NFPA 37

Standard for the

Installation and Use of Stationary Combustion Engines and Gas Turbines

2002 Edition

This edition of NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, was prepared by the Technical Committee on Internal Combustion Engines and acted on by NFPA at its November Association Technical Meeting held November 10–14, 2001, in Dallas, TX. It was issued by the Standards Council on January 11, 2002, with an effective date of January 31, 2002, and supersedes all previous editions.

This edition of NFPA 37 was approved as an American National Standard on January 31, 2002.

Origin and Development of NFPA 37

This project was initiated in 1904 as "Rules and Requirements for the Construction and Installation of Gas and Gasolene *[sic]* Engines" by the Committee of Consulting Engineers of the National Board of Fire Underwriters. Editions of NBFU No. 37 NFPA were published in 1905 and 1910. The project was turned over to the NFPA Committee on Explosives and Combustibles, which expanded the 1915 edition to include coal gas producers, and was retitled as NFPA 37 and 37A, *Installation and Use of Internal Combustion Engines (Gas, Gasolene [sic], Kerosene, Fuel Oil) also Coal Gas Producers (Pressure and Suction Systems).*

Project responsibility was transferred to the Committee of Gases, which revised the subsequent editions issued in 1922 and 1934. In 1955, responsibility for the standard was transferred to the Committee on Internal Combustion Engines, which eliminated the requirements addressing coal gas producers.

Revised editions of the document were issued in 1959, 1963, 1967, 1970, 1975, 1979, 1984, 1990, 1994, and 1998.

For the 1998 edition, the following changes of significance were made: (1) major restructuring of the document; (2) removal of the 7500 hp limitation in the scope of the standard; (3) clarification of the definition for an “engine enclosure” and addition of a definition for “engines for emergency use”; (4) clarification of requirements for fuel tanks and fuel supply for liquid-fueled engines; (5) inclusion of guidance for the installation of gas trains for gaseous-fueled engines; and (6) addition of requirements for engine exhaust systems.

The 2002 edition includes format and technical revisions. The 2000 edition of the NFPA *Manual of Style* was applied in this document's restructure and format. Introductory material in Chapter 1 has been formatted for consistency among all NFPA documents. Referenced publications that apply to the document have been relocated from the last chapters to Chapter 2, resulting in the renumbering of chapters. Informational references remain in the last annex. Appendices are now designated as annexes. Definitions in Chapter 3 have been reviewed for consistency with definitions in other NFPA documents, are systematically aligned, and are individually numbered. Paragraph structuring has been revised with the intent of one mandatory requirement per section, subsection, or paragraph. Information that often accompanied many of the requirements was moved to Annex A, Explanatory Material. Exceptions have been deleted or rephrased in mandatory text, unless the exception represents an allowance or required alternate procedure to a general rule when limited specific conditions exist. The format appearance and structure provide continuity among NFPA documents, clarity of mandatory text, and greater ease in locating specific mandatory text.

The significant content changes concern spill prevention and containment through provisions for glass sight gauges or sight feeds for lubricating oil, and fuel spill containment requirements.

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Committee Scope: This Committee shall have primary responsibility for documents on the fire safety of the installation, operation, and control of internal combustion engines, including gas turbine engines, using all types of fuel, within structures or immediately exposing structures.

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

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

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

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

Chapter 1 Administration

1.1 Scope.

This standard establishes criteria to minimize the hazards of fire during the installation and operation of stationary combustion engines and gas turbines.

1.2 Purpose.

This standard provides minimum fire safety requirements for the installation and operation of stationary combustion engines and gas turbines.

1.3 Application.

1.3.1* This standard applies to stationary combustion engines and gas turbines. This standard also applies to portable engines that remain connected for use in the same location for a period of one week or more.

1.3.2 This standard applies to new installations and to those portions of existing equipment and installations that are changed or modified.

1.3.3 The effective date of application of this standard is not determined by NFPA. All questions related to applicability shall be directed to the authority having jurisdiction.

1.4 Equivalency.

1.4.1 Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety to those prescribed by this standard, provided technical documentation is submitted to the authority having jurisdiction to demonstrate equivalency, and the system, method, or device is approved for the intended purpose.

1.4.2* In determining the suitability of the equipment or component for use, the authority having jurisdiction shall consider the following:

(1) The equipment or component is listed for the intended use.

(2) The equipment or component meets the requirements of applicable standards through stamping or certification.

(3) The equipment or component displays the mechanical strength and durability for the intended application.

(4) The equipment or component is used in the same or a similar application as in this document.

1.5 Units and Formulas.

1.5.1* Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). These units are listed in Table 1.5.1 with conversion factors. Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection.

Table 1.5.1 Units of Measurement

Name of Unit	Unit Symbol	Conversion Factor

meter	m	1 ft = 0.3048 m
millimeter	mm	1 in. = 25.4 mm
liter	L	1 gal = 3.785 L
cubic decimeter	dm^3	1 gal = 3.785 dm^3
cubic meter	m^3	1 ft^3 = 0.0283 m^3
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^5 Pa

1.5.2 If a value for a measurement as given in this standard is followed by an equivalent value in other units, the first stated shall be regarded as the requirement. A given equivalent value shall be considered to be approximate.

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers,* 1998 edition.

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems,* 1999 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 2000 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems,* 1997 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 1999 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2001 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems,* 1998 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2000 edition.

NFPA 54, *National Fuel Gas Code*, 1999 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2001 edition.

NFPA 70, *National Electrical Code*®, 2002 edition.

NFPA 72®, *National Fire Alarm Code*®, 1999 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances,* 2000 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems,* 2000 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2000 edition.

2.3 Other Publications.

2.3.1 API Publications.

American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005.

API 620, *Design and Construction of Large Welded Low-pressure Storage Tanks,* 1996.

API 650, *Welded Steel Tanks for Oil Storage*, 1998.

2.3.2 ASME Publications.

American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ANSI/ASME *Boiler and Pressure Vessel Code*, 1998.

ANSI/ASME B31.3, *Process Piping*, 1999.

2.3.3 MSS Publication.

Manufacturer's Standardization Society of the Valve & Fittings, Inc., 127 Park Street NE, Vienna, VA 22180.

MSS SP-69 *Pipe Hangers & Supports — Selection & Application*, 1996.

Chapter 3 Definitions

3.1 General.

The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1 Class I Fuel. Any liquid fuel having a flash point below 37.8°C (100°F).

3.3.2* Enclosure. A cover intended for the primary purpose of protecting an engine and related equipment.

3.3.3 Engines. Prime movers such as internal combustion engines, external combustion engines, gas turbine engines, rotary engines, and free piston engines using either gaseous fuels or liquid fuels, or combinations thereof.

3.3.3.1 Combustion Gas Turbine Engines. An engine that produces shaft power utilizing the Brayton (joule) cycle, where atmospheric air is drawn in and compressed; the compressed air then flows into a combustion chamber where fuel is injected and continuous combustion occurs, resulting in high-pressure hot gas to the expansion section (turbine) where the heat energy is converted to rotating, mechanical energy.

3.3.3.2* Engines for Emergency Use. Engines that operate under limited use conditions to support critical operations in the protection of life, property, or both.

3.3.3.3 Portable Engines. Engines mounted on skids, wheels, or otherwise arranged so that they can be moved from place to place as the required service indicates.

3.3.3.4* Reciprocating Engines. An engine that uses a spark plug to ignite a fuel–air mixture (e.g., otto cycle engine) or an engine in which high-pressure compression raises the air temperature to the ignition temperature of the injected fuel oil (e.g., diesel cycle engine).

3.3.4 Flue Gas Temperatures. The temperatures of the flue products at the point or points of passing close to or through combustible materials, or at the entrance to a chimney, whichever is applicable.

3.3.5 Hazardous Location. An area where flammable or combustible gases or liquids, or combustible dusts or flyings, usually exist.

3.3.6* Horsepower Rating (Combustion Gas Turbines). The ANSI standard rated power of an engine at the output shaft at 1.01325 bar (14.696 psia) at 15°C (59°F) and a relative humidity of 60 percent.

3.3.7* **Horsepower Rating (Reciprocating Engines).** The power of an engine measured at the flywheel or output shaft at standard SAE conditions of 752.1 mm Hg (29.61 in. Hg) barometer at 25°C (77°F) inlet air temperature.

3.3.8 Remote Location. A location suitably separated from the engine installation so as to be accessible during an engine fire.

3.3.9 Spark Protected. Electrical equipment enclosed in a tight case or protected by shields, screens, or insulation that contains sparks or prevents their emission.

3.3.10 Tanks.

3.3.10.1* **Fuel Tank.** A tank containing fuel for an engine(s).

3.3.10.2 Engine-Mounted Tank. A fuel tank furnished and mounted on the engine or engine-frame by the engine manufacturer.

3.3.11 Zero Governor Regulator. A gas pressure regulator equipped with a counter spring beneath the valve; it requires an external impulse signal such as top loading with pressure or generating vacuum in the downstream piping.

Chapter 4 Engines — General Requirements

4.1 Engine Locations.

4.1.1 General Requirements.

4.1.1.1 Engines shall be situated so that they are readily accessible for maintenance, repair, and fire fighting.

4.1.1.2* The air supply shall be designed to meet at least the minimum requirements for combustion, cooling, and ventilation, and to prevent flue gas products from being drawn from stacks or flues of boilers or other combustion devices.

