

NFPA[®]

37

Standard for the
Installation and Use of
Stationary Combustion
Engines and Gas Turbines

2021



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NFPA® 37

Standard for the

Installation and Use of Stationary Combustion Engines and Gas Turbines

2021 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. It was issued by the Standards Council on October 5, 2020, with an effective date of October 25, 2020, and supersedes all previous editions.

This edition of NFPA 37 was approved as an American National Standard on October 25, 2020.

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 were published in 1905 and 1910.

The project was turned over to the NFPA Committee on Explosives and Combustibles, who produced the 1915 edition by combining the 1910 edition of NFPA 37 with the 1908 edition of NBFU No. 37A, “Rules and Requirements for the Construction, Installation and Use of Coal Gas Producers (Pressure and Suction Systems).” The 1915 edition was designated NFPA 37 – 37A, *Installation and Use of Internal Combustion Engines (Gas, Gasolene [*sic*], Kerosene, Fuel Oil) also Coal Gas Producers (Pressure and Suction Systems)*. Responsibility for the project was later transferred to the Committee of Gases, which produced revised editions of NFPA 37 – 37A in 1922 and 1934.

In 1955, responsibility for the standard was transferred to the Committee on Internal Combustion Engines, which eliminated the provisions addressing coal gas producers. Revised editions of the document were issued in 1959, 1963, 1967, 1970, 1975, 1979, 1984, 1990, 1994, 1998, 2002, 2006, 2010, 2015, 2018, and 2021.

The 1998 edition was reorganized. The 7500-horsepower limitation in the scope was removed, guidance for installing gas trains for gaseous-fueled engines was included, and requirements for engine exhaust systems were added.

The 2002 edition was revised and restructured to comply with the *NFPA Manual of Style*. New requirements were added for containment of fuel spills. Additional requirements were added for spill prevention and containment through provisions for glass sight gauges or sight feeds for lubricating oil.

Revisions for the 2006 edition included new requirements for detached structures used specifically for housing engines or turbines and their appurtenances. A comprehensive section describing required components of a gas train was added. Comprehensive requirements for gas regulators and manual shutoff valves were also added.

The 2010 edition incorporated enhanced and new definitions for *automatic safety shutoff valve*, *automatic safety vent valve*, *vent valve*, and *secondary containment tank*. A new subsection was added to establish specific safety component requirements for automatic safety shutoff valves as applied to gas turbines compared to those for internal combustion engines. A requirement for double block valve arrangement in liquid fuel lines was added. The Control and Instrumentation chapter was completely revised to establish the minimum required protective control devices for engines and turbines. Changes to this chapter also included provisions to identify devices that can be replaced by alarms and establishing operator response procedures.

Revisions to the 2015 edition included requiring that engines and turbines comply with wind and seismic design criteria. A requirement for a vent valve or valve proving system for a gas train was added. Requirements for a flame arrester when biogas fuels are used and for a filter or strainer in the fuel line were added. A requirement was also added to allow the use of a proof-of-closure switch

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or a valve proving system as alternatives to a vent valve between the two automatic safety shutoff valves was also added. The zone system of electrical area classification. Annexes were expanded by to address fire suppression system design for thin-walled gas turbines (based on aircraft engine designs). The performance criteria were revised for total flooding gaseous agent suppression systems and local application gaseous agent suppression systems. A new subsection was added to address retrofit of existing fire suppression systems.

Revisions to the 2018 edition included adding provisions related to the proximity of engines and weatherproof enclosures to combustible construction. A new subsection to address proper anchoring of flexible connectors was added. The allowable operating time for automatic safety shutoff valves (ASSVs) was revised from 1 second to 2 seconds, to be consistent with ANSI Z21.21, *Automatic Valves for Gas Appliances*. The Overpressure Protection section was extensively revised to provide for protection for gas trains that operate between 2 psi and 125 psi. A requirement was added for the investigation of any situation resulting in a trip of the high-pressure limit control prior to manual reset. Annex text was extensively revised to address the concerns of products of combustion, particularly carbon monoxide, from the exhaust of stationary engines.

