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NFPA 37 Stationary Combustion Engines and Gas Turbines 1984

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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Standard for the Installation and Use of

Stationary Combustion Engines and Gas Turbines

NFPA 37-1984

1984 Edition of NFPA 37

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 the National Fire Protection Association, Inc., at its Annual Meeting held May 21-24, 1984 in New Orleans, Louisiana. It was issued by the Standards Council on June 14, 1984, with an effective date of July 5, 1984, and supersedes all previous editions.

The 1984 edition of this document has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 37

This standard was initiated in 1904 as "Rules and Requirements for the Construction and Installation of Gas and Gasoline Engines" by a committee of the National Board of Fire Underwriters. NFPA published editions in 1905, 1915, 1922, 1934, 1955, 1963, 1967, 1970, 1975, and 1979. In 1955, responsibility for the standard was transferred from the Committee on Gases to the Committee on Internal Combustion Engines.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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.

Contents

Standard for the Installation and Use of

Stationary Combustion Engines and Gas Turbines

NFPA 37-1984

Information on referenced documents can be found in Chapter 10 and Appendix A.

Chapter 1 General Provisions

1-1 Purpose and Scope.

1-1.1 This standard applies to the fire safety for the installation and operation of stationary combustion engines and gas turbines not exceeding 7500 horsepower per unit. This standard applies also to portable engines which remain connected for use in the same location for a period of one week or more and which are used instead of or to supplement stationary engines.

1-1.2 This standard does not apply to engines used to propel any mobile structure.

1-1.3 Engines used to drive fire pumps shall comply with this standard and any special provisions contained in NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps*.

1-1.4 Engines used in essential electrical systems in health care facilities shall comply with this standard and any special provisions contained in Chapter 6 of NFPA 99, *Standard for Health Care Facilities*.

1-2 Definitions.

Approved. Acceptable to the "authority having jurisdiction."

NOTE: 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 or 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 concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Engines. Includes such prime movers 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.

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

Fuel 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.

Gallon. One U.S. gallon = 0.83 Imperial gallons = 3.785 liters.

Horsepower Rating.

(1) **Reciprocating engines.** The power of an engine measured at the flywheel or output shaft at standard SAE conditions of 29.61 in. (7521 mm) Hg barometer at 77°F (25°C) inlet air temperature in accordance with SAE Standard J1349, *Engine Power Test Code*.

(2) **Gas turbine engines.** The ANSI standard rated power of an engine at the output shaft at 14.696 psia (1.01325 bar) at 59°F (15°C) and a relative humidity of 60 percent in accordance with ANSI B133.6, *Procurement Standard for Gas Turbine Ratings and Performance*.

Psig. Pressure in pounds per square inch gage.

Spark Protected. Electrical equipment enclosed in a tight case or protected by shields, screens or insulation which will contain sparks or prevent their emission.

Tank, Day. A fuel oil tank located inside a structure which provides fuel to the engine.

Tank, Integral. A fuel oil tank furnished by the engine manufacturer and mounted on the engine.

Tank, Supply. A separate fuel tank for supplying fuel to the engine or to a day tank.

Chapter 2 Engines

2-1 General Locations.

2-1.1 Engines, with or without their "weatherproof" housings, which are attached to the engine subbase, may be installed outdoors, inside structures, or on roofs of structures, as follows:

2-1.1.1 Engines, and their "weatherproof" housings if provided, which are installed outdoors or outdoors on roofs of structures, shall be located at least 5 ft (1.5 m) from openings in walls and at least 3 ft (1 m) from structures having combustible adjacent walls.

2-1.1.2 Engines rated at more than 50 hp shall be located in accordance with 2-1.1.1, or be installed in detached structures reserved exclusively for the purpose (or with equipment and processes having similar hazard), or in rooms within or attached to other structures.

2-1.1.2.1 Detached structures shall be of noncombustible or fire-resistive construction (*see NFPA 220, Standard Types of Building Construction*). Provision shall be made

for venting a fuel explosion with minimum structural damage (*see NFPA 68, Guide for Explosion Venting*) or ventilation adequate to prevent a hazardous accumulation of flammable vapors or gases shall be provided both when the engine is operating or shut down (*see 2-1.4*).