4.1.1.3* Combustible materials shall not be stored in rooms or enclosures housing engines. Combustible materials required for day-to-day operations/maintenance shall be permitted when stored properly.

4.1.1.4 Engines fueled by a Class I fuel or liquid-phase LP-Gas shall not be installed in rooms containing fired equipment or open flames.

4.1.1.5* Air filters shall be of the type that will not burn freely when exposed to a fire.

4.1.2 Engines Located in Structures.

4.1.2.1* Detached structures shall be of noncombustible or fire-resistive construction.

4.1.2.2* Detached structures shall have ventilation designed to prevent a hazardous accumulation of flammable vapors or gases, both when the engine is operating or when it is shut down.

4.1.2.3 Engine rooms located within structures shall have interior walls, floors, and ceilings of at least 1-hour fire resistance rating.

4.1.2.4 The ceiling of rooms located on the top floor of a structure shall be permitted to be noncombustible or protected with an automatic fire suppression system.

4.1.2.5* Engine rooms shall have ventilation that is adequate to prevent a hazardous accumulation of flammable vapors or gases, both when the engine is operating and when it is shut down.

4.1.2.6 Engine rooms attached to structures shall comply with 4.1.2.1 and 4.1.2.2 except that the common wall shall have a fire resistance rating of at least 1 hour.

4.1.2.7* Openings from an engine room to other sections of the structure shall be provided with automatic or self-closing fire doors or dampers corresponding to the rating of the wall.

4.1.2.8 Rooms containing engines utilizing a Class I fuel shall be located on an exterior wall. Construction of the exterior wall shall provide ready accessibility for fire-fighting operations through the provision of doors, access openings, windows, louvers, or light-weight, noncombustible wall panels.

4.1.3 Engines Located on Roofs.

4.1.3.1 Engines, and their weatherproof housings if provided, that are installed on roofs of structures shall be located at least 1.5 m (5 ft) from openings in walls and at least 1.5 m (5 ft) from structures having combustible walls. A minimum separation shall not be required where the following conditions exist:

(1) The adjacent wall of the structure has a fire resistance rating of at least 1 hour.

(2) The weatherproof enclosure is constructed of noncombustible materials, and it has been demonstrated that a fire within the enclosure will not ignite combustible materials outside the enclosure.

4.1.3.2* Where an engine or skid-mounted assembly containing an engine is mounted on a roof, the surface, beneath the engine and beyond the engine and any oil containment dike to a minimum distance of 30.5 cm (12 in.), shall be noncombustible.

4.1.4 Engines Located Outdoors. Engines, and their weatherproof housings if provided, that are installed outdoors shall be located at least 1.5 m (5 ft) from openings in walls and at least 1.5 m (5 ft) from structures having combustible walls. A minimum separation shall not be required where the following conditions exist:

(1) The adjacent wall of the structure has a fire resistance rating of at least 1 hour.

(2) The weatherproof enclosure is constructed of noncombustible materials, and it has been demonstrated that a fire within the enclosure will not ignite combustible materials outside the enclosure.

4.2 Foundations.

Engines shall be supported on foundations or secured to a noncombustible framework.

4.3 Hazardous Locations.

In hazardous locations, engines neither compressing a flammable gas nor pumping a flammable liquid shall be installed to meet the following three criteria:

(1) In an enclosure of fire-resistive construction

(2) Ventilated from a nonhazardous outside area

(3) With outside access only

4.4 Engines Handling Hazardous Materials (Other Than Their Own Fuel Supply).

4.4.1 The use of an engine-driven unit compressing a flammable gas or pumping a flammable liquid shall be permitted provided the combination unit or groups of such combined units are isolated from areas not having a similar hazard.

4.4.2* Isolation shall be permitted to be achieved by either locating the unit outdoors, or by indoor structural separation in accordance with 4.1.2, except as modified by all of the following:

(1) Provision shall be made for the venting of an explosion.

(2) Rooms containing combustion engines located within structures shall have interior walls, floors, and ceilings of at least 2-hour fire resistance rating.

(3) A room or structure as described in (2) shall be ventilated in an approved manner from a nonhazardous area.

4.4.3 Engine Accessories for Hazardous Locations.

4.4.3.1 Each spark-ignition engine comprising part of a unit for compressing a flammable gas or pumping a flammable liquid shall have magnetos or distributors and coils of the spark-protected type, and all leads positively attached.

4.4.3.2 Ventilation openings in such devices shall be protected by a fire screen unless the device is purged, pressurized, or otherwise protected in an approved manner.

4.4.3.3 Ignition wire shall be positively attached at each end by use of the outer sheath of the insulation.

4.4.3.4 Spark plugs shall be fully shielded against flashover. Fully radio-shielded spark plugs or spark plugs provided with insulating boots shall be permitted.

4.4.3.5 Flame-arresting equipment shall be attached to the engine air intake to avoid blowoff or rupture. A mechanically attached air filter shall be permitted to meet this requirement.

4.4.3.6 Starter, generator, and associated electrical equipment attached to engines shall be of the spark-protected type.

4.4.3.7 Fan belts shall be electrically conductive (nonsparking).

4.5 Electrical Installations.

4.5.1 Electrical installations in rooms containing engines shall comply with NFPA 70, *National Electrical Code*®.

4.5.2 Engine rooms or other locations shall not be classified as hazardous locations as defined in Article 500 of NFPA 70, *National Electrical Code*, solely by reason of the engine fuel, lubricating oil, or hydraulic fluid.

4.5.3 Engine Wiring. Wire and insulation materials shall have all of the following characteristics:

(1) Capacity to remain flexible over typical engine operating temperature ranges

(2) Capacity to have the minimum possible absorption of oils, fuels, and other fluids commonly found on or near the engine

(3) Be rated for continuous use at the maximum range of temperatures that will occur where installed

4.5.3.1 Wiring shall be protected by either fuses or circuit breakers in accordance with its ampacity.

4.5.3.2 The wire shall be stranded annealed copper.

4.5.3.3 The ground circuits on engine wiring shall be permitted to be any of the following:

(1) Green in color

(2) Green in color with yellow trace

(3) Braided uninsulated cable

4.5.3.4* Electrical control circuits on engines not for emergency use shall be designed to shut down the engine automatically in case of control wire break, disconnect, or cutting.

4.5.3.5 The requirements of 4.5.3 shall not apply to ignition wiring, thermocouples, and microprocessor wiring.

4.5.4 Batteries, wiring, and electrical devices shall be protected against arcing and accidental shorting.

4.6* General Installation Requirements.

Engines and their appurtenances shall be installed in accordance with the following:

(1) Applicable NFPA codes and standards

(2) Industry standards

(3) User's requirements

(4) Manufacturer's installation instructions

Chapter 5 Fuel Supply — Gaseous

5.1* Gas Piping.

5.1.1 Gas piping shall be installed by one of the following methods:

(1) All fuel gas systems at service pressures equal to or less than gauge pressure of

861.8 kPa (125 psi) shall be installed in accordance with NFPA 54, *National Fuel Gas Code*.

(2) All fuel gas systems at service pressures in excess of 861.8 kPa (gauge pressure of 125 psi) other than LP-Gas systems shall be installed in accordance with ANSI/ASME B31.3, *Process Piping*, 1999.

(3) LP-Gas systems, whether liquid or vapor phase, shall be installed in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*.

5.1.2* Plastic pipe shall not be used to carry fuel within a room housing an engine(s).

5.1.3 Approved metallic flexible connectors for protection against damage caused by settlement, vibration, expansion, contraction, or corrosion shall be permitted.

5.1.4 Approved nonmetallic connectors for protection against damage caused by settlement, vibration, expansion, contraction, or corrosion shall be permitted except for LP-Gas in the liquid phase.

5.2* Gas Trains.

Gas trains for engines shall contain at least the following components:

(1) Manual shutoff valve

(2) Regulator, with vent and control line if needed

(3) Low-pressure switch for engines with a 2500 MBH (2.5 million Btu/hr) full-load input or greater

(4) Automatic safety shutoff valve for engines with a 400 MBH (400,000 Btu/hr) full-load input or greater

(5) Automatic control valve

(6) Manual leak test valve for engines with a 400 MBH (400,000 Btu/hr) full-load input or greater

(7) High-pressure switch (manual reset) for engines with a 2500 MBH (2.5 million Btu/hr) full-load input or greater

5.3 Regulators.

5.3.1* A gas pressure regulator located inside a structure shall be provided with one of the following:

(1) A vent to the outside of the structure that discharges at least 1.5 m (5 ft) away from any structure opening

(2) Any regulator or zero governor that operates with gas pressure on both sides of the diaphragm

(3) A full lock-up regulator

(4) A listed vent-limiting device

5.3.2 When the gas pressure on the upstream side of a non-full lock-up regulator is more than a gauge pressure of 3.5 kPa (0.5 psi), a relief valve shall be installed on the downstream side of the regulator and vented to the outside of the structure, discharging at least 1.5 m (5 ft) away from any structure opening.

5.3.2.1 Such relief valves and any connected piping shall be sized to vent the required volume of gas.

5.4 Shutoff Valves.

5.4.1* Gaseous fuel piping to each engine shall have an approved manual shutoff valve in a remote location.

