CCC

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2021 International Fire Code

E103.2 Evaluation questions. The following are sample evaluation questions:

1. What is the material? Correct identification is important; exact spelling is vital. Checking labels and SDS and asking responsible persons should be among the highest priorities.
2. What are the concentration and strength?
3. What is the physical form of the material? Liquids, gases and finely divided solids have differing requirements for spill and leak control and containment.
4. How much material is present? Consider in relation to permit amounts, *maximum allowable quantity per control area* (from Group H occupancy requirements), amounts that require detached storage and overall magnitude of the hazard.
5. What other materials (including furniture, equipment and building components) are close enough to interact with the material?
6. What are the likely reactions?
7. What is the activity involving the material?
8. How does the activity impact the hazardous characteristics of the material? Consider vapors released or hazards otherwise exposed.
9. What must the material be protected from? (For example, other materials, temperature, shock, pressure.)
10. What effects of the material must people and the environment be protected from?
11. How can protection be accomplished? Consider:

    11.1. Proper containers and equipment.

    11.2. Separation by distance or construction.

    11.3. Enclosure in cabinets or rooms.

    11.4. Spill control, drainage and containment.

    11.5. Control system ventilation, special electrical, detection and alarm, extinguishment, explosion venting, limit controls, exhaust scrubbers and excess flow control.

    11.6. Administrative (operational) control signs, ignition source control, security, personnel training, established procedures, storage plans and emergency plans.

Evaluation of the hazard is a strongly subjective process; therefore, the person charged with this responsibility must gather as much relevant data as possible so that the decision will be objective and within the limits prescribed in laws, policies and standards.

It could be necessary to cause the responsible persons in charge to have tests made by qualified persons or testing laboratories to support contentions that a particular material or process is or is not hazardous. See Section 104.8.2

Add new text as follows:

SECTION E104
GHS HAZARDOUS MATERIALS DEFINITIONS CONTENT

E104.1 Hazardous materials definitions.
The categorization and classification of hazardous materials enables the code user to determine the applicability of requirements based on hazard category and class related to the physical and health hazards of materials. The current definitions found in Chapter 2 have been developed using criteria found in NFPA codes and standards, model fire prevention codes, NIOSH, requirements of the U.S. DOT, and by U.S. OSHA.

The chemical industry has grown substantially since the inception of the IFC hazard definitions. Large-scale global production and distribution of common and specialty chemicals has become mainstream. In the 1990s, the United Nations (UN) developed the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) to create international congruency among chemical suppliers. The GHS is an internationally agreed upon standard of classification and labeling that utilizes prescriptive, standardized testing procedures and criteria to classify hazardous materials.

The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) published a revised Hazard Communication Standard (29 CFR 1910.1200) to align with the GHS in March 2012. It became effective in May 2012. All manufacturers selling, producing or transporting chemicals in the United States are now required to comply with the GHS and provide this standardized hazard information on all Safety Data Sheets (SDSs).

Safety Data Sheets are a primary source of information for identifying hazards for chemicals and mixtures containing hazardous materials. It can be helpful for fire code officials to become familiar with the GHS definitions and how they relate to IFC hazard definitions.

E104.2 GHS Hazardous Materials Definitions Comparison Table.

Table E104.2 provides a tabular presentation of the various definitions published within the International Fire Code. In addition, the table presents corresponding definitions, where available, from the 2012 edition of the Hazard Communication Standard developed by the Occupational Health and Safety Administration (OSHA) along with applicable hazard statement codes. OSHA's 2012 Hazard Communication Standard aligns with the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The Table is not meant to imply perfect alignment between IFC and GHS definitions.

