIIA	-		585	1.1	-	
Bromopropyne	106-96-7	D	I	10	324	3.0	-	-	-
n-Butane	106-97-8	D[d,g]	GAS	-		288	1.9	8.5	2.0
1,3-Butadiene	106-99-0	B(D)[d,e]	GAS	-		420	2.0	11.5	1.9
1-Butanol	71-36-3	D[d]	I	36	343	1.4	11.2	2.6	7.0
Butyl alcohol(s) (butanol-2)	78-92-2	D[d]	I	23.8	405	1.7	9.8	2.6	-
Butylamine	109-73-9	D	GAS	−12	312	1.7	9.8	2.5	92.9
Butylene	25167-67-3	D	I	-		385	1.6	10.0	1.9
n-Butyraldehyde	123-72-8	C[d]	I	−12	218	1.9	12.5	2.5	112.2
n-Butyl Acetate	123-86-4	D[d]	I	22	421	1.7	7.6	4.0	11.5

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mr
sec-Butyl Acetate	105-46-4	D	II	−8	-		1.7	9.8	4.0
tert-Butyl Acetate	540-88-5	D	II	-	-			1.7	9.8
n-Butyl Acrylate (Inhibited)	141-32-2	D	II	49	293	1.7	9.9	4.4	5.5
n-Butyl Glycidyl Ether	2426-08-6	B(C)[e]	II	-	-	-	-	-	-
n-Butyl Formal	110-62-3	C	I	12	222	1.5	10.1	3.0	34.3
Butyl Mercaptan	109-79-5	C	I	2	-	-	-		
Butyl-2-Propenoate	141-32-2	D	II	49	-		1.7	9.9	4.4
para tert-Butyl Toluene	98-51-1	D	IIIA	-	-	-	-	-	-
n-Butyric Acid	107-92-6	D[d]	IIIA	72	443	2.0	10.0	3.0	0.8
Carbon Disulfide	75-15-0	d,h	I	−30	90	1.3	50.0	2.6	358.8
Carbon Monoxide	630-08-0	C[d]	GAS	-		609	12.5	74	0.97
Chloroacetaldehyde	107-20-0	C	IIIA	88	-	-	-	-	
Chlorobenzene	108-90-7	D	I	29	593	1.3	9.6	3.9	11.9
1-Chloro-1-Nitropropane	2425-66-3	C	IIIA	-	-	-	-	-	-
Chloroprene	126-99-8	D	GAS	−20	-		4.0	20.0	3.0
Cresol	1319-77-3	D	IIIA	81	559	1.1	-		3.7
Crotonaldehyde	4170-30-3	C[d]	I	13	232	2.1	15.5	2.4	33.1
Cumene	98-82-8	D	I	36	424	0.9	6.5	4.1	4.6
Cyclohexane	110-82-7	D	I	−17	245	1.3	8.0	2.9	98.8
Cyclohexanol	108-93-0	D	IIIA	68	300	-	-		
Cyclohexanone	108-94-1	D	II	44	420	1.1	9.4	3.4	4.3
Cyclohexene	110-83-8	D	I	−6	244	1.2	-		2.8
Cyclopropane	75-19-4	D[d]	I	-		503	2.4	10.4	1.5
p-Cymene	99-87-6	D	II	47	436	0.7	5.6	4.6	1.5
Decene	872-05-9	D	II	-		235	-	-	
n-Decaldehyde	112-31-2	C	IIIA	85	189	0.77	5.8	5.4	0.13
n-Decanol	112-30-1	D	IIIA	82	288	-	-		
Decyl Alcohol	112-30-1	D	IIIA	82	288	-	-		
Diacetone Alcohol	123-42-2	D	IIIA	64	603	1.8	6.9	4.0	1.4
Di-Isobutylene	25167-70-8	D[d]	I	2	391	0.8	4.8	3.8	-
Di-Isobutyl Ketone	108-83-8	D	II	60	396	0.8	7.1	4.9	1.7
o-Dichlorobenzene	95-50-1	D	IIIA	66	647	2.2	9.2	5.1	-
1,4-Dichloro-2,3 Epoxybutane	3583-47-9	D[d]	I	-	-			1.9	8.5
1,1-Dichloroethane	1300-21-6	D	I	-		438	6.2	16.0	3.4
1,2-Dichloroethylene	156-59-2	D	I	97	460	5.6	12.8	3.4	204

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mr
1,1-Dichloro-1-Nitroethane	594-72-9	C	IIIA	76	-	-	-		
1,3-Dichloropropene	10061-02-6	D	I	35	-		5.3	14.5	3.8
Dicyclopentadiene	77-73-6	C	I	32	503	-	-	-	
Diethylamine	109-87-9	C[d]	I	−28	312	1.8	10.1	2.5	-
Diethylaminoethanol	100-37-8	C	IIIA	60	320	-	-		
Diethyl Benzene	25340-17-4	D	II	57	395	-	-		
Diethyl Ether (Ethyl Ether)	60-29-7	C[d]	I	−45	160	1.9	36	2.6	538
Diethylene Glycol Monobutyl Ether	112-34-5	C	IIIA	78	228	0.9	24.6	5.6	0.02
Diethylene Glycol Monomethyl Ether	111-77-3	C	IIIA	93	241	-	-	-	
N-N-Dimethyl Aniline	121-69-7	C	IIIA	75	371	1.2	7.0	4.2	0.7
2,4-Dimethyl Aniline	95-68-1	C	IIIA	90	460	1.1	9.7	4.2	0.1
Dimethyl Formamide	68-12-2	D	II	58	455	2.2	15.2	2.5	4.1
Dimethyl Sulfate	77-78-1	D	IIIA	83	188	-	-		
Dimethylamine	124-40-3	C	GAS	-		400	2.8	14.4	1.6
2,2-Dimethylbutane	75-83-2	D[g]	I	−48	405	-	-	-	
2,3-Dimethylbutane	78-29-8	D[g]	I	-		396	-	-	-
3,3-Dimethylheptane	1071-26-7	D[g]	I	-		325	-	-	-
2,3-Dimethylhexane	584-94-1	D[g]	I	7	315	1.0	5.9	3.9	23.5
2,3-Dimethylpentane	565-59-3	D[g]	I	−12	335	1.1	6.7	3.5	68.8
Di-N-Propylamine	142-84-7	C	I	17	299	-	-	-	
1,4-Dioxane	123-91-1	C[d]	I	12	180	2.0	22.0	3.0	38.2
Dipentene	138-86-3	D	II	45	237	0.7	6.1	4.7	-
Dipropylene Glycol Methyl Ether	34590-94-8	C	IIIA	85	-		1.1	3.0	5.1
Diisopropylamine	108-18-9	C	GAS	−6	316	1.1	7.1	3.5	-
Dodecene	6842-15-5	D	IIIA	100	255	-	-	-	-
Epichlorohydrin	3132-64-7	C[d]	I	33	411	3.8	21.0	3.2	13.0
Ethane	74-84-0	D[d]	GAS	−135	472	3.0	12.5	1.0	-
Ethanol	64-17-5	D[d]	I	13	363	3.3	19.0	1.6	59.5
Ethylamine	75-04-7	D[d]	I	−18	385	3.5	14.0	1.6	1048
Ethylene	74-85-1	C[d]	GAS	-		490	2.7	36.0	1.0
Ethylenediamine	107-15-3	D[d]	I	33	385	2.5	12.0	2.1	12.5
Ethylenimine	151-56-4	C[d]	I	−11	320	3.3	54.8	1.5	211