5.4.2 In multiple-engine installations, the shutoff valve shall be located no closer to the engine than the first takeoff or branch pipe that serves only that engine.

5.4.3 If the shutoff valve is locked open, the key shall be secured in a well-marked, accessible location near the valve.

5.4.4 Every gaseous-fueled engine shall have one of the following devices that will automatically shut off the flow of fuel in the event the engine stops from any cause:

(1) A carburetion valve

(2) Zero governor–type regulating valve

(3) Fuel control valve

(4) Auxiliary valve

5.4.5 Automatically started or unattended engines shall be provided with a control valve or an auxiliary valve that will stop the flow of fuel in the event the engine stops for any cause.

5.4.5.1 A zero governor–type regulator alone shall not be adequate protection in such installations.

5.4.5.2 The auxiliary valve shall be installed ahead of any flexible connector to the carburetion valve, zero governor, or other controls.

5.5 Pressure-Boosting Equipment.

5.5.1 Boosters or compressors, if used, shall be approved for the service intended.

5.5.2 Receivers, if used, shall be certified with a stamp that they have been designed, constructed, and tested as required by Section VIII, Division 1, “Pressure Vessels,” of the ANSI/ASME *Boiler and Pressure Vessel Code*.

Chapter 6 Fuel Supply — Liquid

6.1* Design and Construction of Liquid-Fueled Tanks.

Fuel tanks shall meet one of the following criteria:

(1) Be constructed in accordance with the applicable tank specifications in NFPA 30,

Flammable and Combustible Liquids Code

(2) Be listed as "Steel-Inside Tanks for Oil Burner Fuel"

(3) Be listed as "Underground Tanks for Flammable Liquids"

(4) Be listed as "Aboveground Tanks for Flammable Liquids"

(5) Be constructed in accordance with API 650, *Welded Steel Tanks for Oil Storage*

(6) Be constructed in accordance with API 620, *Design and Construction of Large Welded Low-pressure Storage Tanks*

Exception: Fuel tanks mounted on the engine by the manufacturer for gravity feed to a carburetor.

6.1.1 Metallic tanks shall be liquidtight with welded or brazed joints.

6.1.2 Nonmetallic tanks shall be of liquidtight, one-piece construction.

6.2* Installation Criteria for Fuel Tanks Containing Class I Fuels.

6.2.1 Tanks for Class I fuels other than engine-mounted tanks shall be located underground or aboveground outside of structures.

6.2.2 Engine-mounted tanks shall not exceed 95 L (25 gal) capacity.

6.2.3 Not more than one tank shall be installed on each engine.

6.2.4 Engine-mounted tanks shall be securely mounted on the engine assembly and protected against all of the following:

(1) Vibration

(2) Physical damage

(3) Engine heat

(4) The heat of exhaust piping

6.2.5* Fuel tanks shall be installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

6.3* Installation Criteria for Fuel Tanks Containing Liquid Fuels Other Than Class I Fuels.

6.3.1 General. Engine-mounted tanks shall be securely mounted on the engine assembly and protected against all of the following:

(1) Vibration

(2) Physical damage

(3) Engine heat

(4) The heat of exhaust piping

6.3.2 Fuel Tanks Inside Structures.

6.3.2.1 Fuel tanks inside structures shall be securely mounted on noncombustible supports.

6.3.2.2* Fuel tanks not in a room by themselves shall not exceed 2500 L (660 gal). Fuel tanks larger than 2500 L (660 gal) capacity shall be enclosed in a room in accordance with 6.3.5 or 6.3.6. Not more than one such 2500 L (660 gal) capacity tank, or two or more of these tanks with an aggregate capacity of not more than 2500 L (660 gal), shall be connected to one engine.

Exception: Fuel tanks of any size shall be permitted within engine rooms or mechanical spaces, provided the engine or mechanical room is designed using recognized engineering practices with suitable fire detection, fire suppression, and containment means to prevent the spread of fire beyond the room of origin.

6.3.2.3* The aggregate capacity of all fuel tanks in a structure shall not exceed 5000 L (1320 gal) unless that portion exceeding 5000 L (1320 gal) is enclosed in a room in accordance with 6.3.5 or 6.3.6.

Exception: Fuel tanks of any size shall be permitted within engine rooms or mechanical spaces provided the engine or mechanical room is designed using recognized engineering practices with suitable fire detection, fire suppression, and containment means to prevent the spread of fire beyond the room of origin.

6.3.2.4 Fuel tanks within structures shall be provided with spill containment consisting of either a wall, a curb, or a dike having a capacity at least equal to that of the largest surrounded tank.

Exception: A spill containment system of lesser capacity equipped with an overflow or drainage system that is adequate in size and location to convey any spillage of fuel to a tank (inside or outside) or to a safe area outside the structure.

6.3.3 Fuel Tanks Outdoors (Aboveground or Underground) or Beneath a Structure.

Fuel tanks located outside, either aboveground or underground, or beneath a structure, shall comply with the applicable provisions of NFPA 30, *Flammable and Combustible Liquids Code*.

6.3.4 Fuel Tanks on Roofs.

6.3.4.1 Fuel tanks on roofs shall be mounted securely on noncombustible supports.

6.3.4.2 Fuel tanks located on roofs shall be provided with spill containment consisting of either a wall, a curb, or a dike having a capacity at least equal to that of the largest surrounded tank.

Exception: A spill containment system of lesser capacity equipped with an overflow or drainage system that is adequate in size and location to convey any spillage of fuel to a tank (inside or outside) or to a safe area outside the structure.

6.3.5 Rooms Housing Only Fuel Tanks with an Aggregate Capacity of 5000 L (1320 gal) or Less.

6.3.5.1 Rooms containing only fuel tanks with an aggregate capacity of 5000 L (1320 gal) or less shall be constructed of walls, floor, and ceiling having a fire resistance rating of not less than 1 hour with the walls bonded to the floor.

6.3.5.1.1 If the walls of such rooms extend to and are bonded to the underside of a concrete floor or roof above that has a fire resistance rating of not less than 1 hour, a separate ceiling shall not be required for the room.

6.3.5.1.2 At least 381 mm (15 in.) clearance shall be left around each tank for the purpose of inspection and repair.

6.3.5.2 Each tank room shall be provided with an opening that is protected by a self-closing 1-hour-rated fire door if it opens inside a building.

6.3.5.2.1 If an exterior door is provided, it shall be listed for fire exposures.

6.3.5.3 Each tank room shall be provided with spill containment consisting of either a wall, a curb, or a dike having a capacity at least equal to that of the largest tank.

Exception: A spill containment system of lesser capacity equipped with an overflow or drainage system that is adequate in size and location to convey any spillage of fuel to a tank (inside or outside) or to a safe area outside the structure.

6.3.5.4* Ventilation.

(A) Ventilation for tank rooms shall be sufficient to maintain the concentration of vapors within the room at or below 25 percent of the lower flammable limit of the fuel used.

(B) Ventilation shall be accomplished by mechanical or natural exhaust ventilation that shall be to a safe location outside the building, without recirculation of the exhaust air.

(C) Provision shall be made for introduction of make-up air in such a manner as to avoid short-circuiting the ventilation and shall be arranged to include all floor areas or pits where flammable vapors can collect.

6.3.6 Rooms Housing Only Fuel Tanks with an Aggregate Capacity of More Than 5000 L (1320 gal).

6.3.6.1 Rooms containing only fuel tanks shall be constructed of walls, floor, and ceiling having a fire resistance rating of not less than 3 hours with the walls bonded to the floor.

6.3.6.1.1 If the walls of such rooms extend to and are bonded to the underside of a concrete floor or roof above that has a fire resistance rating of not less than 3 hours, a separate ceiling shall not be required for the room.

6.3.6.1.2 At least 381 mm (15 in.) clearance shall be left around each tank for the purpose of inspection and repair.

6.3.6.2 Any opening of a tank room shall be protected by a self-closing 3-hour fire-rated door or damper assembly as applicable.

6.3.6.3 Each tank room shall be provided with spill containment consisting of either a wall, a curb, or a dike having a capacity at least equal to that of the largest tank.

Exception: A spill containment system of lesser capacity equipped with an overflow or drainage system that is adequate in size and location to convey any spillage of fuel to a tank (inside or outside) or to a safe area outside the structure.

6.3.6.4 Floor openings shall be protected by a ramp or curb of sufficient height to contain the entire contents of the tank within the walls to the height corresponding to the level of fuel that will be retained.

6.3.6.4.1 The curb shall be built to withstand the lateral pressure due to the liquid head, and the walls and floor shall be liquidtight.

Exception: Rooms provided with a spill containment system that is adequate in size and location to convey any spillage of a fuel to a tank (inside or outside) or to a safe area outside the room.

6.3.6.5* Ventilation.

(A) Ventilation for tank rooms shall be sufficient to maintain the concentration of vapors within the room at or below 25 percent of the lower flammable limit of the fuel used.

(B) Ventilation shall be accomplished by mechanical or natural exhaust ventilation that shall be to a safe location outside the building, without recirculation of the exhaust air.

(C) Provision shall be made for introduction of make-up air in such a manner as to avoid short-circuiting the ventilation and shall be arranged to include all floor areas or pits where flammable vapors can collect.