2-1.1.2.2 Rooms located within structures shall have interior walls, floors, and ceilings of at least one hour fire resistance rating. (The ceiling of such a room located on the top floor of a structure need not be fire-resistive but shall be either noncombustible or protected with automatic sprinklers.)

These rooms shall have provision for venting a fuel explosion with mimimum structural damage (*see NFPA 68*) or ventilation adequate to prevent a hazardous accumulation of flammable vapors or gases shall be provided both when the engine is operating or shut down (*see 2-1.4*).

Openings in the engine room that open into other sections of the structure shall be provided with automatic or self-closing fire doors or dampers to confine a fire to the engine room.

2-1.1.2.3 Rooms attached to structures shall comply with 2-1.1.2.1 except that the common wall shall have a fire resistance rating of at least one hour. Openings in the engine room should preferably be in outside walls but, if they open into other sections of the structure, they shall be provided with automatic or self-closing fire doors or dampers.

2-1.2 Engines which are installed in structures or at outside locations shall have adequate emergency lighting as well as normal lighting.

2-1.3 Engines shall be situated so that they will be readily accessible for maintenance, repair and fire fighting.

2-1.4 Provision shall be made to supply sufficient air for combustion, proper cooling, and adequate ventilation. Air provided shall be sufficient to prevent flue gas products from being drawn from stacks or flues of boilers or other combustion devices in the same room used to exhaust combustion products. Requirements for air vary with the types and sizes of engines, the driven equipment, other air consuming equipment in the room and the nature of the engine room.

2-1.5 Combustible materials (not the engine and its appurtenances) shall not be located in a room housing an engine.

2-1.6 Gasoline or liquid-phase LP-Gas fueled engines shall not be installed in rooms or locations containing fired equipment or open flames.

2-2 Foundations.

2-2.1 Stationary engines shall be supported on firm foundations or suitable steel framework properly secured.

2-3 Floor and Roof Protection.

2-3.1 If engine is mounted on a combustible floor or roof, the surface beneath the engine and beyond the engine to a mimimum distance of 12 in. (305 mm) shall be covered with noncombustible insulation with sheet metal between the insulation and the engine.

2-4 Hazardous Locations.

2-4.1 In areas where flammable gases or liquids, combustible dusts or flyings normally exist, engines not compressing a flammable gas or not pumping a flammable liquid shall be installed in an enclosure of fire-resistive construction, with outside access only and well ventilated from a nonhazardous outside area.

2-5 Units Handling Hazardous Materials (Other Than Their Own Fuel Supply).

2-5.1 The use of an integral engine-driven unit compressing a flammable gas or pumping a flammable liquid is permitted provided the combination unit or groups of such combined units are suitably isolated from areas not having a similar hazard. Isolation may be achieved by location outdoors or by indoor structural separation in accordance with 2-1.1.2; except that indoor installation shall also comply with 2-5.1.1 through 2-5.1.3

2-5.1.1 Provision shall be made for venting an explosion with mimimum structural damage (*see NFPA 68, Guide for Explosion Venting*).

2-5.1.2 Rooms located within structures shall have interior walls, floors, and ceilings of at least two hours fire resistance rating.

2-5.1.3 Such a room or structure shall be ventilated in an approved manner from a nonhazardous area.

2-5.2 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 have all leads positively attached. Ventilation openings in such devices shall be adequately protected by a fire screen unless the device is purged, pressurized, or otherwise protected.

2-5.3 Ignition wire shall be positively attached at each end by use of the outer sheath or the insulation.

2-5.4 Spark plugs shall be fully shielded against flashover. Spark plugs either fully radio shielded or provided with insulating boots are acceptable.

2-5.5 Flame arresting equipment shall be securely attached to the engine air intake to avoid blowoff or rupture. A firmly fixed air filter shall be considered as meeting this requirement.

2-5.6 Starter, generator and associated electrical equipment, attached to engines, shall be of the spark protected type.

2-5.7 Batteries, wiring and electrical protective devices shall be protected against flashover and accidental shorting.

2-5.8 Means shall be provided for shutting down the engine at a readily accessible location remote from the engine.

2-6 Electrical Installations.

2-6.1 Electrical installations in rooms containing engines shall comply with NFPA 70, *National Electrical Code®*.