TABLE E104.2 IFC AND GHS HAZARD DEFINITION COMPARISON

IFC MATERIAL	IFC CLASS	IFC DEFINITION	GHS 2017 (REV 7) CLASSIFICATION (H-CODE AND CATEGORY); HAZARD STATEMENT;DEFINITION
Aerosol		A combination of a container, a propellant and a material that is dispensed. Aerosol products shall be classified by means of the calculation of their chemical heats of combustion and shall be designated Level 1, Level 2 or Level 3.	Any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state
Aerosol	Level 1	Those with a total chemical heat of combustion that is less than or equal to 8,600 Btu/lb (20kJ/g).	H223, Category 3; Pressurized container: May burst if heated: 1) Any aerosol that contains ≤ 1% flammable components (by mass) and that has a heat of combustion < 20 kJ/g; or 2) Any aerosol that contains > 1% (by mass) flammable components or which has a heat of combustion of ≥ 20 kJ/g but which, based on the results of the ignition distance test, the enclosed space ignition test or the aerosol foam flammability test, does not meet the criteria for Category 1 or Category 2
Aerosol	Level 2	Those with a total chemical heat of combustion that is greater than 8,600 Btu/lb (20kJ/g), but less than or equal to 13,000 Btu/lb (30kJ/g).	H223, Category 2; Flammable aerosol. Pressurized container: May burst if heated: 1) Any aerosol that dispenses a spray that, based on the results of the ignition distance test, does not meet the criteria for Category 1, and which has: (a) a heat of combustion of >= 20 kJ/g; (b) a heat of combustion of < 20 kJ/g along with an ignition distance of >= 15 cm; or (c) a heat of combustion of < 20 kJ/g and an ignition distance of < 15 cm along with either, in the enclosed space ignition test a time: (i) - a time equivalent of ≤ 300 s/m3; or (ii) - a deflagration density of ≤ 300 g/m3; or 2) Any aerosol that dispenses a foam that, based on the results of the aerosol foam flammability test, does not meet the criteria for Category 1, and which has a flame height of ≥ 4 cm and a flame duration of ≥ 2 s.
Aerosol	Level 3	Those with a total chemical heat of combustion that is greater than 13,000 Btu/lb (30kJ/g).	H222, Category 1; Extremely flammable aerosol. Pressurized container: May burst if heated: 1) Any aerosol that contains >= 85% flammable components (by mass) and has a heat of combustion of >= 30 kJ/g; 2) Any aerosol that dispenses a spray that, in the ignition distance test, has an ignition distance of >= 75 cm; or 3) Any aerosol that dispenses a foam that, in the foam flammability test, has: (a) a flame height of >= 20 cm and a flame duration of >= 2 s; or (b) a flame height of >= 4 cm and a flame duration of >= 7 s.
Combustible liquid	-	A liquid having a closed cup flash point at or above 100°F (38°C). Combustible liquids shall be subdivided as follows:	A flammable liquid means a liquid having a flash point of not more than 93°C

Combustible liquid	II	Liquids having a closed cup flash point at or above 100°F (38°C) and below 140°F (60°C).	H226, Category 3; Flammable liquid and vapour: Flash point ≥ 23°C and ≤ 60°C
Combustible Liquid	IIIA	Liquids having a closed cup flash point at or above 140°F (60°C) and below 200°F (93°C)	H227, Category 4; Combustible liquid: Flash point > 60°C and ≤ 93°C
Combustible Liquid	IIIB	Liquids having closed cup flash points at or above 200°F (93°C).	N/A
Compressed Gas	-	A material or mixture of materials that: 1) Is a gas at 68°F (20°C) or less at 14.7 psia (101 kPa) of pressure, and 2) Has a boiling point of 68°F (20°C) or less at 14.7 psia (101 kPa) which is either liquefied, nonliquefied or in solution, except those gases which have no other health- or physical-hazard properties are not considered to be compressed until the pressure in the packaging exceeds 41 psia (282 kPa) at 68°F (20°C). States of compressed gases: 1) Nonliquefied compressed gases are gases, other than those in solution, which are in a packaging under the charged pressure and are entirely gaseous at a temperature of 68°F (20°C). 2) Liquefied compressed gases are gases that, in a packaging under the charged pressure, are partially liquid at a temperature of 68°F (20°C). 3) Compressed gases in solution are nonliquefied gases that are dissolved in a solvent. 4) Compressed gas mixtures consist of a mixture of two or more compressed gases contained in a packaging, the hazard properties of which are represented by the properties of the mixture as a whole.	Gases under pressure are gases which are contained in a receptacle at a pressure of 200 kPa (gauge) or more at 20°C, or which are liquefied, or liquefied and refrigerated. - H280, compressed gas; Contains gas under pressure; May explode if heated: A gas which when under pressure is entirely gaseous at -50°C (-58°F), including all gases with a critical temperature ≤ -50°C (-58°F). - H280, liquefied gas; Contains gas under pressure; May explode if heated: A gas which when under pressure is partially liquid at temperatures above -50°C (-58°F). H280, dissolved gas; Contains gas under pressure; May explode if heated: A gas which when under pressure is dissolved in a liquid phase solvent.
Corrosive	-	A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the point of contact. A chemical shall be considered corrosive if, when tested on the intact skin of albino rabbits by the method described in DOTn 49 CFR 173.137, such chemical destroys or changes irreversibly the structure of the tissue at the point of contact following an exposure period of 4 hours. This term does not refer to action on inanimate surfaces.	H314, Category 1 (1A, 1B, 1C); Causes severe skin burns and eye damage: Skin corrosion refers to the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis occurring after exposure to a substance or mixture.
Cryogenic fluid	-	A fluid having a boiling point lower than -130°F (-89.9°C) at 14.7 pounds per square inch atmosphere (psia) (an absolute pressure of 101.3 kPa)	H281, refrigerated liquefied gas; Contains refrigerated gas; May cause cryogenic burns or injury: A gas which is made partially liquid because of its low temperature.
Cryogenic - Flammable	-	A cryogenic fluid that is flammable in its vapor state.	H220, Category 1A; Extremely flammable gas: Gases, which at 20°C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammability limit unless data show they meet the criteria for Category 1B