6.4 Installation Criteria for Fuel Tanks Containing Liquefied Petroleum Gases.

LP-Gas systems in the liquid phase shall be installed in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*.

6.5 Fuel Flow Control.

6.5.1 Liquid fuel supply systems, including drains from carburetors, shall be designed and installed to minimize, as far as practicable, the accidental discharge of fuel into the engine room or structure.

6.5.2 Alarms, float-controlled valves, or mechanical or remote-reading-level gauges or protected sight glass gauges shall be installed to aid personnel in properly operating the fuel system.

6.5.3 Stationary-powered fuel pumps supplying fuel tanks shall have “stop” controls sensitive to a tank's high liquid level.

6.5.4 Fuel tanks supplied by pumps shall be provided with all of the following:

(1) An overflow line

(2) A high-level alarm

(3) A high-level automatic shutoff

6.5.4.1 The overflow line shall be continuous piping, without valves or traps, to the source tank or collection system.

6.5.4.2 The capacity of the overflow line shall exceed the delivery capacity of the supply lines to the fuel tank.

6.5.5 Overflows, vents, fuel piping, or fuel tanks shall not be located at or near engine air intake, exhaust piping, mufflers, or filters.

6.5.6 Pressure relief valves and relief piping shall be provided where the potential exists for overpressurizing fuel system piping.

6.5.6.1 Relief piping shall be routed, without valves or traps, to the source tank or collection system.

6.5.7* Fuels That Require Heating.

6.5.7.1 Circulation of fuel shall be maintained through heaters regardless of engine fuel demand by means of constant recirculation to fuel tanks.

6.5.7.2 Fuel-heating systems shall include thermostatic control and suitable pressure and temperature gauges.

6.6 Filling.

6.6.1 Engine-mounted tanks for Class I fuels shall be filled by a closed piping system.

6.6.1.1 Filling by approved safety cans shall be permitted when the engine is shut down and engine surface temperature is below the autoignition temperature of the fuel.

6.6.2 Engine-mounted tanks for liquid fuels other than Class I fuels shall be filled by a closed piping system.

6.6.2.1 Filling from a container shall be permitted when the engine is shut down and engine surface temperature is below the autoignition temperature of the fuel.

6.6.3 Piping for fuel tanks shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

6.7 Vent Piping.

Vent piping shall be installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

6.8 Fuel Piping, Valves, and Fittings.

6.8.1* Piping shall be in accordance with Chapter 3 of NFPA 30, *Flammable and Combustible Liquids Code*, except that piping shall be steel or other metal and the provisions of 6.8.2 shall apply.

6.8.2 Piping systems shall be supported and protected against physical damage and excessive stresses in accordance with MSS SP-69, *Pipe Hangers & Supports — Selection and Application*.

6.8.2.1* Approved metallic or nonmetallic flexible connectors shall be permitted to protect the piping system against damage caused by settlement, vibration, expansion, contraction, or corrosion.

6.8.3* Valves shall be provided to control the flow of liquid fuel in normal operation and to shut off the flow of fuel in the event of a pipe break.

6.8.4 Piping to aboveground supply tanks filled from tank cars or tank vehicles by centrifugal pumps shall be provided with check valves to prevent backflow.

6.9 Transfer of Liquid Fuel to Engines.

Liquid fuel shall feed to engines by pumps.

6.9.1 Fuel tanks mounted on the engine by the engine manufacturer for fuel feed to a carburetor shall be permitted.

Chapter 7 Lubricating Systems

7.1 General Requirements.

7.1.1 Lubricating oil reservoirs shall include the following protective devices:

(1) A flame arrester on the vent pipe, where the vent terminates in the exhaust gas path

(2) A high-oil-level alarm if reservoir is filled automatically

(3) A remote shutdown switch for auxiliary lubricating oil pumps, if provided

7.1.2 The vent pipe shall not terminate in a location where the vapors can be drawn into the engine combustion air supply.

7.2 Combustion Gas Turbines.

7.2.1 Lubricating oil reservoirs provided with heaters shall be provided with a low-oil-level heater shutdown switch set to shut off the heater before the oil level falls to a level below the top of the heater element.

7.2.2 Lubricating oil reservoirs provided with a positive displacement lubricating oil pump shall be provided with a pressure relief valve.

7.2.3 Lubricating oil reservoir vent-piping for combustion gas turbines driving compressors that handle flammable gases and utilize a combined lubricating oil and seal oil system shall not terminate in the exhaust gas path.

7.2.4 Lubricating oil reservoirs for combustion gas turbines driving compressors that handle flammable gases and utilize a combined lubricating oil and seal oil system shall be provided with a connection for an inert gas blanket.

7.3* Lubricating Oil Piping.

Lubricating oil piping shall be in accordance with the provisions of 6.8.1, 6.8.2, and 6.8.3.

7.4 Reciprocating Engines.

7.4.1 On engines where crankcase explosions can be a hazard, explosion escape venting shall be provided, or means shall be used to maintain a nonflammable atmosphere in the crankcase.

7.4.2 Auxiliary reservoir oil supply chambers, if used, shall be vented through either separate vents or a common venting system.

7.4.3 Engines designed to operate with a negative pressure in the crankcase and equipped with a separate lubricating oil sump shall be provided with check valves in the venting system from the sump.

7.5 Safeguards for Gauging Devices.

Sight gauges or feeds for lubricating oil shall be protected against physical damage to prevent the escape of oil.

Chapter 8 Engine Exhaust Systems

8.1 Design and Construction.

8.1.1* Engine exhaust systems shall be designed and constructed such that the system can withstand the anticipated exhaust gas temperatures.

8.1.2* Exhaust systems shall be designed and constructed to withstand the intended service.

8.1.3 Chimneys, where required, shall be constructed and installed in accordance with NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*.

8.1.4* Exhaust systems shall be designed and constructed to withstand forces caused by the ignition of unburned fuel, or shall have provisions to relieve those forces without damaging the exhaust system.

8.1.5* Low points in exhaust systems shall have drains.

8.2 Installation.

8.2.1 Exhaust systems shall be connected to the engine to prevent the escape of sparks, flame, or flue gas within the structure.

8.2.2 Engine exhaust systems shall have one or more flexible connectors if necessary to minimize the risk of a leak in the engine exhaust system because of engine vibration or thermal expansion.

8.2.3 Exhaust System Termination.

8.2.3.1* Exhaust systems shall terminate outside the structure at a point where hot gases, sparks, or products of combustion will discharge to a safe location.

8.2.3.2 Exhaust system terminations shall not be directed towards combustible material or structures, or into atmospheres containing flammable gases, flammable vapors, or combustible dusts.

8.2.3.3* Exhaust systems equipped with spark-arresting mufflers shall be permitted to terminate in Division 2 locations as defined in Article 500 of NFPA 70, *National Electrical Code*.

8.2.4 Where necessary to prevent personnel burns, exhaust systems shall be guarded.

8.2.5 Exhaust systems shall be a metal, masonry, or factory-built chimney where they pass through a floor, ceiling, attic, or concealed space.

8.2.5.1* If an engine exhaust connects to the same flue as other fuel-burning appliances, the engine exhaust shall enter the flue at least 1½ exhaust pipe or duct equivalent diameters above or below the level of the other appliance vent(s).

8.2.5.1.1 Common venting shall be permitted where appropriate calculations demonstrate that the exhaust from the engine does not reduce the performance of the other appliance(s).

8.2.5.2* An engine exhaust that will discharge at positive pressure (greater than atmospheric pressure) shall not enter the same flue as an appliance that relies on natural draft to vent.

8.2.5.2.1 Common venting shall be permitted where appropriate calculations demonstrate that the exhaust from the engine does not reduce the performance of the other appliance(s).

8.3 Clearance from Exhaust Systems with Exhaust Gas Temperatures Less Than 760°C (1400°F).

8.3.1 Exhaust pipes and ducts shall have clearances of at least 229 mm (9 in.) to adjacent combustible materials, except as specified in 8.3.2 and 8.3.3. The clearance shall be measured from the outside surface of the exhaust pipe or duct, not from any insulation that might be present.

8.3.2 Exhaust pipes and ducts passing directly through combustible roofs shall be guarded at the point of passage by ventilated metal thimbles that extend not less than 229 mm (9 in.) on each side (above and below) of roof construction and are at least 152 mm (6 in.) larger than the exhaust pipe or duct.

8.3.3 Exhaust pipes and ducts passing directly through combustible walls or partitions shall be guarded at the point of passage by one of the following methods:

(1) Metal ventilated thimbles not less than 305 mm (12 in.) larger in diameter than the exhaust pipe or ducts

(2) Metal or burned fire clay thimbles built in brickwork or other approved fireproofing materials providing not less than 203 mm (8 in.) of insulation between the thimble and combustible material

8.4* Clearance from Exhaust Systems with Exhaust Gas Temperatures Greater Than 760°C (1400°F).

Exhaust systems with exhaust gas temperatures greater than 760°C (1400°F) shall comply with NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*.

Chapter 9 Control and Instrumentation

9.1 All Engines.

Each engine shall be equipped with an automatic engine speed control.