2-6.2 Engine rooms or other locations shall not be classified as hazardous locations as defined in Article 500 of the *National Electrical Code* solely by reason of the engine fuel.

Chapter 3 Engine Protective Devices

3-1 All Engines.

3-1.1 Each stationary engine shall have an automatic engine speed governor.

3-2 Engines — 10 Horsepower or More.

3-2.1 Engines of 10 hp or more shall be equipped with the device specified in 3-1.1 and the following additional protection shall be provided:

(a) An automatic engine shutdown device for high jacket water temperature or high cylinder temperature (*see 3-4.1*)

(b) An automatic engine shutdown device for low lubricating oil pressure or, in the case of a splash lubricated engine, for low oil level

(c) If an engine is intended for emergency use only or is constantly attended, an alarm is permissible in lieu of the devices specified in (a) and (b).

3-3 Engines — 100 Horsepower or More.

3-3.1 Engines of 100 hp or more shall have the devices specified in 3-1.1 and 3-2.1 and the following additional protection shall be provided:

(a) An automatic engine shutdown device for engine overspeed

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

(c) Some means of shutting down the engine at a readily accessible location remote from the engine

(d) A remote means of shutting off the fuel supply

(e) Except for gas turbines in excess of 1,000 hp, a remote means of shutting down lubricating oil pumps not directly driven by the engine

(f) If the engine is intended for emergency use only or is constantly attended, an alarm is permissible in lieu of the engine shutdown device specified in (b).

3-4 Gas Turbines

3-4.1 Gas turbine engines shall be equipped with the devices specified in 3-3.1, 3-2.1(b) and 3-3.1 and the following additional protection shall be provided:

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

(b) A means for shutting off the fuel supply in the event of flameout

(c) If a turbine is intended for emergency use only or is constantly attended, an alarm is permissible in lieu of the device specified in (a).

3-4.2 The turbine starting sequence shall include a purge cycle adequate to insure a nonflammable atmosphere in the turbine and exhaust system prior to ignition.

Chapter 4 Fuel Supply for Gas Fueled Engines

4-1 Gas Piping.

4-1.1 Except as provided in 4-1.2 and 4-1.3, gas piping shall be installed in accordance with the appropriate standard cited in 4-1.1.1 through 4-1.1.3.

4-1.1.1 For all fuel gases other than LP-Gas in the liquid phase and for service pressures of 60 psi (413.7 kPa) and less, NFPA 54, *National Fuel Gas Code*, and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

4-1.1.2 For all fuel gases other than LP-Gas in the liquid phase and for service pressures in excess of 60 psi (413.7 kPa), *Code for Fuel Gas Piping*, ANSI B31.2 and NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

4-1.1.3 For LP-Gas in the liquid phase, NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

4-1.2 Plastic pipe, carrying fuel, shall not be used in a structure housing an engine or engines.

4-1.3 The use of approved metallic flexible connectors for protection against damage caused by settlement, vibration, expansion, contraction or corrosion is acceptable. The use of approved nonmetallic connectors for the same purpose is acceptable except for LP-Gas in the liquid phase. If flexible connectors are located so that they may be exposed to a fire of short duration the approval shall consider the ability of the connector to stand up under such conditions.

4-2 LP-Gas Systems.

4-2.1 Liquefied petroleum gas (LP-Gas) supply systems shall be installed in accordance with the appropriate provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

4-3 Regulators.

4-3.1 A gas pressure regulator located inside a structure shall be provided with either a vent to the outside of the structure and discharge at least 5 ft (1.5 m) away from any structure opening, or a listed vent limiting device, except any regulator or zero governor that operates with gas pressure on both sides of the diaphragm does not require venting. When the gas pressure on the upstream side of the regulator is more than ½ psig (3.5 kPa), a relief valve

shall be installed on the downstream side of the regulator. Relief valves shall be connected to the outside of the structure and discharge at least 5 ft (1.5 m) away from any structure opening, and such relief valves and any connected piping shall be sized to vent the required volume of gas.

4-4 Shutoff Valves.

4-4.1 Gas piping to engines shall have an approved shutoff valve remote from the engine and preferably outside the structure. If the valve is locked open, the key shall be secured in a well-marked accessible location near the valve.