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mr
Ethylene Chlorohydrin	107-07-3	D	IIIA	59	425	4.9	15.9	2.8	7.2
Ethylene Dichloride	107-06-2	D[d]	I	13	413	6.2	16.0	3.4	79.7
Ethylene Glycol Monoethyl Ether Acetate	111-15-9	C	II	47	379	1.7	-		4.7
Ethylene Glycol Monobutyl Ether Acetate	112-07-2	C	IIIA	-		340	0.9	8.5	-
Ethylene Glycol Monobutyl Ether	111-76-2	C	IIIA	-		238	1.1	12.7	4.1
Ethylene Glycol Monoethyl Ether	110-80-5	C	II	-		235	1.7	15.6	3.0
Ethylene Glycol Monomethyl Ether	109-86-4	D	II	-		285	1.8	14.0	2.6
Ethylene Oxide	75-21-8	B(C)[d,e]	I	−20	429	3	100	1.5	1314
2-Ethylhexaldehyde	123-05-7	C	II	44	191	0.85	6.6	4.4	1.9
2-Ethylhexanol	104-76-7	D	IIIA	81	-		0.9	9.7	4.5
2-Ethylhexyl Acrylate	103-09-3	D	IIIA	88	252	-	-	-	
Ethyl Acetate	141-78-6	D[d]	I	−4	427	2.0	11.5	3.0	93.2
Ethyl Acrylate (Inhibited)	140-88-5	D[d]	I	9	372	1.4	14.0	3.5	37.5
Ethyl Alcohol	64-17-5	D[d]	I	13	363	3.3	19.0	1.6	59.5
Ethyl Sec-Amyl Ketone	541-85-5	D	II	59	-	-	-	-	-
Ethyl Benzene	100-41-4	D	I	15	432	0.8	6.7	3.7	9.6
Ethyl Butanol	97-95-0	D	II	57	-		1.2	7.7	3.5
Ethyl Butyl Ketone	106-35-4	D	II	46	-	-	-		
Ethyl Chloride	75-00-3	D	GAS	−50	519	3.8	15.4	2.2	-
Ethyl Formate	109-94-4	D	GAS	−20	455	2.8	16.0	2.6	-
Ethyl Mercaptan	75-08-1	C[d]	I	−18	300	2.8	18.0	2.1	527.4
n-Ethyl Morpholine	100-74-3	C	I	32	-	-	-		
2-Ethyl-3-Propyl Acrolein	645-62-5	C	IIIA	68	-	-	-		
Ethyl Silicate	78-10-4	D	II	-	-	-	-		
Formaldehyde (Gas)	50-00-0	B	GAS	-		430	7	73	1.0
Formic Acid	64-18-6	D	II	50	434	18.0	57.0	1.6	42.7
Fuel Oil 1	8008-20-6	D	II or IIIA[k]	38–72[k]	210	0.7	5.0	-	-
Fuel Oil 2	-	-			II or IIIA[k]	52–96[k]	257	-	-
Fuel Oil 6	-	-			IIIA or	66–132[k]	-	-	-

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	Vapor Relative Density (Air = 1)	Va Pres (mr
					IIIB[k]				
Furfural	98-01-1	C	IIIA	60	316	2.1	19.3	3.3	2.3
Furfuryl Alcohol	98-00-0	C	IIIA	75	490	1.8	16.3	3.4	0.6
Gasoline	8006-61-9	D[d]	I	−46	280	1.4	7.6	3.0	-
n-Heptane	142-82-5	D[d]	I	−4	204	1.0	6.7	3.5	45.5
n-Heptene	81624-04-6	D[g]	I	−1	204	-	-		
n-Hexane	110-54-3	D[d,g]	I	−23	225	1.1	7.5	3.0	152
Hexanol	111-27-3	D	IIIA	63	-	-	-		
2-Hexanone	591-78-6	D	I	35	424	1.2	8.0	3.5	10.6
Hexene	592-41-6	D	I	−26	245	1.2	6.9	-	
sec-Hexyl Acetate	108-84-9	D	II	45	-	-	-		
Hydrazine	302-01-2	C	II	38	23	-		98.0	1.1
Hydrogen	1333-74-0	B[d]	GAS	-		500	4	75	0.1
Hydrogen Cyanide	74-90-8	C[d]	GAS	−18	538	5.6	40.0	0.9	-
Hydrogen Selenide	7783-07-5	C	I	-	-	-	-	-	
Hydrogen Sulfide	7783-06-4	C[d]	GAS	-		260	4.0	44.0	1.2
Isoamyl Acetate	123-92-2	D	I	25	360	1.0	7.5	4.5	6.1
Isoamyl Alcohol	123-51-3	D	II	43	350	1.2	9.0	3.0	3.2
Isobutane	75-28-5	D[g]	GAS	−82	460	1.8	8.4	2.0	2639
Isobutyl Acetate	110-19-0	D[d]	I	18	421	2.4	10.5	4.0	17.8
Isobutyl Acrylate	106-63-8	D	I	-		427	-	-	
Isobutyl Alcohol	78-83-1	D[d]	I	−40	416	1.2	10.9	2.5	10.5
Isobutyraldehyde	78-84-2	C	GAS	−40	196	1.6	10.6	2.5	-
Isodecaldehyde	3085-26-5	C	IIIA	85	-	-	-		
Isohexane	107-83-5	D[g]	I	−33	306	1.2	7.0	2.0	211.7
Isopentane	78-78-4	D[g]	I	−56	420	1.4	8.3	2.6	688.(
Isooctyl Aldehyde	123-05-7	C	II	44	191	0.85	6.6	4.4	1.9
Isophorone	78-59-1	D	-		84	460	0.8	3.8	4.8
Isoprene	78-79-5	D[d]	I	−54	220	1.5	8.9	2.4	550.(
Isopropyl Acetate	108-21-4	D	I	-		460	1.8	8.0	3.5
Isopropyl Ether	108-20-3	D[d]	I	−28	443	1.4	7.9	3.5	148.7
Isopropyl Glycidyl Ether	4016-14-2	C	I	-	-	-	-	-	-
Isopropylamine	75-31-0	D	GAS	−26	402	2.3	10.4	2.0	-
Kerosene	8008-20-6	D	II	72	210	0.7	5.0	-	-
Liquefied Petroleum Gas	68476-8-7	D	I	-		405	-	-	-

