NFPA 820
Standard for Fire Protection in Wastewater Treatment and Collection Facilities

1999 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 820

Standard for

Fire Protection in Wastewater Treatment and Collection Facilities

1999 Edition

This edition of NFPA 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities*, was prepared by the Technical Committee on Wastewater Treatment Plants and acted on by the National Fire Protection Association, Inc., at its May Meeting held May 17–20, 1999, in Baltimore, MD. It was issued by the Standards Council on July 22, 1999, with an effective date of August 13, 1999, and supersedes all previous editions.

This edition of NFPA 820 was approved as an American National Standard on August 13, 1999.

Origin and Development of NFPA 820

The Committee on Wastewater Treatment Plants was organized in 1983 to have primary responsibility for documents on safeguarding against the fire and explosion hazards specific to wastewater treatment plants and associated collection systems. This document includes the hazard classification of specific areas and processes. The need to develop NFPA 820 was based on fire or explosion incidents that, while infrequent, are relatively severe when they do occur. Initial work on the document was begun early in 1985 and resulted in the first edition being issued in 1990. Extensive changes were made between the first edition and the 1992 edition, with the most notable revision being the document title, which was changed from *Recommended Practice for Fire Protection in Wastewater Treatment Plants* to *Recommended Practice for Fire Protection in Wastewater Treatment and Collection Facilities*. In addition, the document scope was revised to include storm sewer systems and their appurtenances.

In 1995 the document was changed from a recommended practice to a standard, which contains mandatory requirements. This was done because NFPA 820 was widely referenced by various jurisdictions.

The 1999 edition of NFPA 820 was changed to include some editorial corrections and to make the document more enforceable. The definitions were also modified to conform to NFPA's *Manual of Style*.

Technical Committee on Wastewater Treatment Plants

Garr M. Jones, *Chair*
Brown and Caldwell, CA [SE]

Alphonse A. Abadir, U.S. Dept. of Labor (OSHA), DC [L]
Rep. Sporting Arms & Ammunition Mfrs. Inst., Inc.
John R. Anderson, Marshfield, MA [SE]
Alonza W. Ballard, Crouse-Hinds, NY [M]
Rep. Nat'l Electrical Mfrs. Assn.
Richard D. Gottwald, Society of the Plastics Industry, DC [M]
John N. Harrell, Wilson & Co. Engr & Architects, MO [SE]
Gary Hewitt, The Gorman-Rupp Co., OH [M]
Rep. Water & Wastewater Equipment Mfrs. Assn., Inc.
James Retzloff, The Viking Corp., MI [M]
Rep. Nat'l Fire Sprinkler Assn.
Joseph P. Sheahan, Metro Water Reclamation District of Greater Chicago, IL [U]
Rep. Assn. of Metropolitan Sewerage Agencies
Edward Sikora, Nat'l Clay Pipe Inst., WI [M]
Dao T. Ton, Metropolitan Waste Control Commission, MN [U]
James F. Wheeler, U.S. Environmental Protection Agency, DC [E]

Alternates

Josiah W. Beakley, American Concrete Pipe Assn., TX [M]
(Vot. Alt. to ACPA)
Mark Kreinbihl, The Gorman-Rupp Co., OH [M]
(Alt. to G. Hewitt)
Ralph S. Thomas, Metropolitan Waste Control Commission, MN [U]
(Alt. to D. T. Ton)

Richard P. Bielen, NFPA Staff Liaison

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. A key to classifications is found at the back of this 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.

Committee Scope: This Committee shall have primary responsibility for documents on criteria for safeguarding against the fire and explosion hazards specific to wastewater treatment plants and associated collection systems, including the hazard classification of specific areas and processes.

Contents

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Standard for

Fire Protection in Wastewater Treatment and Collection Facilities

1999 Edition

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

Information on referenced publications can be found in Chapter 9 and Appendix F.

Chapter 1 Introduction

1-1 Scope.

1-1.1 General.

1-1.1.1* This standard provides minimum requirements for protection against fire and explosion hazards in wastewater treatment plants and associated collection systems, including the hazard classification of specific areas and processes.