			Category 1A includes Pyrophoric gases and Chemically unstable gasesH281, refrigerated liquefied gas would also apply
Cryogenic - Inert		A cryogenic fluid that is inert.	H281, refrigerated liquefied gas; Contains refrigerated gas; May cause cryogenic burns or injury: A gas which is made partially liquid because of its low temperature.
Cryogenic - Oxidizing		An oxidizing gas in the cryogenic state.	H270, Category 1; May cause or intensify fire; oxidizer: Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. H281, refrigerated liquefied gas would also apply
Explosives		A chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord and igniters. The term “Explosive” includes any material determined to be within the scope of USC Title 18: Ch. 40 and also includes any material classified as an explosive other than consumer fireworks, 1.4G by the hazardous materials regulations of DOTn CFR Parts 100-185.	An explosive substance (or mixture) is a solid or liquid substance (or mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases.
Explosives	Unstable Explosives		H200; Unstable Explosive: Unstable explosives are those which are thermally unstable and/or too sensitive for normal handling, transport and use. Special precautions are necessary.
Explosives	Division 1.1	Explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.	H201; Explosive; mass explosion hazard: Substances, mixtures and articles which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously).
Explosives	Division 1.2	Explosives that have a projection hazard but not a mass explosion hazard.	H202; Explosive; severe projection hazard: Substances, mixtures and articles which have a projection hazard but not a mass explosion hazard.
Explosives	Division 1.3	Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.	H203; Explosive; fire, blast or projection hazard: Substances, mixtures, and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard: (i) combustion of which gives rise to considerable radiant heat; or (ii) which burn one after another, producing minor blast or projection effects or both;
Explosives	Division 1.4	Explosives that pose a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.	H204; Fire or projection hazard: Substances, mixtures and articles which present no significant hazard: substances, mixtures and articles which present only a small hazard in the event of ignition or initiation. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause virtually instantaneous explosion of almost the entire contents of the package.
Explosives	Division 1.4G	Small fireworks devices containing restricted amounts of pyrotechnic composition designed primarily to produce visual or audible effects by combustion or deflagration that complies with the construction, chemical composition and labeling regulations of the DOTn for fireworks, UN 0336, and the U.S. Consumer Product Safety Commission as set forth in CPSC 16 CFR Parts 1500 and 1507.	N/A
		Very insensitive explosives. This division is	H205; May mass explode in fire: Very insensitive substances or

Explosives	Division 1.5	comprised of substances that have a mass explosion hazard but which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.	mixtures which have a mass explosion hazard: substances and mixtures which have a mass explosion hazard but are so insensitive that there is very little probability or initiation or of transition from burning to detonation under normal conditions.
Explosives	Division 1.6	Extremely insensitive articles which do not have a mass explosion hazard. This division is comprised of articles that contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.	Extremely insensitive articles which do not have a mass explosion hazard: articles which predominantly contain extremely insensitive substances or mixtures and which demonstrate a negligible probability of accidental initiation or propagation.
Flammable Gas	Gaseous	A material which is a gas at 68°F (20°C) or less at 14.7 psia (101 kPa) of pressure [a material that has a boiling point of 68°F (20°C) or less at 14.7 psia (101 kPa)] which: 1. Is ignitable at 14.7 psia (101 kPa) when in a mixture of 13% or less by volume with air; or 2. Has a flammable range at 14.7 psia (101 kPa) with air of not less than 12%, regardless of the lower limit. The limits specified shall be determined at 14.7 psia (101 kPa) of pressure and a temperature of 68°F (20°C) in accordance with ASTM E681.	A flammable gas is a gas having a flammable range with air at 20°C and a standard pressure of 101.3kPa H220, Category 1A; Extremely flammable gas: Gases, which at 20°C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammability limit unless data show they meet the criteria for Category 1B Category 1A includes Pyrophoric gases and Chemically unstable gases H220, Category 1B; Flammable gas: Gases which meet the flammability criteria for Category 1A, but which are not pyrophoric, nor chemically unstable, and which have at least either: (a) a lower flammability limit of more than 6% by volume in air; or (b) a fundamental burning velocity of less than 10 cm/s H280, compressed gas would also apply
			A flammable gas is a gas having a flammable range with air at 20°C and a standard pressure of 101.3kPa H220, Category 1A; Extremely flammable gas: Gases, which at 20°C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammability limit unless data show they meet the criteria for Category 1B Category 1A includes Pyrophoric gases and Chemically unstable gases H220, Category 1B; Flammable gas: Gases which meet the