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mr
Mesityl Oxide	141-97-9	D[d]	I	31	344	1.4	7.2	3.4	47.6
Methane	74-82-8	D[d]	GAS	-		600	5	15	0.6
Methanol	67-56-1	D[d]	I	12	385	6.0	36.0	1.1	126.3
Methyl Acetate	79-20-9	D	I	−10	454	3.1	16.0	2.6	214.5
Methyl Acrylate	96-33-3	D	I	−3	468	2.8	25.0	3.0	87.1
Methyl Alcohol	67-56-1	D[d]	I	12	385	6.0	36	1.1	126.3
Methyl Amyl Alcohol	108-11-2	D	II	41	-		1.0	5.5	3.5
Methyl Chloride	74-87-3	D	GAS	−46	632	8.1	17.4	1.7	-
Methyl Ether	115-10-6	C[d]	GAS	−41	350	3.4	27.0	1.6	-
Methyl Ethyl Ketone	78-93-3	D[d]	I	−6	465	1.97	10.1	2.5	89.8
Methyl Formal	534-15-6	C[d]	I	1	238	-	-		
Methyl Formate	107-31-3	D	I	−19	449	4.5	23.0	2.1	585
2-Methylhexane	591-76-4	D[g]	I	−10	280	1.0	6.0	3.5	65.8
Methyl Isobutyl Ketone	108-10-1	D[d]	I	13	440	1.2	8.0	3.5	11
Methyl Isocyanate	624-83-9	D	I	−15	534	5.3	26.0	2.0	441.3
Methyl Mercaptan	74-93-1	C	GAS	−18	-		3.9	21.8	1.7
Methyl Methacrylate	80-62-6	D	I	10	422	1.7	8.2	3.6	37.2
Methyl N-Amyl Ketone	110-43-0	D	II	49	393	1.1	7.9	3.9	3.8
Methyl Tertiary Butyl Ether	1634-04-4	D	I	−80	435	1.6	8.4	0.2	250.1
2-Methyloctane	3221-61-2	-	-	-				220	-
2-Methylpentane	107-83-5	D[g]	I	−33	306	1.2	7.0	3.0	211.7
2-Methylpropane	75-28-5	D[g]	GAS	−82	460	1.8	8.4	2.0	2639
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
2-Methyl-5-Ethyl Pyridine	104-90-5	D	-		74	-		1.1	6.6
Methylacetylene	74-99-7	C[d]	GAS	−81	340	1.7	57.3	1.38	4360
Methylacetylene-Propadiene	59355-75-8	C	GAS	-	-			3.4	10.8
Methylal	109-87-5	C	I	−18	237	1.6	17.6	2.6	398
Methylamine	74-89-5	D	GAS	-		430	4.9	20.7	1.0
2-Methylbutane	78-78-4	D[g]	I	−56	420	1.4	8.3	2.6	688.6
Methylcyclohexane	208-87-2	D	I	−4	250	1.2	6.7	3.4	-
Methylcyclohexanol	25630-42-3	D	-		68	296	-	-	
2-Methycyclohexanone	583-60-8	D	II	-	-	-	-		

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	Vapor Relative Density (Air = 1)	Va Pres (mı
2-Methylheptane	-		D[g]	-	-			420	-
3-Methylhexane	589-34-4	D[g]	-	-			280	-	-
3-Methylpentane	94-14-0	D[g]	-	-			278	-	-
-	-	-	-	-	-	-	-	-	-
2-Methyl-1-Propanol	78-83-1	D[d]	I	−40	416	1.2	10.9	2.5	10.5
2-Methyl-2-Propanol	75-65-0	D[d]	I	10	478	2.4	8.0	2.6	42.2
2-Methyloctane	2216-32-2	D[g]	-	-			220	-	-
3-Methyloctane	2216-33-3	D[g]	-	-			220	-	-
4-Methyloctane	2216-34-4	D[g]	-	-			225	-	-
Monoethanolamine	141-43-5	D	-		85	410	-	-	
Monoisopropanolamine	78-96-6	D	-		77	374	-	-	
Monomethyl Aniline	100-61-8	C	-	-			482	-	-
Monomethyl Hydrazine	60-34-4	C	I	23	194	2.5	92.0	1.6	-
Morpholine	110-91-8	C[d]	II	35	310	1.4	11.2	3.0	10.1
Naphtha (Coal Tar)	8030-30-6	D	II	42	277	-	-	-	-
Naphtha (Petroleum)	8030-30-6	D[d,i]	I	42	288	1.1	5.9	2.5	-
Neopentane	463-82-1	D[g]	GAS	−65	450	1.4	8.3	2.6	1286
Nitrobenzene	98-95-3	D	-		88	482	1.8	-	
Nitroethane	79-24-3	C	I	28	414	3.4	-		2.6
Nitromethane	75-52-5	C	I	35	418	7.3	-		2.1
1-Nitropropane	108-03-2	C	I	34	421	2.2	-		3.1
2-Nitropropane	79-46-9	C[d]	I	28	428	2.6	11.0	3.1	17.1
n-Nonane	111-84-2	D[g]	I	31	205	0.8	2.9	4.4	4.4
Nonene	27214-95-8	D	I	-	-			0.8	-
Nonyl Alcohol	143-08-8	D	-	-	-				0.8
n-Octane	111-65-9	D[d,g]	I	13	206	1.0	6.5	3.9	14.0
Octene	25377-83-7	D	I	8	230	0.9	-		3.9
n-Octyl Alcohol	111-87-5	D	-	-	-	-	-		
n-Pentane	109-66-0	D[d,g]	I	−40	243	1.5	7.8	2.5	513
1-Pentanol	71-41-0	D[d]	I	33	300	1.2	10.0	3.0	2.5
2-Pentanone	107-87-9	D	I	7	452	1.5	8.2	3.0	35.6
1-Pentene	109-67-1	D	I	−18	275	1.5	8.7	2.4	639.7
2-Pentene	109-68-2	D	I	−18	-	-	-		
2-Pentyl Acetate	626-38-0	D	I	23	-		1.1	7.5	4.5
Phenylhydrazine	100-63-0	D	-		89	-	-	-	