The 2021 edition includes revisions to fire test criteria to establish clearance distances for locating engines on roofs and outdoors. Allowing a calculation under engineering supervision has also been added as an option for locating engines. A new annex on inspection, testing, and monitoring is added. Annex language has been added clarifying that engine rooms, enclosures, or other locations are not classified based on *NFPA 70®*. Automatic safety shutoff valves are required to be listed or specified by the engine or turbine manufacturer for an application. Chapter 8, on engine exhaust systems, has been reorganized to include listings for factory-built chimneys. A new section on hybrid fire extinguishing systems has been added.

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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.

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NFPA 37

Standard for the

Installation and Use of Stationary Combustion Engines and Gas Turbines

2021 Edition

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

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text should be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. This standard establishes criteria for minimizing 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 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 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

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

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2* 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.

1.6 Units and Formulas.

1.6.1* 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 1.6.1 with conversion factors. Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection.

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

1.6.3 All pressures expressed in this document shall be gauge pressures unless specifically noted otherwise.

Table 1.6.1 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
kilopascal	kPa	1 psi = 6.89 kPa
kilowatt	kW	1 hp = 0.75 kW
watt	W	1 Btu/hr = 0.3 W
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10 ⁵ Pa

Chapter 2 Referenced Publications

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

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2018 edition.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2021 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2021 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 2021 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2019 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2017 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2021 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2021 edition.

NFPA 54, *National Fuel Gas Code*, 2021 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2020 edition.

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

NFPA 72®, *National Fire Alarm and Signaling Code®*, 2019 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2019 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems*, 2019 edition.

NFPA 770, *Standard on Hybrid (Water and Inert Gas) Fire Extinguishing Systems*, 2021 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2021 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI Z21.21/CSA 6.5, *Automatic Valves for Gas Appliances*, 2019.

2.3.2 API Publications. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070.

API STD 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*, 12th edition, 2013, with Addendum 1 (2014), Addendum 2 (2018).

API STD 650, *Welded Tanks for Oil Storage*, 12th edition, with Errata 1 (2013), Errata 2 (2014), and Addendum 1 (2014), Addendum 2 (2016), Addendum 3 (2018).

2.3.3 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ANSI/ASME B31.3, *Process Piping*, 2016.

Boiler and Pressure Vessel Code, 2019.

2.3.4 MSS Publications. Manufacturers Standardization Society, 127 Park Street, NE, Vienna, VA 22180-4602.

MSS SP-58, *Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application, and Installation*, 2018.

2.3.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 103, *Factory-Built Chimneys for Residential Type and Building Heating Appliances*, 2010.

UL 429, *Electrically Operated Valves*, 2013.

UL 900, *Standard for Air Filter Units*, 2015.

UL 959, *Medium Heat Appliance Factory-Built Chimneys*, 2010.

2.3.6 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 30, *Flammable and Combustible Liquids Code*, 2021 edition.

NFPA 54, *National Fuel Gas Code*, 2021 edition.

NFPA 85, *Boiler and Combustion Systems Hazards Code*, 2019 edition.

NFPA 101®, *Life Safety Code®*, 2021 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

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

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the 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.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Class I Fuel. For the purpose of this standard, any liquid fuel having a flash point below 37.8°C (100°F).

N 3.3.2 Combustible (Material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible. [101, 2021]

3.3.3* Enclosure. A cover or housing intended to protect an engine and related equipment.

3.3.4 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.

3.3.4.1 Combustion Gas Turbine Engines. An engine that produces shaft power utilizing the Brayton (joule) cycle, where atmospheric air is drawn in and compressed and 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.

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

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

3.3.4.4* 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 (e.g., diesel cycle engine).