4-4.2 Every gas engine shall have a carburetion valve, zero governor-type regulating valve, fuel control valve, or an auxiliary valve which will automatically shut off the flow of gas in case the engine stops from any cause.

4-4.3 Automatically started or unattended engines shall be provided with a fuel control valve or an auxiliary valve which will stop the flow of gas in case the engine stops for any cause. A zero governor-type regulator alone is not adequate protection in such installations. The auxiliary valve shall be installed ahead of any unlisted flexible connector to the carburetion valve, zero governor, or other controls.

4-5 Pressure Boosting Equipment.

4-5.1 When low pressure gas is supplied and pressure boosting equipment is required, compressors shall be approved for the service intended. Receivers, where required, shall be designed, constructed and tested in accordance with the ASME *Boiler and Pressure Vessel Code*, Section VIII, Division 1, Pressure Vessels.

Chapter 5 Fuel Supply for Liquid Fueled Engines

5-1 Design and Construction of Liquid Fuel Tanks.

5-1.1 Integral tanks shall be of steel with welded or brazed joints.

5-1.2 Day tanks shall be of steel with welded joints constructed with the following thicknesses:

Minimum Thickness of Steel

Capacity		Manufacturer's Standard
Gallons	Liters	Gage No.
10 or less	37.9 or less	18
11 to 180	41.6 to 681	16
181 to 275	685 to 1041	14
276 to 550	1045 to 2082	12

5-1.2.1 Tanks in this category listed and labeled "Inside Storage Tanks for Oil Burner Fuel" by Underwriters Laboratories Inc. shall be considered as meeting this provision.

5-1.3 Outside aboveground or underground fuel supply tanks shall be constructed in accordance with the applicable tank specification in Section 2-1 of NFPA 30, *Flammable and Combustible Liquids Code*.

5-1.3.1 Underground tanks smaller than 2,500 gal (9463 L) capacity listed and labeled as "Underground Tank for Flammable Liquids," and aboveground tanks listed and labeled as "Aboveground Tank for Flammable Liquids" by Underwriters Laboratories Inc., and tanks constructed in accordance with A.P.I. Standard No. 650 shall be considered as meeting this provision.

5-2 Fuel Tanks for Gasoline.

5-2.1 Only integral tanks shall be permitted inside or on roofs of structures.

5-2.2 An integral tank shall not exceed 25 gal (95 L) capacity and not more than one tank shall be installed on each engine. It shall be securely mounted on the engine assembly, protected against vibration, physical damage, engine heat and the heat of exhaust piping.

5-2.3 Tanks other than integral tanks shall be located underground or aboveground outside of structures.

5-2.4 Other requirements for day and supply tanks, such as construction, mimimum distance from any line of adjoining property that may be built upon, spacing, dikes, foundations, supports, depth and cover, anchorage, normal and emergency vents and testing, shall be in accordance with the applicable provisions of Sections 2-2, 2-3, 2-5 and 2-7 of NFPA 30, *Flammable and Combustible Liquids Code*.

5-3 Fuel Tanks for Diesel and Fuel Oils.

5-3.1 Fuel tanks inside structures shall comply with the provisions of 5-3.2 through 5-3.8 inclusive. Fuel tanks on roofs of structures shall comply with 5-3.2, 5-3.3, 5-3.6, 5-3.7 and 5-3.8.

5-3.2 Not more than one integral tank shall be installed on each engine. It shall be securely mounted on the engine assembly, protected against vibration, physical damage, engine heat and the heat of exhaust piping.

5-3.3 Except for installations used for emergency purposes as permitted in 5-3.5, an unenclosed day tank located above the lowest story, cellar or basement shall not exceed 60 gal (50 Imperial gal) (227 L) capacity and the total capacity of these tanks so located shall not exceed 60 gal (50 Imperial gal) (227 L).

5-3.4 Day tanks and supply tanks installed for any purpose in the lowest story, cellar or basement shall comply with 5-3.5 and 5-3.7.