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mr
Process Gas > 30% H_2	-		B[j]	GAS	-		520	4.0	75.0
Propane	74-98-6	D[d]	GAS	-		450	2.1	9.5	1.6
1-Propanol	71-23-8	D[d]	I	15	413	2.2	13.7	2.1	20.7
2-Propanol	67-63-0	D[d]	I	12	399	2.0	12.7	2.1	45.4
Propiolactone	57-57-8	D	-	-	-				2.9
Propionaldehyde	123-38-6	C	I	−9	207	2.6	17.0	2.0	318.5
Propionic Acid	79-09-4	D	II	54	466	2.9	12.1	2.5	3.7
Propionic Anhydride	123-62-6	D	-		74	285	1.3	9.5	4.5
n-Propyl Acetate	109-60-4	D	I	14	450	1.7	8.0	3.5	33.4
n-Propyl Ether	111-43-3	C[d]	I	21	215	1.3	7.0	3.5	62.3
Propyl Nitrate	627-13-4	B[d]	I	20	175	2.0	100.0	-	-
Propylene	115-07-1	D[d]	GAS	-		460	2.4	10.3	1.5
Propylene Dichloride	78-87-5	D	I	16	557	3.4	14.5	3.9	51.7
Propylene Oxide	75-56-9	B(C)[d,e]	I	−37	449	2.3	36.0	2.0	534.4
Pyridine	110-86-1	D[d]	I	20	482	1.8	12.4	2.7	20.8
Styrene	100-42-5	D[d]	I	31	490	0.9	6.8	3.6	6.1
Tetrahydrofuran	109-99-9	C[d]	I	−14	321	2.0	11.8	2.5	161.6
Tetrahydronaphthalene	119-64-2	D	IIIA	-		385	0.8	5.0	4.6
Tetramethyl Lead	75-74-1	C	II	38	-	-	-		
Toluene	108-88-3	D[d]	I	4	480	1.1	7.1	3.1	28.53
n-Tridecene	2437-56-1	D	IIIA	-	-			0.6	-
Triethylamine	121-44-8	C[d]	I	−9	249	1.2	8.0	3.5	68.5
Triethylbenzene	25340-18-5	D	-		83	-	-		
2,2,3-Trimethylbutane	-		D[g]	-	-			442	-
2,2,4-Trimethylbutane	-		D[g]	-	-			407	-
2,2,3-Trimethylpentane	-		D[g]	-	-			396	-
2,2,4-Trimethylpentane	-		D[g]	-	-			415	-
2,3,3-Trimethylpentane	-		D[g]	-	-			425	-
Tripropylamine	102-69-2	D	II	41	-	-	-		
Turpentine	8006-64-2	D	I	35	253	0.8	-	-	
n-Undecene	28761-27-5	D	IIIA	-	-			0.7	-
Unsymmetrical Dimethyl Hydrazine	57-14-7	C[d]	I	−15	249	2.0	95.0	1.9	-
Valeraldehyde	110-62-3	C	I	12	222	1.5	10.1	3.0	34.3
Vinyl Acetate	108-05-4	D[d]	I	−6	402	2.6	13.4	3.0	113.4

Chemical	CAS No.	Class I Division Group	Type[a]	Flash Point (°C)	AIT (°C)	%LFL	%UFL	~~Vapor~~ Relative Density (Air = 1)	Va Pres (mm
Vinyl Chloride	75-01-4	D[d]	GAS	−78	472	3.6	33.0	2.2	-
Vinyl Toluene	25013-15-4	D	-		52	494	0.8	11.0	4.1
Vinylidene Chloride	75-35-4	D	I	-		570	6.5	15.5	3.4
Xylene	1330-20-7	D[d]	I	25	464	0.9	7.0	3.7	-
-	-	-	-	-	-	-	-	-	-

[a]Type is used to designate if the material is a gas, flammable liquid, or combustible liquid. *(See 4.2.6 and 4.2.7.)*

[b]Vapor pressure reflected in units of mm Hg at 77°F (25°C) unless stated otherwise.

[c]Class I, Zone Groups are based on IEC 80079-20-1, 2017*, Explosive atmospheres — Part 20-1: Material characteristics for gas and vapor classification — Test methods and data*, which contains additional data on MESG and group classifications.

[d]Material has been classified by test.

[e]Where all conduit runs into explosionproof equipment, the conduit is provided with explosionproof seals installed within 18 in. (450 mm) of the enclosure, equipment for the group classification shown in parentheses is permitted.

[f]For classification of areas involving ammonia, see ANSI/IIAR 2 *Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems*, and CGA G2.1, *Safety Requirements for the Storage and Handling of Anhydrous Ammonia*.

[g]Commercial grades of aliphatic hydrocarbon solvents are mixtures of several isomers of the same chemical formula (or molecular weight). The autoignition temperatures (AIT) of the individual isomers are significantly different. The electrical equipment should be suitable for the AIT of the solvent mixture. *(See A.4.4.2.)*

[h]Certain chemicals have characteristics that need safeguards beyond those necessary for any of the above groups. Carbon disulfide is one of these chemicals because of its low autoignition temperature and the small joint clearance necessary to arrest its flame propagation.

[i]Petroleum naphtha is a saturated hydrocarbon mixture whose boiling range is 68°F to 275°F (20°C to 135°C). It is also known as benzine, ligroin, petroleum ether, and naphtha.