3.3.5 Flue Gas Temperature. The temperature 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.

3.3.6 Gas Train. The portion of the fuel gas supply piping starting with and including the equipment isolation valve and extending to the point at which the fuel enters the prime mover.

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

3.3.8* 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 and at 25°C (77°F) inlet air temperature.

3.3.9 Inlet Gas Pressure. The pressure at the outlet of the equipment isolation valve.

3.3.10 Line Pressure Regulator. A pressure regulator placed in a gas line between the service regulator and the appliance [engine] regulator. [54, 2021]

3.3.11 Overpressure Protection Device. A pressure-limiting or pressure-relieving device that prevents the downstream pressure from exceeding its set point.

3.3.12 Rated Pressure. The maximum internal and external pressures that the materials, devices, or components are designed to contain or control.

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

3.3.14 Service Regulator. A pressure regulator installed by the serving gas supplier to reduce and limit the service line gas pressure to delivery pressure. [54, 2021]

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

3.3.16 Tank.

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

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

3.3.16.3 Secondary Containment Tank. A tank that has an inner and outer wall with an interstitial space (annulus)

between the walls and that has a means for monitoring the interstitial space for a leak. [30, 2021]

3.3.17 Valve.

3.3.17.1* Automatic Safety Shutoff Valve (ASSV). A valve that, upon shutdown conditions, will automatically stop the flow of gas to the engine or turbine. (See 5.4.4 and 5.4.5.)

3.3.17.2 Automatic Safety Vent Valve. A valve that, upon closing of the automatic safety shutoff valves (ASSVs), automatically vents the volume of gas between the two ASSVs to atmosphere.

3.3.17.3 Carburetion Valve. A control valve that meets the functional requirements of an automatic safety shutoff valve (ASSV) by being capable of automatically stopping the flow of gas to the engine.

3.3.17.4* Equipment Isolation Valve. The manually operated valve that isolates the balance of the gas train and the prime mover from the gas supply.

3.3.17.5 Vent Valve. A valve used to allow venting of air or gas from the system to the atmosphere. [85, 2019]

3.3.18 Zero Governor Regulator. A gas pressure regulator equipped with a counter spring beneath the valve that 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, other than those combustible materials required for day-to-day operations/maintenance. Such materials shall be stored properly.

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

4.1.1.5 Combustion air filters mounted directly on engines or turbines shall be listed in accordance with ANSI/UL 900, *Standard for Air Filter Units*.

4.1.2 Engines Located in Structures.

4.1.2.1* Engine Rooms.

4.1.2.1.1 Engine rooms located within structures shall have interior walls, floors, and ceilings of at least 1-hour fire resistance rating, unless otherwise permitted by 4.1.2.1.2.

4.1.2.1.2 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.

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

4.1.2.1.4 Engine rooms attached to structures shall comply with 4.1.2.2.1 and 4.1.2.2.3 except that the common wall shall have a fire resistance rating of at least 1 hour.

4.1.2.1.5* 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 walls in which they are located.

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

4.1.2.2 Dedicated Detached Structures.

4.1.2.2.1* Dedicated detached structures shall be of noncombustible or fire-resistive construction.

4.1.2.2.2 Dedicated detached 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 any of the following conditions exist:

- (1) The exposing wall of the detached structure has a fire resistance rating of at least 1 hour.
- (2) The exposed wall of the adjacent structure has a fire resistance rating of at least 1 hour.
- (3) The detached structure is protected by an automatic fire protection system.

4.1.2.2.3* Dedicated detached structures shall have ventilation designed to prevent a hazardous accumulation of vapors, gases, or heat, both when the engine is operating and when it is shut down.

4.1.3 Engines Located on Roofs.

Δ 4.1.3.1 Engines and, if provided, their weatherproof housings that are installed on roofs of structures shall be located at least 1.5 m (5 ft) from any openings in the walls of structures.