1-1.1.2 This standard shall apply to the following:

(1) Collection sewers
(2) Trunk sewers
(3) Intercepting sewers
(4) Combined sewers
(5) Storm sewers
(6) Pumping stations
(7) Wastewater treatment plants
(8) Sludge-handling facilities
(9) Chemical-handling facilities
(10) Treatment facilities
(11) Ancillary structures *(see definition in Section 1-5)*

1-1.1.3 This standard shall not apply to the following:

(1) Collection, treatment, or disposal of industrial wastes or manufactured by-products that are treated on-site and not discharged to a publicly or privately operated municipal facility
(2) On-site treatment systems *(see definition in Section 1-5)*
(3) Pressure sewer systems *(see definition of Sewer, Pressure in Section 1-5)*
(4) Building drain systems and appurtenances *(see definition in Section 1-5)*
(5) Industrial sewer systems and appurtenances *(see definition of Sewer, Industrial in Section 1-5)*
(6) Personnel safety from toxic and hazardous materials or products of combustion
(7) Separate nonprocess-related structures *(see definition in Section 1-5)*

1-1.2 Alternative Methods. Nothing in this standard shall prevent or discourage the use of alternative methods, materials, practices, or devices, provided technical data are submitted to the authority having jurisdiction to demonstrate that the alternative method, material, practice, or device is equivalent to or superior to the requirements of this standard.

1-1.3 Fire Risk Evaluation. A fire risk evaluation shall be initiated early in the facility design or alteration to integrate the fire prevention and fire protection requirements described in this document.

1-2 Purpose.

1-2.1 General. The purpose of this standard is to provide a reasonable degree of fire and explosion protection for life, property, continuity of mission, and protection of the environment. The intent of this standard is to reduce or eliminate the effects of fire or explosion by maintaining structural integrity, controlling flame spread and smoke generation, preventing the release of toxic products of combustion, and maintaining serviceability and operation of the facility.

1-2.2 Toxicity and Biological Hazards. This standard shall apply to the fire and explosion hazards of various substances associated with wastewater treatment and conveyance. This standard shall not apply to toxicity and biological hazards.

CAUTION

It is recognized that, from a personnel safety standpoint, toxicity and biological hazards can be present in life-threatening concentrations while no threat of fire or explosion exists.

1-2.3 Ventilation Practices. Ventilation rates required by this standard are intended to minimize fire and explosion hazards, which could be insufficient to protect personnel from exposure to toxic and biological hazards.

1-2.4 Materials Selection. The fire risk evaluation shall include evaluation of flame spread, smoke generation, and the impact that a fire or explosion will have on the structural integrity of the facility when conditions or applications warrant the selection of combustible, limited-combustible, or low flame spread materials.

CAUTION

Since many of the corrosion-resistant materials and coatings are combustible or limited-combustible and could represent a considerable fuel load during fire events, the design and fire risk evaluation shall consider any additional hazards imposed by the use of these materials.

1-3 Application.

1-3.1* New Installations. The requirements of this standard shall apply to new installations. When additions or modifications are made to existing facilities, the modifications shall reflect the requirements of this document. In any event, the requirements of this standard shall be used by owners in a risk assessment to identify the areas of a treatment plant that are vulnerable to fire or other loss.

1-3.2 Document Organization. This document is divided into 9 chapters. Chapters 1, 5, 6, 7, 8, and 9 shall apply generally. Chapters 2, 3, and 4 shall apply to specific processes and functions. The appendixes provide explanatory information. Appendix A provides explanatory information that is tied to paragraphs in Chapters 1 through 8. Appendix B provides a general overview and layout of the unit processes found at a typical wastewater treatment plant, although the arrangement of the unit processes varies from plant to plant.

1-3.3* *National Electrical Code*® Criteria. This standard is based on the criteria established by Article 500 of NFPA 70, *National Electrical Code*®, but is not intended to supersede or to conflict

with the requirements therein. Once an area is properly classified, NFPA 70 specifies the types of equipment and the wiring methods that are required.