[j]Fuel and process gas mixtures found by test not to present hazards similar to those of hydrogen can be grouped based on the test results.

[k] Liquid type and flash point vary due to regional blending differences.

4.4.2.1

Where the MESG and MIC ratio values result in different group classifications, notwithstanding other applicable data, the more restrictive group classification should be applied.

4.4.3

Table 4.4.3 provides a cross-reference of chemicals from Table 4.4.2, sorted by their Chemical Abstract Service (CAS) numbers.

Table 4.4.3 Cross-Reference of Chemical CAS Number to Chemical Name

CAS No.	Chemical Name
50-00-0	Formaldehyde (Gas)
57-14-7	Unsymmetrical Dimethyl Hydrazine
57-57-8	Propiolactone
60-29-7	Diethyl Ether (Ethyl Ether)
60-34-4	Monomethyl Hydrazine
62-53-3	Aniline
64-17-5	Ethanol
64-17-5	Ethyl Alcohol
64-18-6	Formic Acid
64-19-7	Acetic Acid
67-56-1	Methanol
67-56-1	Methyl Alcohol
67-63-0	2-Propanol
67-64-1	Acetone
68-12-2	Dimethyl Formamide
71-23-8	1-Propanol
71-36-3	1-Butanol
-	-
71-41-0	1-Pentanol
71-43-2	Benzene
74-82-8	Methane
74-84-0	Ethane
74-85-1	Ethylene
74-86-2	Acetylene
74-87-3	Methyl Chloride
74-89-5	Methylamine
74-90-8	Hydrogen Cyanide
74-93-1	Methyl Mercaptan
74-98-6	Propane
74-99-7	Methylacetylene
75-00-3	Ethyl Chloride
75-01-4	Vinyl Chloride
75-04-7	Ethylamine
75-05-8	Acetonitrile
75-07-0	Acetaldehyde
75-08-1	Ethyl Mercaptan
75-15-0	Carbon Disulfide
75-19-4	Cyclopropane
75-21-8	Ethylene Oxide
75-28-5	Isobutane

CAS No.	Chemical Name
75-28-5	2-Methylpropane
-	-
75-31-0	Isopropylamine
75-35-4	Vinylidene Chloride
75-52-5	Nitromethane
75-56-9	Propylene Oxide
75-65-0	2-Methyl-2-Propanol
75-74-1	Tetramethyl Lead
75-83-2	2,2-Dimethylbutane
-	-
75-86-5	Acetone Cyanohydrin
77-73-6	Dicyclopentadiene
77-78-1	Dimethyl Sulfate
78-10-4	Ethyl Silicate
78-29-8	2,3-Dimethylbutane
78-59-1	Isophorone
78-78-4	Isopentane
78-78-4	2-Methylbutane
78-79-5	Isoprene
78-83-1	Isobutyl Alcohol
78-83-1	2-Methyl-1-Propanol
78-84-2	Isobutyraldehyde
78-87-5	Propylene Dichloride
78-92-2	Butyl Alcohol(s) (2-Butanol)
78-93-3	Methyl Ethyl Ketone
78-96-6	Monoisopropanolamine
79-09-4	Propionic Acid
79-10-7	Acrylic Acid
79-20-9	Methyl Acetate
79-24-3	Nitroethane
79-46-9	2-Nitropropane
80-62-6	Methyl Methacrylate
94-14-0	3-Methylpentane
95-50-1	o-Dichlorobenzene
95-68-1	2,4-Dimethyl Aniline
96-33-3	Methyl Acrylate
97-95-0	Ethyl Butanol
98-00-0	Furfuryl Alcohol
98-01-1	Furfural
98-51-1	para-tert-Butyl Toluene
98-82-8	Cumene
98-83-9	Alpha-Methyl Styrene
98-87-3	Benzyl Chloride

CAS No.	Chemical Name
98-95-3	Nitrobenzene
99-87-6	p-Cymene
100-37-8	Diethylaminoethanol
100-41-4	Ethyl Benzene
100-42-5	Styrene
100-61-8	Monomethyl Aniline
100-63-0	Phenylhydrazine
100-74-3	n-Ethyl Morpholine
102-69-2	Tripropylamine
103-09-3	2-Ethylhexyl Acrylate
104-76-7	2-Ethylhexanol
104-90-5	2-Methyl-5-Ethyl Pyridine
105-46-4	sec-Butyl Acetate
106-35-4	Ethyl Butyl Ketone
106-63-8	Isobutyl Acrylate
-	-
106-92-3	Allyl Glycidyl Ether
106-96-7	Bromopropyne
106-97-8	n-Butane
106-99-0	1,3-Butadiene
107-02-8	Acrolein (Inhibited)
107-05-1	Allyl Chloride
107-06-2	Ethylene Dichloride
107-07-3	Ethylene Chlorohydrin
107-13-1	Acrylonitrile
107-15-3	Ethylenediamine
107-18-6	Allyl Alcohol
107-20-0	Chloroacetaldehyde
107-31-3	Methyl Formate
-	-
107-83-5	Isohexane
107-83-5	2-Methylpentane
107-87-9	2-Pentanone
107-92-6	n-Butyric Acid
108-03-2	1-Nitropropane
108-05-4	Vinyl Acetate
108-10-1	Methyl Isobutyl Ketone
108-11-2	Methyl Amyl Alcohol
108-18-9	Diisopropylamine
108-20-3	Isopropyl Ether
108-21-4	Isopropyl Acetate
108-24-7	Acetic Anhydride
108-83-8	Di-Isobutyl Ketone