N 4.1.3.2 Engines and, if provided, their weatherproof housings that are installed on roofs or structures shall be located at least 1.5 m (5 ft) from structures having combustible walls, except as provided in 4.1.3.2.1 through 4.1.3.2.4.

4.1.3.2.1 A clearance less than 1.5 m (5 ft) shall be permitted where all portions of the structure that are closer than 1.5 m (5 ft) from the engine enclosure have a fire resistance rating of at least 1 hour.

4.1.3.2.2* A clearance less than 1.5 m (5 ft) shall be permitted where a fire test involving consumption of the available combustibles, within the engine or, if provided, its weatherproof housing demonstrates that a fire originating at the engine or its weatherproof housing will not ignite combustible structures.

N 4.1.3.2.3 If an engine assembly includes a nonrated fuel tank, the testing in 4.1.3.2.2 shall include the fuel tank.

N 4.1.3.2.4 A clearance less than 1.5 m (5 ft) shall be permitted where calculations performed under engineering supervision

demonstrate that a fire originating at the engine or within its weatherproof housing will not ignite combustible structures.

- ▲ **4.1.3.3*** An oil containment system consisting of a curb or dike having a capacity at least equal to the total capacity of the lubricating oil system or the liquid fuel system, whichever is greater, shall be provided.

■ **4.1.3.3.1** This system shall also comply with applicable requirements of Chapter 6.

4.1.3.4* The surface beneath the engine and beyond the engine and the oil containment dike shall be noncombustible to a minimum distance of 300 mm (12 in.).

4.1.4 Engines Located Outdoors.

- ▲ **4.1.4.1** Engines and, if provided, their weatherproof housings that are installed outdoors shall be located at least 1.5 m (5 ft) from any openings in the walls of structures.

■ **4.1.4.2** Engines and, if provided, their weatherproof housings that are installed outdoors shall be located at least 1.5 m (5 ft) from structures having combustible walls except as provided in 4.1.4.2.1 through 4.1.4.2.4.

4.1.4.2.1 A clearance less than 1.5 m (5 ft) shall be permitted where all portions of structures that are closer than 1.5 m (5 ft) from the engine enclosure have a fire resistance rating of at least 1 hour.

4.1.4.2.2* A clearance less than 1.5 m (5 ft) shall be permitted where a fire test involving consumption of the available combustibles, within the engine or, if provided, its weatherproof housing demonstrates that a fire originating at the engine or its weatherproof housing will not ignite combustible structures.

■ **4.1.4.2.3** If an engine assembly includes a nonrated fuel tank, the testing in 4.1.4.2.2 shall include the fuel tank.

■ **4.1.4.2.4** A clearance less than 1.5 m (5 ft) shall be permitted where calculations performed under engineering supervision demonstrate that a fire originating at the engine or within its weatherproof housing will not ignite combustible structures.

4.2* Support of Engines. Engines shall be supported in accordance with the manufacturer's instructions.

4.3* Hazardous Locations. In hazardous locations, engines that neither compress a flammable gas nor pump a flammable liquid shall meet the following three criteria:

- (1) They shall be installed in an enclosure or room of fire-resistive construction.
- (2) They shall be ventilated from a nonhazardous outside area.
- (3) They shall have a defined emergency egress path(s) acceptable to the authority having jurisdiction.

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

4.4.1 The use of an engine-driven unit to compress a flammable gas or to pump 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 employing indoor structural separation in accordance with 4.1.2, except as modified by all of the following:

ration 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) The rooms or structures described in 4.4.2(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 that compresses a flammable gas or pumps a flammable liquid shall have magnetos or distributors and coils of the spark-protected type. All leads shall be 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 wires 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 (nonspark-ing).

4.5 Electrical Installations.

4.5.1 Electrical installations shall comply with *NFPA 70*.

4.5.2* Engine rooms, enclosures, or other locations shall not be classified as hazardous locations as defined in Article 500 of *NFPA 70* 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) 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
- (2) Green 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 automati-