1-4 Metric Units of Measurement. Metric units of measurement used within this standard are in accordance with the modernized metric system known as the International System of Units (SI). Values of measurement are followed by an approximate equivalent value in SI units. For metric conversion practices, see ANSI/IEEE 268, *Metric Practices.*

1-5 Definitions.

Activated Carbon. Adsorptive carbon particles or granules usually obtained by heating carbonaceous material in the absence of air or in steam and possessing a high capacity to selectively remove trace and soluble components from solution.

Activated Sludge. A microbial mass grown in aeration tanks, subsequently separated from treated wastewater by sedimentation, and wasted or returned to the process as needed.

Adjacent. Sharing a common wall, partition, or barrier.

Advanced (Tertiary) Wastewater Treatment. Any physical, chemical, or biological treatment process used to accomplish a degree of treatment greater than that achieved by secondary treatment. (*See also definition of Secondary Wastewater Treatment.*)

Anaerobic Digestion. A unit process designed to biologically convert organic matter (sludge) through the action of microorganisms in the absence of elemental oxygen. Process by-products include a gas containing methane, carbon dioxide, and small quantities of hydrogen sulfide. The digestion tank can have a fixed or floating roof system.

Anaerobic Waste Treatment. A unit process providing treatment of the liquid stream by action of microorganisms in the absence of elemental oxygen. Process by-products include a gas containing methane, carbon dioxide, and small quantities of hydrogen sulfide.

Ancillary Structure. An integral part of the wastewater treatment or collection process.

Approved.* Acceptable to the authority having jurisdiction.

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

Belt Filter. A sludge-dewatering or -concentrating device having continuous bands or belts of filtering media that pass around rollers and from which the material caught on the media is usually removed by gravity and pressure.

Building. A structure used or intended for supporting or sheltering any use or occupancy. Personnel could occupy buildings continuously or intermittently.

Building Drain. In plumbing, the part of the lowest horizontal piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer (house connection or lateral).

Centrifuge. A mechanical device in which centrifugal force is used to separate solids from liquids or to separate liquids of different densities.

Combustible. Any material that does not comply with the definitions of either *noncombustible material* or *limited-combustible material.*

Combustible Gas Detector. A device used to detect the presence of flammable vapors and gases and to warn when concentrations in air approach the explosive range.

Combustible Liquid.* A liquid having a flash point at or above 100°F (37.8°C).

Combustible or Explosive Dust. A dust capable of spontaneous combustion or of exploding or burning when subjected to a source of ignition.

Compost. The product of thermophilic biological oxidation of sludge or other organic materials.

Digester Gas. See definition of *Sludge Gas.*

Dissolved Air Flotation. A separation process in which air bubbles emerging from a supersaturated solution become attached to suspended solids in the liquid undergoing treatment and float to the surface.

Domestic Wastewater. Wastewater derived principally from dwellings, commercial establishments, institutions, and so forth, that could or could not contain small amounts of groundwater, surface water, or storm water.

Dry Well. That portion of a pumping station designed to provide isolation and shelter or accommodations for controls or equipment associated with pumping of wastewater. Dry wells are designed to completely and permanently exclude wastewater or wastewater-derived atmospheres. Dry wells can contain accidental leakage of wastewater from shaft seals or occasional spills. A dry well could contain equipment such as pumps, motors, fans, wiring, controls, lights and associated wiring devices, and other accessories.

Drying Beds. Confined, underdrained, shallow layers of sand or gravel structures on which digested sludge is distributed for draining and air drying. Also applied to underdrained, shallow, diked earthen structures used for drying sludge.

Enclosed Space. The interior of any tank or unit process that is closed to the atmosphere, excluding vents or pressure relief, or the area around any open tank or unit process surrounded by a building or other structure constructed with a roof and solid walls.

Equipment. A general term, including material, fittings, devices, appliances, fixtures, apparatus, and so forth, used as part of, or in connection with, a mechanical, instrumentation, or electrical installation.

Equipment Enclosure. The housing that covers, protects, or guards a piece of equipment and is not intended for personnel occupancy, but can provide for access to the equipment.