CAS No.	Chemical Name
108-84-9	sec-Hexyl Acetate
108-88-3	Toluene
108-90-7	Chlorobenzene
108-93-0	Cyclohexanol
108-94-1	Cyclohexanone
109-60-4	n-Propyl Acetate
109-66-0	n-Pentane
109-67-1	1-Pentene
109-68-2	2-Pentene
109-73-9	Butylamine
109-79-5	Butyl Mercaptan
109-86-4	Ethylene Glycol Monomethyl Ether
109-87-5	Methylal
109-87-9	Diethylamine
109-94-4	Ethyl Formate
109-99-9	Tetrahydrofuran
110-19-0	Isobutyl Acetate
110-43-0	Methyl n-Amyl Ketone
110-54-3	n-Hexane
110-62-3	n-Butyl Formal
110-62-3	Valeraldehyde
110-80-5	Ethylene Glycol Monoethyl Ether
110-82-7	Cyclohexane
110-83-8	Cyclohexene
110-86-1	Pyridine
110-91-8	Morpholine
111-15-9	Ethylene Glycol Monoethyl Ether Acetate
111-27-3	Hexanol
111-43-3	n-Propyl Ether
111-65-9	n-Octane
111-69-3	Adiponitrile
111-76-2	Ethylene Glycol Monobutyl Ether
111-77-3	Diethylene Glycol Monomethyl Ether
111-84-2	n-Nonane
111-87-5	n-Octyl Alcohol
112-07-2	Ethylene Glycol Monobutyl Ether Acetate
112-30-1	n-Decanol
-	-
112-30-1	Decyl Alcohol
112-31-2	n-Decaldehyde
112-34-5	Diethylene Glycol Monobutyl Ether
115-07-1	Propylene
115-10-6	Methyl Ether

CAS No.	Chemical Name
119-64-2	Tetrahydronaphthalene
121-44-8	Triethylamine
121-69-7	N-N-Dimethyl Aniline
123-05-7	2-Ethylhexaldehyde
123-05-7	Isooctyl Aldehyde
123-38-6	Propionaldehyde
123-42-2	Diacetone Alcohol
123-51-3	Isoamyl Alcohol
123-62-6	Propionic Anhydride
123-72-8	n-Butyraldehyde
123-86-4	n-Butyl Acetate
123-91-1	1,4-Dioxane
123-92-2	Isoamyl Acetate
124-40-3	Dimethylamine
126-99-8	Chloroprene
138-86-3	Dipentene
140-88-5	Ethyl Acrylate (Inhibited)
141-32-2	n-Butyl Acrylate (Inhibited)
141-32-2	Butyl-2-Propenoate
141-43-5	Monoethanolamine
141-78-6	Ethyl Acetate
141-97-9	Mesityl Oxide
142-82-5	n-Heptane
142-84-7	Di-n-Propylamine
143-08-8	Nonyl Alcohol
151-56-4	Ethylenimine
156-59-2	1,2-Dichloroethylene
208-87-2	Methylcyclohexane
302-01-2	Hydrazine
-	-
463-82-1	Neopentane
534-15-6	Methyl Formal
540-88-5	Acetic Acid-tert-Butyl Ester
540-88-5	tert-Butyl Acetate
541-85-5	Ethyl Sec-Amyl Ketone
565-59-3	2,3-Dimethylpentane
583-60-8	2-Methycyclohexanone
584-94-1	2,3-Dimethylhexane
589-34-4	3-Methylhexane
591-76-4	2-Methylhexane
591-78-6	2-Hexanone
592-41-6	Hexene
594-72-9	1,1-Dichloro-1-Nitroethane

CAS No.	Chemical Name
624-83-9	Methyl Isocyanate
626-38-0	sec-Amyl Acetate
626-38-0	2-Pentyl Acetate
627-13-4	Propyl Nitrate
628-63-7	n-Amyl Acetate
630-08-0	Carbon Monoxide
645-62-5	2-Ethyl-3-Propyl Acrolein
-	-
872-05-9	Decene
1071-26-7	3,3-Dimethylheptane
1300-21-6	1,1-Dichloroethane
1319-77-3	Cresol
1330-20-7	Xylene
1333-74-0	Hydrogen
1634-04-4	Methyl Tertiary Butyl Ether
2216-32-2	2-Methyloctane
2216-33-3	3-Methyloctane
2216-34-4	4-Methyloctane
2425-66-3	1-Chloro-1-Nitropropane
2426-08-6	n-Butyl Glycidyl Ether
2437-56-1	n-Tridecene
3085-26-5	Isodecaldehyde
3132-64-7	Epichlorohydrin
3583-47-9	1,4-Dichloro-2,3-Epoxybutane
4016-14-2	Isopropyl Glycidyl Ether
4170-30-3	Crotonaldehyde
6842-15-5	Dodecene
7664-41-7	Ammonia
7783-06-4	Hydrogen Sulfide
7783-07-5	Hydrogen Selenide
8006-61-9	Gasoline
8006-64-2	Turpentine
8008-20-6	Fuel Oil 1
8008-20-6	Kerosene
8030-30-6	Naphtha (Coal Tar)
8030-30-6	Naphtha (Petroleum)
10061-02-6	1,3-Dichloropropene
25013-15-4	Vinyl Toluene
25167-67-3	Butylene
25167-70-8	Di-Isobutylene
25340-17-4	Diethyl Benzene
25340-18-5	Triethylbenzene
25377-83-7	Octene

CAS No.	Chemical Name
25630-42-3	Methylcyclohexanol
-	-
27214-95-8	Nonene
-	-
28761-27-5	n-Undecene
-	-
-	-
34590-94-8	Dipropylene Glycol Methyl Ether
59355-75-8	Methylacetylene-Propadiene
68476-85-7	Liquefied Petroleum Gas
81624-04-6	n-Heptene

4.4.4

Annex C lists references that deal with the testing of various characteristics of combustible materials.

Statement of Problem and Substantiation for Public Input

The spelling of "ignitable " throughout the document is incorrect.
Clauses 4.2.1 and 4.2.2 - the original text did not clearly define that the density was relative to that of air.

Other revisions were intended to improve the clarify and consistency.of the text

Submitter Information Verification

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Submittal Date: Mon Oct 19 18:36:44 EDT 2020
Committee: EEC-AAA

Committee Statement

Resolution: FR-1-NFPA 497-2021

Statement: The change of spelling of ignitible would create unnecessary conflict with NFPA 70, as it is well established defined term. NFPA 30 Flammable and Combustible Liquids Code, also uses the spelling of ignitible.

Clauses 4.2.1 and 4.2.2 were changed such that the relative vapor density is defined as the density relative to that of air.

The other revisions did not clarify the existing recommendations.

Public Input No. 3-NFPA 497-2020 [Section No. 5.4]

5.4 Zone Classified Locations.

5.4.1 Zone 0 Classified Locations.

A condition for Zone 0 is whether the location has an ~~ignitible~~ ignitable mixture present continuously or for long periods of time.