5-3.5 Unenclosed day tanks or supply tanks supplying engines which drive generators, alternators, fire pumps, or other equipment used for emergency purposes shall not exceed 660 gal (550 Imperial gal) (2498 L). Not more than one unenclosed 660-gal (550-Imperial gal) (2498-L) capacity tank, or two or more unenclosed tanks with an aggregate capacity of not more than 660 gal (550 Im-

perial gal) (2498 L), shall be connected to one engine. The aggregate capacity of all unenclosed day and supply tanks in a building shall not exceed 1320 gal (1100 Imperial gal) (4996 L). Day and supply tanks with individual capacities larger than 660 gal (550 Imperial gal) (2498 L) or those tanks which cause the unenclosed aggregate capacity to exceed 1320 gal (1100 Imperial gal) (4996 L) in a building shall be enclosed in accordance with 5-3.7.

5-3.5.1 Unenclosed tanks larger than 60 gal (50 Imperial gal) (227 L) aggregate capacity used for emergency purposes described in 5-3.5 shall not be used for any other purpose.

5-3.6 Unenclosed day or supply tanks located above the lowest story, cellar or basement shall have either (1) a wall, curb or dike having a capacity at least equal so that of the largest surrounded tank, or (2) a wall, curb or dike of lesser capacity equipped with an overflow or drainage system which shall be 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.

5-3.7 Tank enclosures shall comply with the following:

5-3.7.1 The enclosure for tanks shall be constructed of walls, floor and top having a fire resistance rating of not less than three hours with the walls bonded to the floor. If the walls of such enclosure extend to and are bonded to the underside of a concrete floor or roof above which has a fire resistance rating of not less than three hours, a separate top is not required for the tank enclosure. At least 15 in. (381 mm) clearance shall be left around the tank for the purpose of inspection and repair.

5-3.7.2 Each tank enclosure shall be provided with an opening which is closed by a self-closing Class A fire door if it opens inside a building. If a door opening goes outside, an appropriate door shall be provided based on exposure presented. Openings shall be protected by a ramp or sill high enough to contain the entire contents of the tank within the walls to the height corresponding to the level of oil that will be retained and the sill shall be built to withstand the lateral pressure due to the liquid head and walls and floor shall be waterproof. In lieu of this, a drain to a properly sized underground tank is permissible.

5-3.7.3 Provision shall be made for adequate ventilation of such enclosures prior to entering for inspection or repair of tanks. An enclosed tank shall be equipped with an open vent or an automatically operated vent, terminating outside the building. Vent openings and vent pipes shall be ample size to prevent abnormal pressure in the tank during filling.

5-3.8 Day or supply tanks inside structures or on roofs shall be securely mounted on substantial noncombustible supports.

5-3.9 Supply tanks located outside aboveground or underground, or beneath a structure, shall comply with the applicable provisions of Sections 2-1, 2-2, 2-3, 2-5 and 2-7 of NFPA 30, *Flammable and Combustible Liquids Code*.

5-4 Fuel Flow Control.

5-4.1 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. Adequate alarms, float controlled valves or mechanical or remote-reading level gages or protected sight glass gages shall be installed to aid personnel in properly operating the fuel system. Stationary powered fuel pumps supplying integral or day tanks shall have "stop" controls sensitive to high tank liquid level.

5-4.2 When supplied by pumps, day tanks or integral tanks shall be provided with an overflow line, a high level alarm, and a high level automatic shutoff. The overflow line shall be continuous piping to the supply tank without valves or traps. Its capacity shall exceed the delivery capacity of the supply lines it serves.

5-4.3 Overflows, vents, fuel piping or fuel tanks shall not be located at or near engine air intake, exhaust piping, mufflers or filters.

5-4.4 Where crude or residual oils are utilized as engine fuel, it is sometimes necessary to heat the fuel above the flash point for satisfactory handling and injection into the engine. This necessitates special storage, purifying and heating systems. When fuel is heated, care shall be taken to maintain circulation through heaters regardless of engine fuel demand by means of constant recirculation to fuel tank, as well as to provide thermostatic control and suitable pressure and temperature gages. Pressure relief valves and relief piping returns to supply tank shall be incorporated where necessary.

5-5 Filling.

5-5.1 Integral tanks for gasoline shall be filled by a closed piping system except filling may be done by approved safety cans when the engine is shut down.

5-5.2 Integral tanks for diesel and fuel oils shall be filled by a closed piping system except that filling may be done from a container when the engine is shut down.