Flammable Gas	Liquified	A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 68°F (20°C) and which is flammable.	flammability criteria for Category 1A, but which are not pyrophoric, nor chemically unstable, and which have at least either: (a) a lower flammability limit of more than 6% by volume in air; or (b) a fundamental burning velocity of less than 10 cm/s AND A gas which when packaged under pressure, is partially liquid at temperatures above -50°C. A distinction is made between: (a) High pressure liquefied gas: a gas with a critical temperature between -50°C and +65°C and (b) Low pressure liquefied gas: a gas with a critical temperature above +65°C. Refrigerated liquified gas A gas which when packaged is made partially liquid because of its low temperature. Dissolved gas A gas which when packaged under pressure is dissolved in a liquid phase solvent. H280, liquefied gas would also apply
Flammable Liquid	-	A liquid having a closed cup flash point below 100°F (38°C). Flammable liquids are further categorized into a group known as Class I liquids. The Class I category is subdivided as follows	A liquid having a flash point of not more than 93°C. A flammable liquid is classified in one of the four categories for this class according to the following table:
Flammable Liquid	IA	Liquids having a flash point below 73°F (23°C) and having a boiling point below 100°F (38°C).	H224, Category 1; Extremely flammable liquid and vapour: Flash point < 23°C and initial boiling point <= 35°C
Flammable Liquid	IB	Liquids having a flash point below 73°F (23°C) and having a boiling point at or above 100°F (38°C).	H225, Category 2; Highly flammable liquid and vapour. Flash point < 23°C and initial boiling point > 35°C
Flammable Liquid	IC	Liquids having a flash point at or above 73°F (23°C) and below 100°F (38°C).	H226, Category 3; Flammable liquid and vapour. Flash point >= 23°C and <= 60°C
Flammable Solid	-	A solid, other than a blasting agent or explosive, that is capable of causing fire through friction, absorption of moisture, spontaneous chemical change or retaining heat from manufacturing or processing, or which has an ignition temperature below 212°F (100°C) or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable solid as determined in accordance with the test method of CPSC 16 CFR Part 1500.44, if it ignites and burns with a self-sustained flame at a rate greater than 0.0866 inch (2.2 mm) per second along its major axis.	A flammable solid is a solid which is readily combustible, or may cause or contribute to fire through friction. A flammable solid is classified in one of the two categories for this class using method N.1 as described in Part III, sub-section 33.2.1 of the Manual of Tests and Criteria, according to: H228, Category 1; Flammable solid: Burning rate test: Substances or mixtures other than metal powders: (a) wetted zone does not stop fire; and (b) burning time < 45 s or burning rate > 2.2 mm/s Metal powders: burning time <=5 min H228, Category 2; Flammable solid: Burning rate test: Substances or mixtures other than metal powders:

			(c) wetted zone stops the fire for at least 4 min; and (d) burning time < 45 s or burning rate > 2.2 mm/s Metal powders: burning time > 5 min and <= 10 min
Highly Toxic		A material which produces a lethal dose or lethal concentration which falls within any of the following categories: 1. A chemical that has a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 g each. 2. A chemical that has a medial lethal dose (LD50) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hrs (or less if death occurs within 24 hrs) with the bare skin of albino rabbits weighing between 2 and 3 kg each. 3. A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg/l or less of mist, fume or dust, when administered by continuous inhalation for 1 hr (or less if death occurs within 1 hr) to albino rats weighing between 200 and 300 g.	Acute toxicity refers to serious adverse health effects (i.e., lethality) occurring after a single or short-term oral, dermal or inhalation exposure to a substance or mixture. Oral H300, Category 1; Fatal if swallowed: LD50 ≤ 5 mg/kg bodyweight H300, Category 2; Fatal if swallowed: LD50 > 5 ≤ 50 mg/kg bodyweight Dermal H310, Category 1; Fatal in contact with skin: LD50 ≤ 50 mg/kg bodyweight H310, Category 2; Fatal in contact with skin: LD50 > 50 ≤ 200 mg/kg bodyweight Inhalation H330, Category 1; Fatal if inhaled: Gases: LC50 ≤ 100 ppm (4 hr) ≈ 200 ppm (1 hr) Vapours: LC50 ≤ 0.5 mg/l (4 hr) ≈ 2 mg/l (1 hr) Dust/mist: LC50 ≤ 0.05 mg/l (4 hr) ≈ 0.2 mg/l (1 hr)
Inert Gas		A gas that is capable of reacting with other materials only under abnormal conditions such as high temperatures, pressures and similar extrinsic physical forces. Within the context of the code, inert gases do not exhibit either physical or health hazard properties as defined (other than acting as a simple asphyxiant) or hazard properties other than those of a compressed gas. Some of the more common inert gases include argon, helium, krypton, neon, nitrogen, and xenon.	Gases under pressure are gases which are contained in receptacles at a pressure of 200 kPa (gauge) or more at 20°C or which are liquefied or liquefied and refrigerated. They comprise compressed gases, liquefied gases, dissolved gases, and refrigerated liquefied gases. *See Compressed gases/Gases under pressure.*
		An organic compound that contains the bivalent -O-O- structure and which may be considered to be a	Organic peroxides are liquid or solid organic substances which contain the bivalent -O-O- structure and may be considered derivatives of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulations (mixtures). Organic peroxides are thermally unstable substances or mixtures, which may undergo exothermic self-accelerating