5.4.1.1

Zone 0 classified locations include the following situations:

(1) Inside vented tanks or vessels containing volatile flammable liquids

(2) Inside inadequately vented spraying or coating enclosures where volatile flammable solvents are used

(3) Between the inner and outer roof sections of a floating roof tank containing volatile flammable liquids

(4) Inside open vessels, tanks, and pits containing volatile flammable liquids

(5) The interior of an exhaust duct that is used to vent ~~ignitible~~ ignitable concentrations of gases or vapors

(6) Inside inadequately ventilated enclosures containing normally venting instruments utilizing or analyzing flammable fluids and venting to the inside of the enclosures

5.4.1.2

It is not good practice to install electrical equipment in Zone 0 locations except when the equipment is essential to the process or when other locations are not feasible.

5.4.2 Zone 1 Classified Locations.

5.4.2.1

The criteria for a Zone 1 location include the following considerations:

(1) Is the location likely to have ~~ignitible~~ ignitable mixtures present under normal conditions?

(2) Is the location likely to have ~~ignitible~~ ignitable mixtures exist frequently because of repair or maintenance operations or because of leakage?

(3) Does the location have conditions in which equipment is operated or processes are carried out, where equipment breakdown or faulty operations could result in the release of ~~ignitible~~ ignitable concentrations of flammable gases or vapors, and also could cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition?

(4) Is the location adjacent to a Zone 0 location from which ~~ignitible~~ 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?

5.4.2.2

Zone 1 classified locations include the following:

(1) Locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another, in areas in the vicinity of spraying and painting operations where flammable solvents are used

(2) Adequately ventilated drying rooms or compartments for the evaporation of flammable solvents

(3) Adequately ventilated locations containing fat and oil extraction equipment using volatile flammable solvents

(4) Portions of cleaning and dyeing plants where flammable liquids are used

(5) Adequately ventilated gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape

(6) Inadequately ventilated pump rooms for flammable gas or for flammable liquids

(7) The interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers

(8) Other locations where ~~ignitible~~ ignitable concentrations of flammable vapors or gases are likely to occur in the course of normal operations, but not classified Zone 0

5.4.3 Zone 2 Locations.

5.4.3.1

The criteria for a Zone 2 location include the following:

(1) ~~Ignitible~~ Ignitable mixtures are not likely to occur in normal operation, and, if they do occur, will exist only for a short period.

(2) ~~Ignitible~~ Ignitable mixtures are handled, processed, or used in the area, but 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.

(3) ~~Ignitible~~ Ignitable mixtures are normally prevented by positive mechanical ventilation, but may become hazardous as the result of failure or abnormal operation of the ventilation equipment.

(4) The location is adjacent to a Zone 1 location, from which ~~ignitible~~ 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.

5.4.3.2

The Zone 2 classification usually includes locations where flammable liquids or flammable gases or vapors are used but which would become hazardous only in case of an accident or unusual operating conditions.

Statement of Problem and Substantiation for Public Input

Correct the spelling of "ignitable" throughout the document

Revisions to the text to improve clarity and consistency.

Submitter Information Verification

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Submittal Date: Mon Oct 19 20:34:36 EDT 2020
Committee: EEC-AAA

Committee Statement

Resolution: The change of spelling of ignitible would create unnecessary conflict with NFPA 70, as it is well established defined term. NFPA 30 Flammable and Combustible Liquids Code, also uses the spelling of ignitible.

Public Input No. 4-NFPA 497-2021 [Section No. 5.10.8]

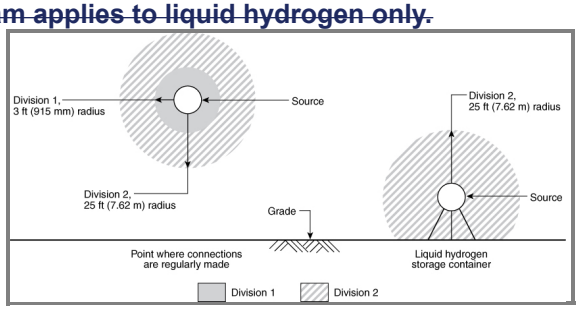
Delete Figure 5.10.8 (a)

5.10.8 Storage of Liquid or Gaseous Hydrogen.

[See Figure 5.10.8(a) through Figure 5.10.8(e).]

Figure 5.10.8(

~~a) Liquid Hydrogen Storage Located Outdoors or Indoors in an Adequately Ventilated Building. This diagram applies to liquid hydrogen only.~~



~~Figure 5.10.8(~~

b) Gaseous Hydrogen Storage Located Outdoors or Indoors in an Adequately Ventilated Building. This diagram applies to gaseous hydrogen only.

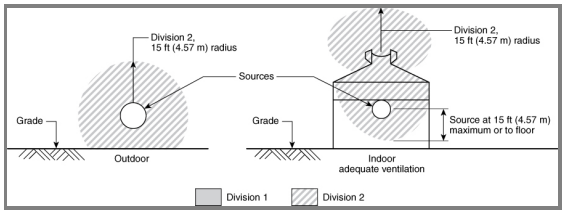


Figure 5.10.8(c) Liquid Hydrogen Storage — Tank and Vaporizer (parts of system containing liquid hydrogen).

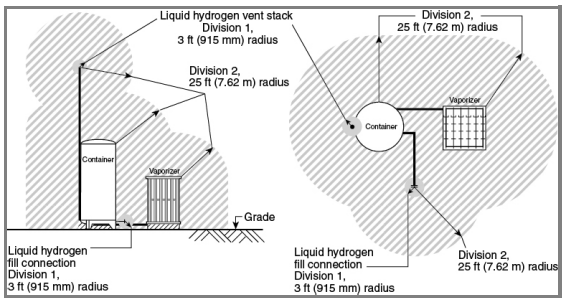


Figure 5.10.8(d) Gaseous Hydrogen Vent Stack.