5-5.3 Piping for day and supply tanks shall be in accordance with 2-2.7, 2-3.6 and 2-4.4 of NFPA 30, *Flammable and Combustible Liquids Code*.

5-6 Vent Piping.

5-6.1 Vent piping shall be installed in accordance with 2-2.6, 2-3.5, or 2-4.2 of NFPA 30, *Flammable and Combustible Liquids Code*.

5-7 Fuel Piping, Valves and Fittings.

5-7.1 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 5-7.2 shall apply.

5-7.2 Piping systems shall be substantially supported, protected against physical damage and excessive stresses. THe use of approved, metallic or nonmetallic, flexible connectors for protection against damage caused by settlement, vibration, expansion, contraction or corrosion is

acceptable. If flexible connectors are located so that they may be exposed to a fire of short duration, the approval shall consider the ability of the connectors to stand up under such conditions.

5-7.3 Sufficient valves shall be provided to control flow of liquid fuel in normal operation and to shut off the flow of fuel in the event of a pipe break.

5-7.4 Piping to aboveground supply tanks filled from tank cars or tank vehicles by centrifugal pumps shall be provided with check valves to prevent back flow.

5-8 Transfer of Liquid Fuel to Engines.

5-8.1 Liquid fuel shall feed to engines by pumps only, except that gravity feed is permitted from integral tanks.

5-8.2 When engines are installed above the lowest story, cellar, or basement or on roofs, the fuel supply shall be pumped to day or supply tanks in an approved manner.

Chapter 6 Exhaust Piping and Chimneys

6-1 Design and Construction.

6-1.1 Engine exhaust discharge systems shall be designed on the basis of flue gas temperatures (see Definition). When such temperatures do not exceed 1000°F (538°C) except for infrequent brief periods, the engines shall be classified as low heat appliances. If these temperatures are exceeded, special consideration shall be given to the higher temperatures.

6-1.2 Exhaust pipes shall be of wrought iron or steel, and of sufficient strength to withstand the service. Fittings of cast iron are acceptable.

6-1.3 Chimneys, where required, shall be constructed and installed in accordance with Sections 2-3, 3-1, 3-3, 4-1 and 4-2 of NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.*

6-1.4 Provision shall be made in exhaust systems to prevent damage resulting from the ignition of unburned fuel. Normally, this is accomplished by built-in strength in the system but also may be accomplished by use of devices such as relief valves, rupture discs, or their equivalent.

6-1.5 Low points in exhaust systems shall be provided with suitable means for draining of condensate.

6-2 Installation.

6-2.1 Exhaust pipes shall be adequately supported and shall be connected to the engine or muffler so that emission of sparks, flame or gas within the structure is prevented.

6-2.2 When necessary, a flexible connector shall be provided in the exhaust pipe from the engine to minimize the possibility of a break in the engine exhaust system because of engine vibration or heat expansion. This connection shall not permit the release of dangerous quantities of gas into the engine room.

6-2.3 Exhaust pipes, except as permitted in 6-3.4, shall terminate outside the structure at a point where the hot gases or sparks will be discharged harmlessly and not be directed against combustible material or structures, or into atmospheres containing flammable gases or vapors or combustible dusts. Exhaust pipes shall not terminate under loading platforms or structures, or near ventilaion air inlets.

6-2.4 Where necessary, exhaust systems shall be guarded to prevent personnel burns.

6-3 Clearance from Combustible Material for Low Heat Appliances.

6-3.1 Exhaust pipes shall be installed with clearances of at least 9 in. (229 mm) to combustible material, except as provided in 6-3.2 and 6-3.3.

6-3.2 Exhaust pipes passing directly through combustible roofs shall be guarded at the point of passage by ventilated metal thimbles which extend not less than 9 in. (229 mm) above and not less than 9 in. (229 mm) below roof construction and which are at least 6 in. (152 mm) in diameter larger than the vent pipe.

6-3.3 Exhaust pipes passing directly through combustible walls or partitions shall be guarded at the point of passage by one of the following methods:

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

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

6-3.4 Exhaust pipes shall be connected to or pass inside of a metal, masonry, or factory-built chimney when the exhaust gases go through a floor, ceiling, attic, or concealed space. When an exhaust pipe is connected to a chimney, a muffler, when necessary, shall be installed between the engine and the point where the exhaust pipe enters the chimney. If other fuel burning appliances are vented into the same chimney, the engine exhaust pipe shall extend up into the chimney beyond any other flue connection.