9.2 Reciprocating Engines.

9.2.1 Reciprocating Engines — 7.5 kW (10 Horsepower) or More. Engines of 7.5 kW (10 hp) or more shall be equipped with the following protective devices:

(1) Device for high jacket water temperature or high cylinder temperature

(2) Device for low lubricating oil pressure or, in the case of a splash-lubricated engine, for low oil level

(3) Provisions for shutting down the engine at the engine and from a remote location

(4) An automatic engine shutdown device for engine overspeed

(5) An automatic engine shutdown device for high lubricating oil temperature

(6) Provisions for shutting down, from a remote location, lubricating oil pumps that are not directly driven by the engine

(7) Provisions for shutting down the engine at the engine and from a remote location

9.2.1.1 For engines intended for emergency use or engines that are constantly attended, 9.2.1(1) and (2) shall be permitted to be configured as alarms. For other engines the protective devices shall shut down the engine.

9.2.2 Diesel Engines. Diesel engines installed in hazardous locations shall also have provisions for shutting down the engine by shutting off both the fuel supply and the combustion air supply.

9.3 Combustion Gas Turbines.

9.3.1* Combustion gas turbine engines shall be equipped with the following protective devices:

(1) An automatic main speed control and overspeed shutdown control

(2) A backup overspeed shutdown control that is independent from the main control specified in (1)

(3) An automatic engine shutdown device for low lubricating oil pressure

(4) Provisions for shutting down the engine from a remote location

(5) Provisions for shutting down, from a remote location, lubricating oil pumps not directly driven by the engine

(6) An automatic engine shutdown device for high exhaust temperatures

(7) A means of automatically shutting off the fuel supply in the event of a flameout

9.3.1.1 For engines intended for emergency use or engines that are constantly attended, low lubricating oil pressure and high exhaust temperature, 9.3.1(1) through (3) and (6) shall be permitted to be configured as alarms. For other engines the protective devices shall shut down the engine.

9.3.2 The combustion gas turbine starting sequence shall include a purge cycle that will result in a nonflammable atmosphere in the turbine and exhaust system prior to introduction of fuel.

Chapter 10 Instructions

10.1 Operating Instructions.

10.1.1 At least one set of engine operating and maintenance instructions shall be supplied with each installation and shall contain the following:

(1) A detailed explanation of the operation of the engine

(2) Instructions for routine maintenance

(3) Detailed instructions for repair of the engine

(4) Pictorial parts list and parts numbers

(5) Pictorial and schematic electrical drawings of wiring systems, including all of the following:

  (a) Operating and safety devices

  (b) Control panels

  (c) Instrumentation

  (d) Annunciators

10.1.2 Operating and maintenance procedures shall be developed and implemented for the engines based on the engine manufacturer's instructions and on generally accepted engineering principles and procedures.

10.1.3 One set of operating and maintenance procedures shall be located where they are readily accessible to personnel operating or maintaining the engine.

10.2* Emergency Instructions.

10.2.1* Emergency shutdown procedures shall be developed and provided for the engine.

10.2.2 A diagram shall be posted conspicuously near the engine, indicating the location of the fuel shutoff valve(s). Diagrams shall not be required for installations with clearly identified fuel shutoff valves.

10.2.3 Emergency operating procedures shall be located where they are readily accessible to personnel operating or maintaining the engine.

10.3* Training.

Individuals responsible for the operation and maintenance of the engine shall be trained in the operating and maintenance procedures, including the emergency shutdown procedures. (*See Chapter 11 for fire protection features*.)

Chapter 11 Fire Protection Features

11.1* General.

A fire risk evaluation shall be performed for each engine equipment installation with respect to all of the following:

(1) Design

(2) Layout

(3) Operating requirements

11.2 Portable Fire Extinguishers.

11.2.1 Portable fire extinguishers, where provided, shall be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

11.2.2 Personnel involved in the installation and operation of engines shall be trained in the use of portable fire extinguishers.

11.3 Fire Detection and Alarm Systems.

11.3.1* Automatic fire detection and alarm systems, where provided, shall comply with *NFPA 72®, National Fire Alarm Code®*.

11.3.2 The electrical installation and required rating of system components shall comply with NFPA 70, *National Electrical Code*.

11.3.3 Automatic fuel stop valves, where required by other sections of this standard, shall be arranged to close upon activation of the fire detection system within the fire alarm zone that covers the engine installation, including auxiliary equipment.

11.3.3.1 Automatic fuel stop valves for engines that are used for emergency use, or for engines that are constantly attended, shall be permitted to remain open upon activation of the detection system.

11.3.4 Mechanical ventilation systems, where provided, shall be arranged to shut down upon activation of the fire detection system within the engine enclosure.

11.3.4.1 Mechanical ventilation systems for engines that are used for emergency use, or for engines that are constantly attended, shall be permitted to remain in operation.

11.4 Fire Protection Systems and Equipment.

11.4.1 Fixed Fire Protection Systems.

11.4.1.1* Fixed fire suppression systems, where provided, shall be in accordance with the following standards, as appropriate, unless specifically noted otherwise in this standard:

(1) NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*

(2) NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

(3) NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*

(4) NFPA 13, *Standard for the Installation of Sprinkler Systems*

(5) NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

(6) NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

(7) NFPA 750, *Standard on Water Mist Fire Protection Systems*

(8) NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*

11.4.2* General.

11.4.2.1* Automatic fuel stop valves, where required by other sections of this standard, shall be arranged to close upon activation of the fire suppression system within the fire alarm zone that covers the engine installation, including auxiliary equipment.

11.4.2.1.1 Automatic fuel stop valves for engines that are for emergency use, or engines that are constantly attended, shall be permitted to remain open upon activation of the detection system.

11.4.2.2 Mechanical ventilation systems, where provided, shall be arranged to shut down upon activation of the fire suppression system within the engine enclosure.

11.4.2.3* Mechanical ventilation systems for engines that are for emergency use, or engines that are constantly attended, shall be permitted to remain in operation.

11.4.3* Foam Systems. Foam systems shall be designed to provide a foam blanket or foam submergence until it can be demonstrated that the engine has cooled to below the autoignition temperature of combustible material present.

11.4.4* Gaseous Agent Fire Systems.

11.4.4.1 Total flooding gaseous agent systems shall be designed to take into consideration both of the following factors:

(1) The agent concentrations required for the specific combustible materials involved

(2) The specific configuration of the equipment and enclosure

11.4.4.1.1 Gaseous suppression systems shall be designed to maintain the design concentration within the enclosure for a minimum of 20 minutes, or until it can be demonstrated that the engine has cooled to below the autoignition temperature of combustible material present.

11.4.4.2 Local application gaseous agent suppression systems shall be designed to operate for a minimum of 20 minutes, or until it can be demonstrated that the engine has cooled to below the autoignition temperature of combustible material present.

11.4.5 Automatic Sprinkler and Water Spray Systems.

11.4.5.1* Automatic sprinkler systems shall be designed to provide for a density of 12.2 L/min/m^2 (0.3 gpm/ft^2) over the most remote 232 m^2 (2500 ft^2).

11.4.5.1.1 Sprinklers shall be spaced at a 9 m^2 (100 ft^2) maximum.

11.4.5.1.2 System coverage shall be provided to all areas within the enclosure located within 6 m (20 ft) of the engine, lubricating oil system, or fuel system.

11.4.5.2 Sprinklers and water spray nozzles shall not be directed at engine components that are susceptible to thermal shock or deformation.

11.4.6 Dry Chemical Fire Suppression Systems.

11.4.6.1 Dry chemical fire suppression systems shall be designed to operate for a minimum of 20 minutes, or until it can be demonstrated that the engine has cooled to below the autoignition temperature of combustible material present.

11.4.7 Water Mist Fire Suppression Systems. Water mist fire suppression systems shall be listed for use with the size and configuration of the specific engine enclosure being protected.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.3.1 This standard is not intended to apply to engines used to propel mobile equipment.

For engines used to drive fire pumps, also see NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

For engines used in essential electrical systems in health care facilities, also see NFPA 99, *Standard for Health Care Facilities*.

For engines used in emergency power supplies, also see NFPA 110, *Standard for Emergency and Standby Power Systems.*

A.1.4.2 Many items or components commonly used in engine installations might not be listed for that specific use. Therefore, users of this standard, including authorities having jurisdiction, need a basis for determining when components are suitable for use. While the items in 1.4.2 are not necessarily all-inclusive, they provide a minimum checklist of factors that should be considered in making this determination. The emphasis should be on the evaluation process and should consider all relevant factors. A component might not meet one or more of subparagraphs (1) through (4) but might still be suitable for use considering all aspects of the design.

A.1.5.1 For additional conversions and information, see ASTM SI 10, *Standard for the Use of the International System of Units (SI): The Modern Metric System*.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Enclosure. An enclosure is not considered to be a structure or a room.

A.3.3.3.2 Engines for Emergency Use. These engines operate to support critical operations such as the following:

(1) Support of building evacuation

(2) Fire suppression

(3) Communications for fire, police, or medical services

(4) Support of the protection of life

A.3.3.3.4 Reciprocating Engines. Engines considered reciprocating engines for the purpose of this standard include the following:

(1) Internal combustion engines

(2) External combustion engines

(3) Rotary engines

(4) Free piston

A.3.3.6 Horsepower Rating (Combustion Gas Turbines). ANSI B133.6, *Procurement Standard for Gas Turbine Ratings and Performance*.