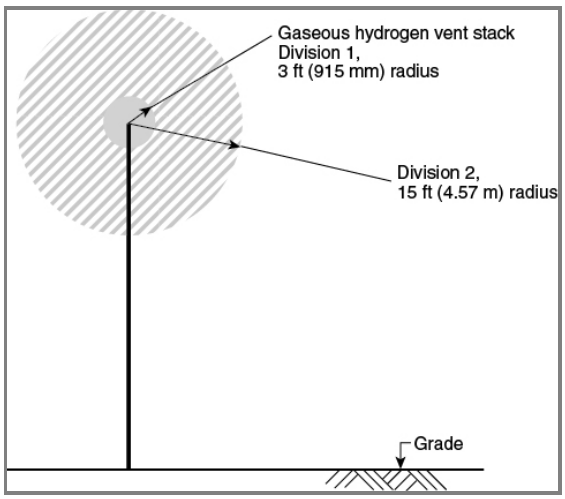
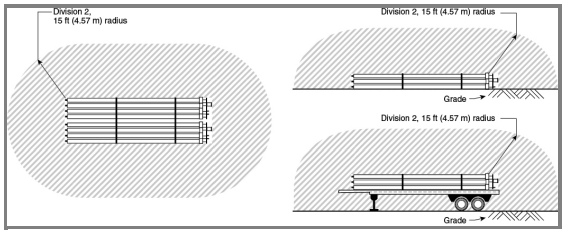


Figure 5.10.8(e) Gaseous Hydrogen Receivers.



Statement of Problem and Substantiation for Public Input

Figure 5.10.8(a) conflicts with Figure 5.10.8(c), which has more specific requirements to match NFPA 55 2020 table 11.2.6.2, Electrical Area Classification. 5.10.8(a) is redundant and poorly described. 5.10.8(c) represents what is described in NFPA 55 in 11.2.6.2.

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Submittal Date: Fri May 28 12:21:49 EDT 2021
Committee: EEC-AAA

Committee Statement

Resolution: The generic figure is retained because there are several discharge points at other locations other than at storage locations. The first figure (Fig. 5.10.8(a)) is needed because there are several instances where hydrogen is transported across a process plant. Removing this figure would not provide guidance in this instance.

Public Input No. 5-NFPA 497-2021 [Section No. 5.11.8]

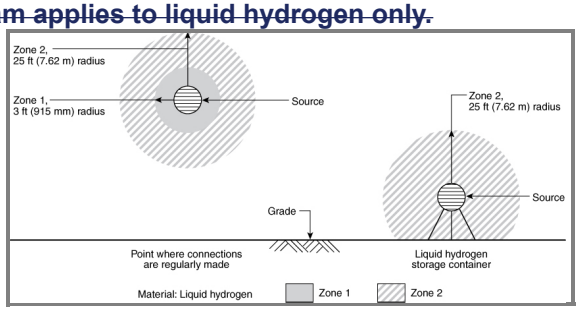
Delete Figure 5.11.8 (a)

5.11.8 Storage of Liquid or Gaseous Hydrogen.

[See Figure 5.11.8(a) through Figure 5.11.8(e).]

Figure 5.11.8(

~~a) Liquid Hydrogen Storage Located Outdoors or Indoors in an Adequately Ventilated Building. This diagram applies to liquid hydrogen only.~~



~~Figure 5.11.8(~~

b) Gaseous Hydrogen Storage Located Outdoors, or Indoors in an Adequately Ventilated Building. This diagram applies to gaseous hydrogen only.

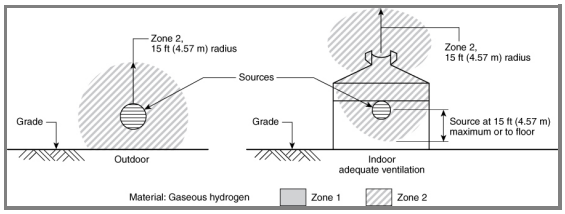


Figure 5.11.8(c) Liquid Hydrogen Storage — Tank and Vaporizer (parts of system containing liquid hydrogen).

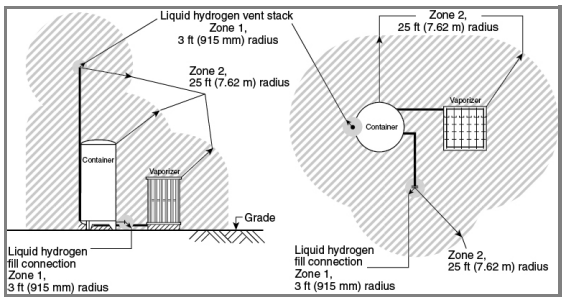


Figure 5.11.8(d) Gaseous Hydrogen Vent Stack.

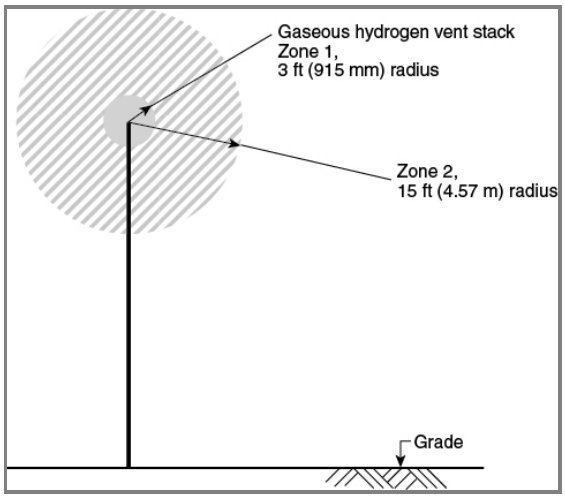
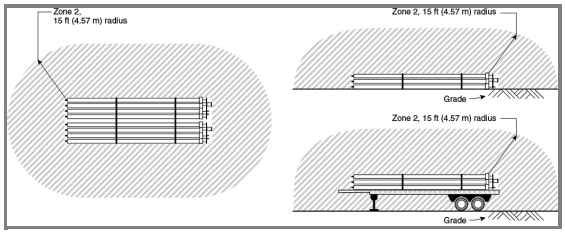


Figure 5.11.8(e) Gaseous Hydrogen Receivers.



Statement of Problem and Substantiation for Public Input

This figure conflicts with Figure 5.11.8(c), which has more specific requirements to match NFPA 55 2020 table 11.2.6.2, Electrical Area Classification. 5.11.8(a) is redundant and poorly described. 5.11.8(c) represents what is described in NFPA 55 in 11.2.6.2.

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Committee: EEC-AAA

Committee Statement

Resolution: The generic figure is retained because there are several discharge points at other locations other than at storage locations. The first figure (Fig. 5.11.8(a)) is needed because there are several instances where hydrogen is transported across a process plant. Removing this figure would not provide guidance in this instance.