Organic Peroxide	-	structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical. Organic peroxides can present an explosion hazard (detonation or deflagration) or they can be shock sensitive. They can also decompose into various unstable compounds over an extended period of time.	decomposition. In addition, they may have one or more of the following properties: (a) be liable to explosive decomposition; (b) burn rapidly; (c) be sensitive to impact or friction; (d) react dangerously with other substances.
Organic peroxide	UD	Organic peroxides that are capable of detonation. These peroxides pose an extremely high-explosion hazard through rapid explosive decomposition	H240, Organic Peroxide, Type A; Heating may cause an explosion: (a) Any organic peroxide which, as packaged, can detonate or deflagrate rapidly will be defined as organic peroxide TYPE A;
Organic Peroxide	I	Describes those formulations that are capable of deflagration but not detonation.	H241, Organic Peroxide, Type B; Heating may cause a fire or explosion: (b) Any organic peroxide possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package will be defined as organic peroxide TYPE B;
Organic Peroxide	II	Describes those formulations that burn very rapidly and that pose a moderate reactivity hazard	H242, Organic Peroxide, Type C; Heating may cause a fire: (c) Any organic peroxide possessing explosive properties when the substance or mixture as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion will be defined as organic peroxide TYPE C; H242, Organic Peroxide, Type D; Heating may cause a fire: (d) Any organic peroxide which in laboratory testing: (i) detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or (ii) does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or (iii) does not detonate or deflagrate at all and shows a medium effect when heated under confinement; will be defined as organic peroxide TYPE D;
Organic Peroxide	III	Describes those formulations that burn rapidly and that pose a moderate reactivity hazard.	H242, Organic Peroxide, Type E; Heating may cause a fire: (e) Any organic peroxide which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement will be defined as organic peroxide TYPE E;
Organic Peroxide	IV	Describes those formulations that burn in the same manner as ordinary combustibles and that pose a minimal reactivity hazard.	H242, Organic Peroxide, Type F; Heating may cause a fire: (f) Any organic peroxide which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power will be defined as organic peroxide TYPE F;

Organic peroxide	V	Describes those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.	H240, Organic Peroxide, Type G; Heating may cause a fire: (g) Any organic peroxide which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C or higher for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point of not less than 150 °C is used for desensitization, will be defined as organic peroxide TYPE G. If the organic peroxide is not thermally stable or a diluent having a boiling point less than 150 °C is used for desensitization, it shall be defined as organic peroxide TYPE F.
Oxidizer		A material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials and, if heated or contaminated, can result in vigorous self-sustained decomposition.	An oxidizing solid is a solid which, while in itself is not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material. An oxidizing liquid is a liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.
Oxidizer	4	An oxidizer that can undergo an explosive reaction due to contamination or exposure to a thermal or physical shock that causes a severe increase in the burning rate of combustible materials with which it comes into contact. Additionally, the oxidizer causes a severe increase in the burning rate and can cause spontaneous ignition of combustibles.	H271, Category 1; May cause fire or explosion; strong oxidizer: - Criteria for solids (based on Test O.1 or O.3 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Test O.1—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture (by mass) of potassium bromate and cellulose. Test O.3—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate greater than the mean burning rate of a 3:1 mixture (by mass) of calcium peroxide and cellulose. Criteria for liquids (based on Test O.2 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Any substance or mixture which, in the 1:1 mixture, by mass, of substance (or mixture) and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of substance and cellulose is less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose.
Oxidizer	3	An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes in contact.	H271, Category 1; May cause fire or explosion; strong oxidizer: Criteria for solids (based on Test O.1 or O.3 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Test O.1—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture (by mass) of potassium bromate and cellulose. Test O.3—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate greater than the mean burning rate of a 3:1 mixture (by mass) of calcium peroxide and cellulose. Criteria for liquids (based on Test O.2 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Any substance or mixture which, in the 1:1 mixture, by mass, of substance (or mixture) and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of substance and cellulose is