A.3.3.7 Horsepower Rating (Reciprocating Engines). SAE J1349, *Engine Power Test Code, Spark Ignition and Compression Ignition*.

A.3.3.10.1 Fuel Tank. This definition includes tanks located as follows:

(1) Indoors

(2) Outdoors

(3) Aboveground

(4) Underground

(5) Mounted on or below the engine or engine assembly

A.4.1.1.2 Requirements for air vary with any of the following factors:

(1) The types and sizes of engines

(2) The driven equipment

(3) Other air-consuming equipment in the room

(4) The nature of the engine room

A.4.1.1.3 Proper storage entails separating combustible materials from ignition sources. For example, instruction manuals and log sheets should be stored on or in a metal desk or bookshelf detached from the engine, and maintenance materials, such as rags, should be stored in metal containers.

A.4.1.1.5 Filters qualifying as Class 1, as tested in accordance with UL 900, *Standard for Safety Test Performance of Air Filters*, meet these requirements.

A.4.1.2.1 For information regarding building construction, refer to NFPA 220, *Standard on Types of Building Construction*.

A.4.1.2.2 Explosion venting for a fuel explosion should be considered for large engine installations. In some installations where it might not be practical for the normal constantly operating ventilation to prevent the accumulation of flammable vapors or gases from leakage, a hazardous vapor detection system is installed. The system is often set up to detect the hazardous vapors at two concentration levels (percentage of the lower explosive limit, LEL).

If the first (lower) level is reached, the ventilation volume is increased by use of a purge fan to remove the vapors. If the second (higher) level is reached, the operation is shut down and the enclosure inverted as the ventilation is stopped. The inverting is normally done quickly and maintained until the leak is stopped, after which the entire hazard volume is purged while operations are resumed.

A.4.1.2.5 Explosion venting for a fuel explosion should be considered for large engine installations.

A.4.1.2.7 Openings in the engine room should be in the outside walls.

A.4.1.3.2 Concrete pavers commonly used as ballast on loose-laid membrane roofs typically satisfy this requirement.

A.4.4.2 See NFPA 68, *Guide for Venting of Deflagrations*.

A.4.5.3.4 Engines for emergency use are intended to support critical operations in the protection of life, property, or both. To require the engine used in this manner to shut down automatically in case of a control wire break might defeat this purpose. Engines for emergency use are not required to shut down in case of control wire break, disconnect, or cutting but are not prevented from doing so based on actual application.

A.4.6 Manufacturer's instructions are recognized as minimum requirements. Any deviations in installation should be reviewed with the manufacturer.

A.5.1 Gaseous-fueled engines are those engines where the fuel supply is delivered to the engine in vapor form, including the following:

(1) Natural gas

(2) Compressed natural gas (CNG)

(3) Propane

(4) LP-Gas

(5) Any other fuel supplied to the engine in vapor form

Liquefied natural gas (LNG), for the purpose of Chapter 5, can be considered a gaseous fuel for engines.

Piping systems supplying gaseous fuels should be designed to minimize piping failure. Several examples of methods for minimizing piping failure are as follows:

(1) Welded pipe joints should be used where practical. Threaded couplings and bolted flanges should be assembled in accordance with the manufacturer's requirements.

(2) If rigid metal piping is used, it should be designed to deflect with the engine in any direction. Properly designed flexible connectors are an alternative in high-vibration areas, such as between rigid pipe supply lines, and manifolds or other points of engine interface.

(3) Rigid piping connected directly to the engine should be supported such that failures will not occur due to the natural frequency of the piping coinciding with the rotational speed of the engine. Care should be taken in the design of pipe supports to avoid vibrations.

A.5.1.2 Plastic pipe is not permitted per this subsection because of the risk of damage from heat, physical contact, and vibration (many plastic pipe products are relatively brittle).

A.5.2 The requirements in this section state the minimum requirements for compliance with this standard. Authorities having jurisdiction could have additional or different requirements.

The following paragraphs describe the basis for the requirements in this standard that are applicable to each component of the gas train:

(1) *Regulator*. To provide steady gas pressure to the engine for stable operation. With its own regulator, the engine will be less affected by pressure spikes or dips caused by the operation of other loads in the plant or on the same gas supply system.

(2) *Low-pressure switch*. To shut down the engine if the gas pressure to the engine falls below the level where the engine can operate properly, thereby reducing the risk of unburned gas discharge through the exhaust. Either a manual or automatic resettable switch is acceptable.

(3) *Safety shutoff valve.* Provides an emergency backup to the automatic control valve to shut off the fuel supply to the engine in case there is a serious fuel or control problem and normal operating controls do not respond.

(4) *Manual leak test valve.* The large number of valves and fittings in the gas train make it more prone to leaks than other piping. In addition, the gas train is often installed after the rest of the piping has been installed and tested. Therefore, a means for leak testing the gas train is needed.

(5) *High-pressure switch (manual reset).* A high-pressure condition is usually caused by failure of a component, such as a regulator. Manual reset is required so that the failed component can be identified and replaced before other components, such as diaphragms for sensing and control, are damaged by a repeat high-pressure condition.

A.5.3.1 A full lock-up regulator is a specially designed regulator that can shut off tight, thus stopping the flow of gas entirely if the load goes to zero and preventing the downstream pressure from rising more than 51 mm (2 in.) above the set point.

A.5.4.1 The shutoff valve is needed for service. It can also serve as an emergency shutoff in case of fire or other engine problem. Locating the shutoff valve outside the structure might provide an additional margin of safety.

A.6.1 Liquid-fueled engines are those where fuel is delivered to the engine in liquid form. This section does not apply to propane when stored as a liquid and utilized as a vapor. (*See Chapter 4*.)

A.6.2 Examples of Class I fuels used are gasoline, gasohol, and alcohol.

A.6.2.5 Installation requirements in NFPA 30, *Flammable and Combustible Liquids Code*, that are applicable to NFPA 37 include minimum distance from adjoining property lines, spacing, dikes, foundations, supports, depth and cover, anchorage, normal and emergency vents, and testing.

A.6.3 Examples of liquid fuels other than Class I fuels are diesel fuel, fuel oils, jet fuel, and kerosene.

A.6.3.2.2 In regard to the exception to 6.3.2.2, fire codes have the following two principal objectives: to prevent fire and, when fire does occur, to limit the spread of smoke and fire in order to limit damage to life and property. One commonly accepted fire protection goal is to extinguish or control the fire before it reaches flashover or full room involvement. In other words, the philosophy is that the worst case should be to sacrifice the room or compartment where the fire occurs in order to protect the rest of the structure.

The provisions of this paragraph do not address the likelihood of a fire. Rather, they address limiting the spread of fire in order to limit damage in the event of a fire. There are many sound fire protection engineering methods and techniques to evaluate equivalent protection. Some are computer based and require many inputs, while others offer a method of understanding, evaluating, presenting, and comparing risks graphically.

A.6.3.2.3 The information in A.6.3.2.2 also applies to the exception to 6.3.2.3.

A.6.3.5.4 See NFPA 30, *Flammable and Combustible Liquids Code*, section on ventilation.

A.6.3.6.5 See NFPA 30, *Flammable and Combustible Liquids Code*, section on ventilation.

A.6.5.7 Where crude or residual oils are utilized as engine fuel, it is sometimes necessary to heat the fuel above the flashpoint of certain light fractions within the fuel for satisfactory handling and injection into the engine. This condition necessitates special storage, purifying, and heating systems.

A.6.8.1 Piping systems supplying liquid fuels should be designed to minimize piping failure. Several examples of methods for minimizing piping failure are as follows:

(1) Welded pipe joints should be used where practical. Threaded couplings and bolted flanges should be assembled in accordance with the manufacturer's requirements.

(2) If rigid metal piping is used, it should be designed to deflect with the engine in any direction. Properly designed flexible connectors are an alternative in high-vibration areas, such as between rigid pipe supply lines and manifolds or other points of engine interface.

(3) Rigid piping connected directly to the engine should be supported such that failures will not occur due to the natural frequency of the piping coinciding with the rotational speed of the engine. Care should be taken in the design of pipe supports to avoid vibrations.

A.6.8.2.1 Flexible connectors can fail under fire exposure. This factor should be considered in the design of piping systems.

A.6.8.3 There are several ways to meet the requirements of this section. Shutoff mechanisms can be either manual or automatic.

Manual valves located away from the engine or outside of the engine room can be used as emergency shutoff devices. Solenoid valves interlocked with other controls can also be used to shut off fuel supplies.

In the event of a fire, automatic valves utilizing fusible links have been used to shut off fuel supplies. The fusible element might be in the valve handwheel or attached to a flexible wire and spring of a lever-operated valve. These valves are normally closed. They are held open when the fusible element is intact.

An oil safety valve or antisiphon valve could be utilized to shut off the fuel supplies where the possibility of continued, undesirable oil flow by gravity or siphoning exists due to a pipe break. An oil safety valve requires a vacuum on its outlet to open and permit oil flow, thereby automatically stopping flow in the event of a pipe break. An oil safety valve will also stop oil flow in the event of a gasket leak on a basket-type oil filter or strainer that prevents the oil pump on the engine from pulling a vacuum.