Explosionproof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and capable of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

Explosive Limits. The minimum concentration of a gas–air or vapor–air mixture that supports flame, if ignited, is known as the lower explosive limit (LEL) and the maximum concentration of a gas–air or vapor–air mixture that, if ignited, supports flame is known as the upper explosive limit (UEL). Above the UEL and below the LEL, ignition cannot take place.

(These values might change in oxygen-enriched atmospheres.)

Filter (Pressure or Gravity). A device used to pass liquid through a medium to remove suspended solids.

Filter Press. A unit process, using a plate and frame press, that is operated hydraulically and mechanically to produce a semisolid sludge cake from a slurry.

Fire Barrier. A continuous vertical or horizontal membrane, such as a wall or floor assembly, that is designed and constructed with a specified fire resistance rating to limit the spread of fire and that also will restrict the movement of smoke. Such barriers might have protected openings.

Fire Loading. The amount of combustibles present in a given area, expressed in Btu/ft^2 (kJ/m^2).

Fire Prevention. Measures directed toward avoiding the inception of fire.

Fire Protection. Methods of providing for fire control or fire extinguishment.

Fire Resistance Rating. The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*. This definition applies to the materials used in the construction of buildings but does not apply to furnishings or the contents of buildings or to the fire hazard evaluation of materials.

Fire-Rated Penetration Seal. An opening in a fire barrier for the passage of pipe, cable, duct, and so forth, that has been sealed so as to maintain a barrier rating.

Flammable Liquid.* A Class I liquid having a flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psia (2068 mm Hg) at 100°F (37.8°C).

Flash Dryer. A device for vaporizing water from partly dewatered and finely divided sludge through contact with a current of hot gas or superheated vapor that includes a squirrel-cage mill for separating the sludge cake into fine particles.

Flash Mixer. A device for quickly dispersing chemicals uniformly throughout a liquid or semisolid.

Flocculator. A unit process for the formation of floc in wastewater.

Fluidized Bed Reactor. A pressure vessel or tank that is designed for liquid–solid or gas–solid reactions; the liquid or gas moves upward through the solids' particles at a velocity sufficient to suspend the individual particles in the fluid. Applications include ionexchange, granular activated carbon adsorbers, and some types of furnaces, kilns, and biological contactors.

Force Main (Pressure Main). A pressure pipe connecting the pump discharge of a wastewater pumping station under pressure to a point of discharge.

Fuel Gases.* Any gas used as a fuel source, including natural gas, manufactured gas, sludge gas, liquefied petroleum gas–air mixtures, liquefied petroleum gas in the vapor phase, and mixtures of these gases.

Galleries. Long tunnels or walkways connecting separate buildings or structures. Galleries are generally underground, without windows, and with limited entrances and exits. Galleries frequently contain gas or other hazardous material transport systems, water, wastewater, sludge piping, electrical wiring, and mechanical or electrical equipment.

Gas-Handling Equipment. Equipment, including gas compressors, sediment traps, drip traps, gas scrubbers, and pressure-regulating and control valves, used in the removal of gas evolved from the anaerobic digestion process and the compression, conditioning, or treatment of this gas. Gas-handling equipment does not include equipment or devices for the utilization of the gas, such as boilers, engines, and waste gas burners.

Grit Chamber. A detention chamber or an enlargement of a sewer designed to reduce the velocity of flow of the liquid to permit the separation of mineral from organic solids by differential sedimentation.

Hazardous (Classified) Location. Locations are classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that might be present and the likelihood that a flammable or combustible concentration or quantity is present. Each room, section, or area is considered individually in determining its classification.

Hazardous Waste. Any waste that is potentially damaging to the environment or human health because of toxicity, ignitibility, corrosivity, chemical reactivity, or other reason.

Heat Treatment. A sludge-conditioning process combining high temperature, time, and pressure to improve the dewaterability of organic sludge.

Hydrogen Sulfide (H_2S). A toxic and lethal gas produced in sewers and digesters by anaerobic decomposition of wastewater solids or other anaerobic wastewater or sludge treatment processes.