			less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose.
Oxidizer	2	An oxidizer that will cause a moderate increase in the burning rate of combustible materials with which it comes in contact.	H272, Category 2; May intensify fire, oxidizer Criteria for solids (based on Test O.1 or O.3 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Test O.1—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose and the criteria for Category 1 are not met. Test O.3—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate equal to or greater than the mean burning rate of a 1:1 mixture (by mass) of calcium peroxide and cellulose and the criteria for Category 1 are not met. Criteria for liquids (based on Test O.2 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Any substance or mixture which, in the 1:1 mixture, by mass, of substance (or mixture) and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of a 40% aqueous sodium chlorate solution and cellulose; and the criteria for Category 1 are not met.
Oxidizer	1	An oxidizer that does not moderately increase the burning rate of combustible materials.	H272, Category 3; May intensify fire, oxidizer Criteria for solids (based on Test O.1 or O.3 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Test O.1—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose and the criteria for Categories 1 and 2 are not met. Test O.3—Any substance or mixture which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate equal to or greater than the mean burning rate of a 1:2 mixture (by mass) of calcium peroxide and cellulose and the criteria for Categories 1 and 2 are not met. Criteria for liquids (based on Test O.2 in Part III of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria): Any substance or mixture which, in the 1:1 mixture, by mass, of substance (or mixture) and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of a 65% aqueous nitric acid solution and cellulose; and the criteria for Categories 1 and 2 are not met.
Oxidizing gas	Gaseous	A gas that can support and accelerate combustion of other materials more than air does.	Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. H270, Category 1; May cause or intensify fire; oxidizer: Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.

			H280, compressed gas would also apply
Oxidizing gas	Liquified	An oxidizing gas that is liquefied (liquefied gases are gases that, in a packaging under the charged pressure, are partially liquid at 68° F (20° C).	Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. - H270, Category 1; May cause or intensify fire; oxidizer: Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. H280, liquefied gas would also apply
Pyrophoric		A chemical with an autoignition temperature in air, at or below a temperature of 130°F (54 °C).	*Separate definitions based upon physical state, see below:*
Pyrophoric	Solid	A solid with an autoignition temperature in air, at or below a temperature of 130°F (54 °C).	H250, Category 1; Pyrophoric solid, Catches fire spontaneously if exposed to air: A pyrophoric solid is a solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air. Classification criteria: The solid ignites within 5 min of coming into contact with air.
Pyrophoric	Liquid	A liquid with an autoignition temperature in air, at or below a temperature of 130°F (54 °C).	H250, Category 1; Pyrophoric liquid, Catches fire spontaneously if exposed to air: A pyrophoric liquid is a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air. Classification criteria: The liquid ignites within 5 min when added to an inert carrier and exposed to air, or it ignites or chars a filter paper on contact with air within 5 min. Testing is performed at 25 ±2°C and 50 ±5% relative humidity.
Pyrophoric	Gas	A gas with an autoignition temperature in air, at or below a temperature of 130°F (54 °C).	H220, Category 1A; Extremely flammable gas. May ignite spontaneously if exposed to air: A pyrophoric gas is a flammable gas that is liable to ignite spontaneously in air at a temperature of 54° C or below. H280, compressed (or liquefied) gas would also apply.
		A chemical falling within any of the following categories: 1. A chemical that has a median lethal dose (LD50) of more than 50 mg per kg, but not more than 500 mg per kg of body weight when administered orally to albino rats weighing between 200 and 300 g each. 2. A chemical that has a medial lethal dose (LD50) of more than 200 mg per kg but not more than 1,000	Acute toxicity refers to serious adverse health effects (i.e., lethality) occurring after a single or short-term oral, dermal or inhalation exposure to a substance or mixture. - Oral H301, Category 3; Toxic if swallowed: LD50 > 50 ≤ 300 mg/kg bodyweight - H302, Category 4; Harmful if swallowed: LD50 > 300 ≤ 2,000 mg/kg bodyweight - Dermal H311, Category 3, Toxic in contact with skin: LD50 > 200 ≤ 1,000 mg/kg bodyweight - Inhalation