A.7.3 Piping systems supplying lubricating or hydraulic oil should be designed to minimize piping failure. Several examples of methods for minimizing piping failure are as follows:

(1) Welded pipe joints should be used where practical. Threaded couplings and bolted flanges should be assembled in accordance with the manufacturer's requirements.

(2) Where practical, lubricating oil lines should use guard pipe construction, with the pressurized supply line located inside the return line.

(3) If rigid metal piping is used, it should be designed to deflect with the engine in any

direction. Properly designed flexible connectors are an alternative in high-vibration areas.

(4) Rigid piping connected directly to the engine should be supported such that failures will not occur due to the natural frequency of the piping coinciding with the rotational speed of the engine.

A.8.1.1 The exhaust gas flow, engine manufacturer's recommendations, and user requirements should also be considered in the design and construction of engine exhaust systems.

A.8.1.2 The “service” of an exhaust system includes any of the following:

(1) Exposure to heat (short-term and sustained high temperature)

(2) Corrosive atmospheres (internal or external)

(3) Internal pressure (including possible explosion of unburned fuel)

(4) External forces (such as wind, weight of snow, dust or dirt accumulation, or seismic event)

A.8.1.4 Normally, this provision is met by the built-in strength of the system but also can be accomplished by use of devices such as relief valves, rupture discs, or their equivalent.

A.8.1.5 Low points are needed to provide a means of draining liquids that can accumulate in the exhaust system, including condensate, rainwater, or melted snow.

A.8.2.3.1 Exhaust systems should not terminate under structures (including loading platforms) or where the possibility of exhaust gas entrainment into ventilation intakes might occur.

A.8.2.3.3 Division 2 locations are defined in Article 500 of NFPA 70, *National Electrical Code*. In general, flammable quantities or concentrations do not exist in Division 2 locations under normal operation. However, flammable quantities or concentrations might exist in a Division 2 location in case of accident, infrequent or abnormal operation, or failure of auxiliary equipment such as mechanical ventilation.

A.8.2.5.1 Calculations for exhausting engines and other appliances into the same flue can be complex and should only be performed by qualified persons. Factors that affect calculations include the uniqueness of the installation, the number of devices venting into the flue, the exhaust gas flow and temperature, and the size and height of the flue.

A.8.2.5.2 See A.8.2.5.1.

A.8.4 Exhaust systems with temperatures in this range might require special consideration as to the following:

(1) Choice of materials

(2) Provision for thermal expansion

(3) Clearances from combustible materials

(4) Other design details

A.9.3.1 One method of shutting down a combustion gas turbine is by means of an emergency stop button provided at a remote location, in addition to the normal remote stop button. The purpose of the emergency stop button is to shut off the fuel supply and electrical power to the unit, leaving only essential lubricating oil and fire suppression services operational. The emergency stop button is usually colored red and conspicuously identified.

An emergency stop might differ from a normal remote stop by avoiding some shutdown sequences, such as a cooldown period.

A.10.2 Emergency instructions should be established for all operations involved with engines. At a minimum, a written fire emergency plan should be developed that includes the following:

(1) Response to the fire alarms and fire system supervisory alarms

(2) Notification of personnel identified in the plan

(3) Evacuation of employees not directly involved in fire-fighting activities for the fire area

(4) Coordination with security forces or other designated personnel to admit public fire department

(5) Fire extinguishment activities

(6) Periodic drills to verify viability of the plan

(7) Control room operators' activities during fire emergencies

A.10.2.1 Procedures for the operation of the engine during abnormal operating conditions also should be developed.

A.10.3 Training for operating and maintenance procedures will vary by system type, size, and complexity. The manufacturer's recommendations for training will prevail as a minimum requirement, as amended by the owner or the authority having jurisdiction.

Training can consist of reading and understanding an instruction manual for very small systems to formalized classroom and hands-on training for larger systems. Of particular importance is training on emergency shutdown procedures. Operating personnel should be knowledgeable of and capable of operation of all emergency shutdown procedures.

A.11.1 The fire risk evaluation should result in a list of recommended fire protection features, separation or control of common and special hazards, and the detection and suppression of fires. The fire risk evaluation should at least consider the following:

(1) Life safety requirements

(2) The type and quantity of combustible materials involved, including engine fuel and lubricating oil

(3) Potential ignition sources, including electrical components and hot metal surfaces

(4) Oxygen and ventilation sources

(5) The location of the engine, including maximum and minimum ambient conditions expected

(6) The method of fuel transfer

(7) The importance of the engine to operations

A.11.3.1 For each enclosure requiring fire protection, fire detectors are required for the timely detection of a fire. Determination of the type of fire detector to be used should be based on the application and engine equipment arrangement. If heat-activated fire detectors are used, temperature settings should be based on the maximum ambient temperatures of the enclosure that can be expected under normal operating conditions, so that fire detectors do not actuate when a fire is not present [the fire detectors should actuate at a temperature at least 38°C (100°F) above the maximum ambient temperature]. For more rapid detection of fires, the use of flame detectors can be justified for early warning, engine shutdown, or fire suppression system activation. There should be an even distribution of fire detectors to allow for proper detection throughout the enclosure, strategically positioning the detectors near specific hazards, but away from high-ventilation flow paths that could disperse heat and delay detection of a fire, or away from heat-producing devices, such as heaters, that could unnecessarily set off the fire detectors. The fire detectors should be mounted firmly to rigid structures and in areas where minimum vibration is present. Where a fire suppression system is also being used, consideration should be given to cross-zoning the detectors such that at least two detectors that are installed in different electrical loops have to trip in order for the suppression system to activate. If smoke detectors are used, there should be an even distribution of the detectors, strategically positioned near specific hazards and within ventilation flow paths, where applicable, such that any smoke generated will be detected as quickly as possible.

Hazardous vapor detection can be appropriate where vapor leaks might be expected. This type of detector can identify the need for engine fuel system shutdown and possible inerting of the engine enclosure via a fire suppression system discharge.

Components that should be considered when installing a fire detection and alarm system, especially when used in conjunction with a fire suppression system, should at least include the following:

(1) Fire alarm strobe and horns positioned in highly visible and audible areas of the engine enclosure on the inside and outside of the enclosure, where applicable

(2) Warning signs positioned on enclosure access doors where a fire suppression system has been installed

(3) Manual discharge stations positioned near enclosure access doors where a fire suppression system has been installed

(4) Manual lockout stations for engine maintenance purposes positioned near enclosure access doors where a fire suppression system has been installed

(5) Predischarge timers, located in the fire control panel, allowing a time delay (at least 30 seconds is recommended) between fire alarm strobe and horn annunciation and fire suppression system discharge

A.11.4.1.1 Upon installation, all fire suppression systems, including the fire detection and alarm system, should be fully tested in accordance with the applicable NFPA standards. Applicable standards can require a full discharge or concentration test to ensure the fire suppression system operates properly.

A.11.4.2 Fire suppression system design concentrations and discharge durations should be held as long as the hazards of hot metal surfaces above the autoignition temperature and uncontrollable combustible fluid flow exist (consult manufacturer for applicable engine cool-down times). From testing, this time requirement has been shown to be approximately 20 minutes for many areas, but can be substantially longer. It has been shown that the initial discharge design concentrations will not usually hold for a 20-minute time period in most engine enclosures, and, under these circumstances, an added extended discharge is necessary to prevent potential fire reignition due to smoldering and heat soak. Where design concentrations still cannot be maintained effectively, an alternative system should be provided.

A.11.4.2.1 For emergency use engines, the consideration of whether or not to provide an automatic fuel shutdown valve that stops the flow of fuel when the engine enclosure fire suppression system activates should take into account the following:

(1) If the engine is constantly attended, an automatic valve might not be necessary.

(2) If more than one source of emergency power is available, it might be possible to shut down one source without adversely affecting the supply of emergency power. In this case, the automatic valve should be provided.

(3) If more than one source of emergency power is available, what is the likelihood that a fire involving one source will spread to the other sources? If the fire is likely to spread to other sources or exposures, an automatic stop valve should be provided.

(4) If the engine is for emergency use, the following could cause accidental operation of the fire suppression system. If the fire detection system is tied to the fire suppression system, shutdown of the emergency use engine could occur at a time when shutdown would be unacceptable. Provisions should be considered to prevent the following:

    (a) Accidental activation of the fire detection system.

    (b) Prolonged operation of the engine during a power outage, which can produce extreme temperatures or conditions not found during system commissioning, testing, and inspection. For example, heat detectors might activate if placed too close to exhaust manifolds, smoke detectors might activate after animal nests are built touching exhaust piping, and optical flame detectors might detect lightning or other phenomenon not present during system commissioning.

    (c) Electrical voltage irregularities or transients in the outside power supply system, which might necessitate emergency power and might also cause unpredictable operation of the fire detection system.

(5) Even though an engine is for emergency use and it might be desirable to maintain emergency power during a fire, it might not be possible to keep the engine running even if the fuel line is not closed because of one or more of the following:

   (a) Gaseous fire suppression systems require the closure of all vents, doors, and dampers, and the closure of these can prevent the engine from receiving radiator cooling air or combustion air, or both, and subsequently can cause the engine to stop running or become damaged.

   (b) Fires involving motor fuel will generally cause high temperatures in the engine enclosure that are likely to damage or destroy electrical distribution cabling intended to distribute emergency power.