Identified. As applied to equipment, recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular code requirement. *(See definition of Equipment.)*

Imhoff Tank. A deep, two-story wastewater treatment tank, consisting of an upper continuous-flow sedimentation chamber and a lower sludge digestion chamber. The upper chamber floor slopes steeply to trapped slots through which solids can slide into the lower chamber. The lower chamber receives no fresh wastewater directly but is provided with gas vents and with means for drawing digested sludge from near the bottom.

Incineration. Combustion or controlled burning of volatile organic matter in sludge and solid waste that reduces the volume of the material while producing heat, dry inorganic ash, and gaseous emissions.

Industrial Waste. Generally liquid, solid, or gaseous wastes originating from the manufacture of specific products. Such wastes are usually more concentrated, are more variable in content and rate, and require more extensive or different treatment than municipal waste.

Inspection. A visual examination of a system or portion thereof to verify that it appears to be in operating condition and is free of physical damage.

Intrinsically Safe. Equipment and wiring that are not capable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific flammable or combustible atmospheric mixture in its most easily ignitible concentration. Abnormal conditions include accidental damage to any field-installed wiring, failure of electrical components, application of overvoltage, adjustment and maintenance operations, and other similar conditions. *(See*

ANSI/ISA RP 12.67, Installation of Intrinsically Safe Instrument Systems in Class I Hazardous Locations.)

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.

Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), where tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* and complies with (a) or (b): (a) Materials having a structural base of noncombustible material with a surfacing not exceeding a thickness of $^1/_8$ in. (3.2 mm) that has a flame spread index not greater than 50; and (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible.

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.

Low Flame Spread. A material with a flame spread rating of 25 or less when classified in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials.*

Maintenance. Work performed to keep equipment operable or to make repairs.

Maintenance Hole. A structure atop an opening in a gravity sewer, or an opening in the top or side of an enclosed vessel to permit personnel entry. Also referred to as manhole or manway.

Methane (CH_4). A colorless, odorless, flammable gaseous hydrocarbon present in natural gas and formed by the anaerobic decomposition of organic matter. *(See also definition of Anaerobic Digestion.)*

Nitrification Tank. A unit process for the oxidation of ammonia and nitrogen into nitrates through biochemical actions.

Noncombustible Material. A material that in the form in which it is used and under the conditions anticipated will not aid combustion or add appreciable heat to an ambient fire. Materials, when tested in accordance with ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C (1382°F),* and conforming to the criteria contained in Chapter 7 of the referenced standard, shall be considered as noncombustible. This definition applies to the materials used in the construction of buildings but does not apply to furnishings or the contents of buildings or to the fire hazard evaluation of materials.

Nonenclosed. Any tank or unit process open to the atmosphere or the area around any open tank or unit process housed in a building or other structure constructed with a roof and having at least 50 percent of the wall area open to the atmosphere. Fixed open louvered panels with effective openings greater than 50 percent of the wall area and evenly distributed over the wall area are considered open to the atmosphere.

On-Site Treatment System. A self-contained system, including pumping equipment, that provides both treatment and disposal of wastewater on or immediately adjacent to a single residence or group of residences or small commercial establishments.

Oxygen-Enriched Atmosphere. Any atmosphere with an oxygen concentration greater than ambient by volume at normal atmospheric pressure.

Ozonation. The process of contacting wastewater or air with ozone for the purpose of disinfection, oxidation, or odor control.

Physically Separated. A gastight partition between two adjacent spaces, or two nonadjacent spaces, with no means of gas communication between the spaces. Personnel entry to the separate spaces is by individual, grade-level exterior access ports with no physical connection between the two.

Primary Wastewater Treatment. The first major treatment in a wastewater treatment plant, generally consisting of one or more of the following unit processes: screening, comminution or grinding, grit removal, sedimentation, and skimming.

Pumping Station. A structure that contains pumps and appurtenant piping, valves, and other mechanical and electrical equipment for pumping wastewater or other liquid. Also called lift station.