Toxic		mg per kg of body weight when administered by continuous contact for 24 hrs (or less if death occurs within 24 hrs) with the bare skin of albino rabbits weighing between 2 and 3 kg each. 3. A chemical that has a median lethal concentration (LC50) in air of more than 200 ppm but not more than 2,000 ppm by volume or less of gas or vapor, or more than 2 mg/l but not more than 20 mg/l of mist, fume or dust, when administered by continuous inhalation for 1 hr (or less if death occurs within 1 hr) to albino rats weighing between 200 and 300 g	H330, Category 2; Fatal if inhaled: Gases: LC50 > 100 ppm (4 hr) ≈ 200 ppm (1 hr) ≤ 500 ppm (4 hr) ≈ 1,000 ppm (1 hr) Vapours: LC50 > 0.5 mg/l (4 hr) ≈ 2 mg/l (1 hr) ≤ 2 mg/l (4 hr) ≈ 8 mg/l (1 hr) Dust/mist: LC50 > 0.05 mg/l (4 hr) ≈ 0.2 mg/l (1 hr) ≤ 0.5 mg/l (4 hr) ≈ 2 mg/l (1 hr) H331, Category 3; Toxic if inhaled: Gases: LC50 > 500 ppm (4 hr) ≈ 1,000 ppm (1 hr) ≤ 2,500 ppm (4 hr) ≈ 5,000 ppm (1 hr) Vapours: LC50 > 2 mg/l (4 hr) ≈ 8 mg/l (1 hr) ≤ 10 mg/l (4 hr) ≈ 40 mg/l (1 hr) Dust/mist: LC50 > 0.5 mg/l (4 hr) ≈ 2 mg/l (1 hr) ≤ 1 mg/l (4 hr) ≈ 4 mg/l (1 hr)
Unstable (reactive)		A material, other than an explosive, which in the pure state or as commercially produced, will vigorously polymerize, decompose, condense or become self-reactive and undergo other violent chemical changes, including explosion, when exposed to heat, friction or shock, or in the absence of an inhibitor, or in the presence of contaminants, or in contact with incompatible materials. Unstable (reactive) materials are subdivided as follows:	Self-reactive substances or mixtures are thermally unstable liquids or solid substances or mixtures liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes substances and mixtures classified under the GHS as explosives, organic peroxides or as oxidizing. A self-reactive substance or mixture is regarded as possessing explosive properties when in laboratory testing the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement.
Unstable (reactive)	4	Materials that in themselves are readily capable of detonation or of explosive decomposition or explosive reaction at normal temperatures and pressures. This class includes materials that are sensitive to mechanical or localized thermal shock at normal temperatures and pressures.	H240, Type A; Heating may cause an explosion: (a) Any self-reactive substance or mixture which can detonate or deflagrate rapidly, as packaged, will be defined as self-reactive substance TYPE A;
Unstable (reactive)	3	Materials that in themselves are capable of detonation or of explosive decomposition or explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. This class includes materials that are sensitive to thermal or mechanical shock at the elevated temperatures and pressures.	H241, Type B; Heating may cause a fire or explosion: (b) Any self-reactive substance or mixture possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package will be defined as self-reactive substance TYPE B;
			H242, Type C; Heating may cause a fire: (c) Any self-reactive substance or mixture possessing explosive properties when the substance or mixture as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion will be defined as self-reactive substance TYPE C;

Unstable (reactive)	2	Materials that in themselves are normally unstable and readily undergo violent chemical change but do not detonate. This class includes materials that can undergo chemical change with rapid release of energy at normal temperatures and pressures, and that can undergo violent chemical change at elevated temperatures and pressures.	H242, Type D; Heating may cause a fire: (d) Any self-reactive substance or mixture which in laboratory testing: (i) detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or (ii) does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or (iii) does not detonate or deflagrate at all and shows a medium effect when heated under confinement; will be defined as self-reactive substance TYPE D;
Unstable (Reactive)	1	Materials that in themselves are normally stable but which can become unstable at elevated temperatures and pressures.	H242, Type E; Heating may cause a fire: (e) Any self-reactive substance or mixture which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement will be defined as self-reactive substance TYPE E; H242, Type F; Heating may cause a fire: (f) Any self-reactive substance or mixture which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power will be defined as self-reactive substance TYPE F; (g) Any self-reactive substance or mixture which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60 °C to 75 °C for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point greater than or equal to 150 °C is used for desensitization will be defined as self-reactive substance TYPE G. If the mixture is not thermally stable or a diluent having a boiling point less than 150°C is used for desensitization, the mixture shall be defined as self-reactive substance TYPE F
Unstable (reactive) gas	Gaseous		A chemically unstable gas is a flammable gas that is able to react explosively even in the absence of air or oxygen. H220, Category 1A, Category A; Extremely flammable gas. May react explosively even in the absence of air: Flammable gases which are chemically unstable at 20°C and a standard pressure of 101.3 kPa. H220, Category 1A, Category B; Extremely flammable gas. May react explosively even in the absence of air at elevated pressure and/or temperature: Flammable gases which are chemically unstable at a temperature greater than 20°C and/or a standard pressure greater than 101.3 kPa. H280, compressed gas would also apply.
			H260, Category 1; In contact with water releases flammable