6-4 Clearance from Combustible Material for Medium or High Heat Appliances.

6-4.1 Exhaust systems from medium or high heat appliances shall be given special consideration as to clearances from combustible materials and as to design of exhaust, and shall comply with NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.*

Chapter 7 Lubricating Oil

7-1 Crankcase or Oil Reservoir Protection.

7-1.1 Crankcases or oil reservoirs shall be adequately vented.

7-1.2 On large engines where crankcase explosions can be a hazard, adequate explosion escape openings shall be

provided, or suitable means used to maintain a nonflammable atmosphere in the crankcase:

7-1.3 Auxiliary reservoir oil supply chambers, if used, shall be vented either through separate vent or a common venting system.

7-1.4 Engines designed to operate with a negative pressure in the crankcase, and equipped with a separate lubricating oil sump, shall be provided with adequate-sized check valves in the venting system from the sump.

7-2 Lubricating Oil Piping.

7-2.1 Lubricating oil piping shall be in accordance with the provisions of 5-7.1, 5-7.2 and 5-7.3.

7-3 Safeguards for Gaging Devices.

7-3.1 Glass gages or sight feeds for lubricating oil, the breakage of which will permit the escape of oil, shall be protected against physical damage.

Chapter 8 Instructions

8-1 Operating Instructions.

8-1.1 Instructions for starting, stopping, operation and routine maintenance shall be supplied with each engine and, where feasible, shall be conspicuously posted on or near the equipment.

8-2 Emergency Instructions.

8-2.1 Where a fuel shutoff valve is used, a diagram with shutoff instructions shall be conspicuously posted on or near the valve, a safe distance from the engine or other potential fire location (*see 4-4 and 5-4*).

Chapter 9 Fire Protection

9-1 General.

9-1.1 Fire protection shall be provided in a manner acceptable to the authority having jurisdiction.

9-2 Fire Extinguishers.

9-2.1 For liquid fueled engines, excluding LP-Gas in the liquid phase, approved portable fire extinguishers of appropriate size, type, and number shall be provided, as specified in NFPA 10, *Standard for Portable Fire Extinguishers*.

9-2.2 For gas-fueled engines, including LP-Gas in the liquid phase, approved portable fire extinguishers of appropriate size, type, and number shall be provided. However, personnel should be instructed about the danger of extinguishing a gas fire by means other than shutting off the fuel.

Chapter 10 Mandatory Referenced Publications

10-1 This chapter lists publications referenced within this document which, in whole or in part, are part of the requirements of this document.

10-1.1 NFPA Publications. The following publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 10-1984, *Standard for Portable Fire Extinguishers*

NFPA 30-1984, *Flammable and Combustible Liquids Code*

NFPA 54-1984, *National Fuel Gas Code*

NFPA 58-1983, *Standard for the Storage and Handling of Liquefied Petroleum Gases*

NFPA 68-1978, *Guide for Explosion Venting*

NFPA 70-1984, *National Electrical Code*

NFPA 211-1983, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*

NFPA 220-1979, *Standard on Types of Building Construction*

10-1.2 Other Publications.

10-1.2.1 The following publication is available from the American Petroleum Institute, 2101 L Street NW, Washington, DC 20037.

API 650-1980, *Welded Steel Tanks for Oil Storage*

10-1.2.2 The following publications are available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

ANSI/ASME *Boiler and Pressure Vessel Code — 1980*

ANSI B31.2-1968, *Fuel Gas Piping*

ANSI B133.6-1978, *Procurement Standard for Gas Turbine Ratings and Performance*

10-1.2.3 The following publication is available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

SAE J1349-Dec. 1980, *Engine Power Test Code — Spark Ignition and Diesel*

Appendix A Informatory Referenced Publications

This appendix lists publications which are referenced within this NFPA document for information purposes only and thus is not considered part of the requirements of the document.

A-1 NFPA Publications. The following publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 20-1983, *Standard for the Installation of Centrifugal Fire Pumps*

NFPA 99-1984, *Standard for Health Care Facilities*