   (c) Fires involving motor fuel are likely to damage or destroy the fuel line, which will prevent the engine from having an adequate supply of fuel and result in loss of emergency power.

(6) The location of the engine can affect the risk of spread of fire or smoke to, or within, the rest of the building. An engine on a roof would present a different hazard from an engine in a basement. The need for automatic fuel shutoff is greater in an installation that poses an increased risk to the building or its contents.

(7) Most operation of engines for emergency use occurs during routine testing, when normal power is also available. A fire during routine testing can cause damage that will take months to repair. During such repair time, emergency power might not be available to some or all of the critical equipment or facilities. Even if an automatic fuel stop valve is determined to present an unacceptable risk to an emergency use engine, arrangements should be considered that would provide automatic fuel shutdown in the event of a fire during routine testing.

A.11.4.2.3 After the fire suppression system has extinguished the fire, the suppression agent and potentially toxic products of combustion should be removed from the engine enclosure before personnel without air breathing apparatus enter for inspection or repairs. Removal is usually accomplished by dilution ventilation, using a combination of exhaust and make-up air. Removal can be accomplished by using either normal or mechanical ventilation.

Normal ventilation is natural movement of air through the enclosure or room by opening doors or windows. In instances where rooms or enclosures are inside larger structures, care should be taken to avoid introducing contaminants into other building areas.

Mechanical ventilation systems can consist of the normal ventilation system for the room or enclosure, or a dedicated purge system. Exhaust air should discharge outside the engine enclosure, away from operable windows and outside air intakes.

In locating the exhaust air discharge, consideration should be given to both the engine enclosure and nearby structures. Chapter 15, “Airflow Around Buildings,” of the ASHRAE 1997 *Handbook — Fundamentals* can be consulted for guidelines on exhaust air stack height and distance from other structures, as well as air intakes needed to provide adequate dilution and to avoid detrimental effects of downdrafts.

Make-up air and exhaust openings in the enclosure should be sized and located to minimize short-circuiting. Short-circuiting occurs when make-up air flows directly from the inlet to the outlet without adequately sweeping through the enclosure. For suppression agents heavier than air, make-up air should enter high and exhaust should leave low. For suppression agents lighter than air, make-up air should enter low and exhaust should leave high. In either case, inlets and outlets should ideally be on opposite sides of the enclosure.

Make-up air openings in the enclosure should be sized for relatively low velocities. With sufficiently low velocity, the incoming make-up air tends toward "plug flow," pushing contaminated air towards the exhaust. High-velocity incoming air would mix the make-up and contaminated airstreams, reducing the contaminant concentration of the exhausted air.

Exhaust air openings should likewise be sized for low velocities. Higher velocities tend to create a funnel effect, leaving dead zones of contaminated air that is slow to be exhausted.

For guidance on calculating the time required to achieve a suitable atmosphere within the room or enclosure, refer to NFPA 92A, *Recommended Practice for Smoke-Control Systems*, NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*, or the ASHRAE and SFPE *Design of Smoke Management Systems*. For guidance in determining allowable concentrations of contaminant, refer to material safety data sheets (MSDS) and permissible exposure limits (PEL) from OSHA.

A.11.4.3 When foam suppression systems are used, full discharge tests should be completed to determine if the engine will be submerged. Fencing, with a maximum opening of 13 cm^2 (2 $in.^2$), or other barriers should be used when openings in the protected engine enclosure are present.

A.11.4.4 Gaseous agent fire suppression systems can be used to extinguish engine equipment fires in either of the following two ways:

(1) Total flooding systems are used where there is a permanent enclosure around the fire hazard that is adequate to enable the design concentration to be built up and to be maintained for the period of time required to ensure the complete and permanent extinguishment of a fire for the specific combustible materials involved. For total flooding systems, potential leakage sources should be included in the gaseous agent design quantities, which should include leakage through ventilation dampers. Usually ventilation dampers are either gravity actuated (i.e., close when the ventilation fans automatically shut down upon gaseous agent discharge) or pressure actuated (i.e., close by means of counterweight and a pressure-operated latch that is activated by the gaseous agent). Leakage from the interface between the enclosure walls and the foundation should also be taken into consideration. For engine enclosures with high ambient temperatures, additional quantities of the gaseous agent could be needed to account for the heat effect on the agent. Usually, a factor of safety of 20 percent or greater is also added to account for unforeseen circumstances.

(2) Local application systems are used for the extinguishment of surface fires of combustible gases, liquids, or solids, where the fire hazard is not enclosed or where the enclosure does not conform to the requirements for a total flooding system. For local application systems, it is imperative that the entire fire hazard be

protected. The hazard area should include all areas that are subject to spillage, leakage, splashing, condensation, and so forth, of combustible materials that might extend a fire outside the protected area or lead a fire into the protected area. This type of hazard could necessitate dikes, drains, or trenches to contain any combustible material leakage. When multiple–engine equipment fire hazards are in an area such that they are interexposing, provisions should be made to ensure that the hazards can be protected simultaneously, which could involve subdividing the hazards into sections and providing independent protection to each section.

Gaseous agent fire suppression systems should generally be designed to have the capacity to supply two full discharges to avoid having to keep the engine shut down until the gaseous agent reservoir can be replenished, particularly after a minor fire or accidental discharge. Two full discharges should use 90 percent of the total gaseous agent reservoir capacity as an optimum design; however, up to 95 percent is acceptable. For applications where ambient temperatures are above the normal operating conditions of the gaseous agent reservoir, a shelter with ventilation openings or an equivalent alternative should be used. Where ambient temperatures are below the normal operating conditions of the gaseous agent reservoir, reservoir heaters (such as immersion heaters) and instrument line heaters should be used or, where applicable, the reservoir can be superpressurized with nitrogen to maintain the required flows and pressures in a low-temperature environment.

A.11.4.5.1 Automatic sprinkler systems are considered to be effective in controlling lubricating oil fires. Sprinkler densities provided in this standard are based on Extra Hazard, Group 1 occupancy as defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*. Automatic sprinkler protection designed as local protection for the engine in many cases provides better protection than sprinkler protection installed only at the ceiling level.

Consideration should be given to providing local protection when the protected engine equipment is located in a high bay area. Delayed activation time or lack of water penetration could delay fire suppression from a ceiling system.

Local protection for engines can be accomplished using either a wet system or a single interlock pre-action system with heat detection. The system piping should loop the diesel at the height of the engine cylinder heads. Detectors should be located above the engine and around the system piping.

Because of the tight radial clearances on combustion gas turbines and the potential for rubbing of rotating parts and increased damage, it is advisable to use great care if using a sprinkler or water spray suppression system. Water from a ceiling or spot protection system could effectively control a fire; however, gaseous suppression agents could be just as effective without the potential for equipment damage when the system activates.

Annex B Informational References

B.1 Referenced Publications.

The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

B.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 1999 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 1999 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2000 edition.

NFPA 68, *Guide for Venting of Deflagrations,* 2002 edition.

NFPA 70, *National Electrical Code®,* 2002 edition.

NFPA 92A, *Recommended Practice for Smoke-Control Systems,* 2000 edition.

NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas,* 2000 edition.

NFPA 99, *Standard for Health Care Facilities,* 2002 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2002 edition.

NFPA 220, *Standard on Types of Building Construction,* 1999 edition.

B.1.2 Other Publications.

B.1.2.1 ANSI Publication. American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI B133.6, *Procurement Standard for Gas Turbine Ratings and Performance,* 1994.

B.1.2.2 ASHRAE Publications. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE, *Handbook — Fundamentals,* 1997.

ASHRAE and SFPE, *Design of Smoke Management Systems*, 1992.

B.1.2.3 ASTM Publication. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM SI 10, *Standard for the Use of the International System of Units (SI): The Modern Metric System,* 1997.

B.1.2.4 SAE Publication. Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

SAE J1349, *Engine Power Test Code, Spark Ignition and Compression Ignition,* 1990.

B.1.2.5 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 900, *Standard for Safety Test Performance of Air Filters,* 1994 edition.

B.2 Informational References.

(Reserved)

B.3 References for Extracts.

(Reserved)

Formal Interpretation

Formal Interpretation

NFPA 37

Use of Stationary Combustion Engines and Gas Turbines

2002 Edition

Reference: 10-4.2.1
F.I. No.: 37-98-1

Question No. 1: Is it the intent of paragraph 10-4.2.1 to prohibit the installation of an automatic fuel stop valve, actuated by an automatic fire extinguishing system, in the fuel supply to engines used for emergency use?

Answer: No.

Question No. 2: Is it the intent of paragraph 10-4.2.1 to prohibit the installation of an automatic fuel stop valve, actuated by a manually actuated fire extinguishing system in the fuel supply to engines used for emergency use?

Answer: No.

Question No. 3: Is it the intent of the Standard, NPFA 37, to allow the owner or designer of a stationary, emergency use, combustion engine or gas turbine, to have the discretion to decide (in consultation with their insurers, AHJs, and others) whether or not to include an automatic fuel stop valve in the fuel system.

(An answer of "no" to this question would mean that the owner or designer has no discretion and that the automatic stop valve requirements are mandated by code.)

Answer: Yes.

Issue Edition: 1998
Reference: 10-4.2.1
Issue Date: June 19, 2000
Effective Date: July 10, 2000

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