Water reactive	3	Materials that react explosively with water without requiring heat or confinement.	gases which may ignite spontaneously: Any substance or mixture which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than 10 liters per kilogram of substance over any one minute. (UN/DOT test methods: Test N.5, Part III, sub-section 33.4.1.4)
Water reactive	2	Materials that react violently with water or have the ability to boil water. Materials that produce flammable, toxic or other hazardous gases, or evolve enough heat to cause autoignition of combustibles upon exposure to water or moisture.	H261, Category 2; In contact with water releases flammable gas: Any substance or mixture which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 liters per kilogram of substance per hour, and which does not meet the criteria for Category 1.
Water reactive	1	Materials that react with water with some release of energy, but not violently.	H261, Category 3; In contact with water releases flammable gas: Any substance or mixture which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 liters per kilogram of substance per hour, and which does not meet the criteria for Categories 1 and 2.

a. The table illustrates that there is not perfect alignment between the IFC and GHS definitions and provides information on similarities and difference between the two classification systems.

Revise as follows:

TABLE ~~E104.1~~ E105.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
CGA P-20—2009	*Standard for Classification of Toxic Mixtures*	E103.1.3.1
CGA P-23—2008	*Standard for Categorizing Gas Mixtures Containing Flammable and Nonflammable Components*	E102.1.2
UN (Rev.7, 2017)	UN Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Part 2: Physical Hazards	Table E104.2

SECTION ~~E104~~ E105
REFERENCED STANDARDS

Add new standard(s) as follows:

UN

United Nations Statistics Division
New York , NY 10017
USA

UN Rev.7, 2017
UN Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Part 2: Physical Hazards

Reason: Fire Code officials must enforce the hazardous materials provisions of the International Fire Code (IFC) and the International Building Code (IBC) to ensure that people and property in our communities are safe. Consequences of missing or incorrect classification include increased fire and life safety risk and can lead to misclassification of an occupancy.
United Nations (UN) reference is added to provide Fire Code officials the option to compare IFC and GHS hazardous materials definitions. The UN's Globally Harmonized System (GHS) is an internationally agreed upon standard of classification and labeling that utilizes prescriptive, standardized testing procedures and criteria to classify hazardous materials. Federal law (29 CFR 1910.1200 and 49 CFR 173.127) mandates that manufacturers selling, producing or transporting chemicals in the United States classify chemicals according to the GHS system and make the information readily available in product Safety Data Sheets (SDSs). Adding a comparison between IFC and GHS definitions to illustrate the differences and similarities better informs code officials faced with validating classifications of hazardous materials.

This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/fire-code-action-committee-fcac/

Cost Impact: The code change proposal will not increase or decrease the cost of construction
If the GHS categories were used to inform IFC hazard classification, there would be no change in the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, UN Rev.7, 2017 UN Recommendations on the Transport of Dangerous Goods, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Part 2: Physical Hazards, Chapter 2.13 and 2.14, with regard to some of the key ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before March 20, 2021.

F233-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal was approved based upon the action on F232-21 and due to the need to transition the hazardous materials classifications to the globally harmonized standard (GHS). (Vote: 14-0)

Individual Consideration Agenda

Public Comment CCC01-21:

IFC: TABLE E104.2

Proponents:
Michael O'Brian, representing FCAC (fcac@iccsafe.org)
requests As Modified by Public Comment

Modify as follows:

2021 International Fire Code

TABLE E104.2 IFC AND GHS HAZARD DEFINITION COMPARISON

Portions of table not shown remain unchanged.

IFC MATERIAL	IFC CLASS	IFC DEFINITION	GHS 2017 (REV 7) CLASSIFICATION (H-CODE AND CATEGORY); HAZARD STATEMENT;DEFINITION
Organic peroxide	V	Describes those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.	~~H240,~~ Organic Peroxide, Type G; ~~Heating may cause a fire:~~ (g) Any organic peroxide which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C or higher for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point of not less than 150 °C is used for desensitization, will be defined as organic peroxide TYPE G. If the organic peroxide is not thermally stable or a diluent having a boiling point less than 150 °C is used for desensitization, it shall be defined as organic peroxide TYPE F.

a. The table illustrates that there is not perfect alignment between the IFC and GHS definitions and provides information on similarities and difference between the two classification systems.

Commenter's Reason: This public comment is simply correcting an error in correlation from GHS to this table.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
Simply an editorial clean up to more closely match GHS. Cost impact is unchanged from the original proposal.

Public Comment# 2309