Pyrolysis. The destructive distillation of organic compounds in an oxygen-free environment that converts the organic matter into gases, liquids, and char.

Residential Wastewater. Wastewater derived from areas consisting of single- and multiple-family residences.

Rotating Biological Contactor (RBC). A unit process for wastewater treatment that is composed of large, closely spaced plastic discs that are rotated about a horizontal shaft (usually a secondary biological treatment process).

Screening Chamber. A chamber or enlargement of a sewer where large suspended or floating solids or material is removed from raw wastewater by a screen.

Scum or Skimmings. Grease, solids, liquids, and other floatable material removed from settling tanks.

Secondary Wastewater Treatment. Wastewater treatment unit processes usually consisting of primary treatment and biological oxidation using activated sludge or trickling filtration followed by clarification.

Sedimentation. The unit process of subsidence of suspended matter carried by water, wastewater, or other liquids by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material. Also called settling, it can be enhanced by chemical addition, coagulation, and flocculation.

Separate Nonprocess-Related Structures. Structures that are physically separated and do not contain any process-related equipment associated with the collection and treat-

ment of wastewater and solids derived from wastewater treatment processes.

Sewer. A single pipe or system of pipes or conduits that carries wastewater or drainage water.

Sewer, Branch. A sewer that receives wastewater from a relatively small area and discharges into a main sewer serving more than one branch sewer area.

Sewer, Building. In plumbing, the extension from the building drain to the public sewer or other place of disposal (also called house connection or lateral).

Sewer, Collector. A pipe or conduit that receives wastewater from a relatively small area from two or more lateral sewers and that subsequently discharges into a trunk sewer.

Sewer, Combined. A sewer intended to receive both wastewater and storm or surface water.

Sewer, Industrial. A sewer intended to receive only industrial wastewater or other liquid or water-carried wastes. *(See also definitions of Sewer, Sanitary; Sewer, Storm; and Sewer, Combined).*

Sewer, Interceptor. A sewer that receives dry-weather flow and frequently additional predetermined quantities of storm water (if from a combined system) from a number of transverse sewers or outlets and conducts such waters to a point for treatment or disposal (also called main sewer).

Sewer, Outfall. A sewer that receives wastewater from a collecting system or from a treatment plant and carries it to a point of final discharge.

Sewer, Pressure. A collection sewer that incorporates a wastewater grinder pump or septic tank effluent pump to convey wastewater from a single residence or group of residences or small commercial establishments to a private or public sewer system or on-site disposal system.

Sewer, Private. A sewer privately owned and used by one or more properties or owners.

Sewer, Relief. A sewer built to carry the flows in excess of the capacity of an existing sewer. Also, a sewer intended to carry a portion of the flow from a district in which the existing sewers are of insufficient capacity.

Sewer, Residential. A sewer intended to receive only residential wastewater. *(See also definitions of Sewer, Combined; Sewer, Sanitary; and Sewer, Storm).*

Sewer, Sanitary. A sewer that carries liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions together with minor quantities of storm water, surface water, and groundwater that are not admitted intentionally.

Sewer, Storm. A pipe or conduit that carries storm water and surface water, street wash, and other wash water, or drainage, but excludes domestic wastewater and industrial wastes (also called storm drain).

Sewer, Trunk. The principal pipe or conduit to which one or more collector sewers or branch sewers are tributaries (also called main sewer).

Sewer Gas. Gas resulting from decomposition of organic matter in wastewater in sewers and from the incidental, uncontrolled release of hydrocarbons or decomposition of organic matter in stagnant liquid and septic sludge in wastewater treatment plants. The gas could contain trace quantities of methane and hydrogen sulfide and could be low in oxygen. It could be both a fire and life safety hazard.

Shall. Indicates a mandatory requirement.

Sludge. A semiliquid mass of accumulated settled solids deposited from wastewater, raw or treated, in tanks or basins. Also referred to as biosolids.

Sludge Cake. A semisolid product of a sludge-dewatering process.

Sludge Dewatering. The process of removing a part of the water in sludge by any physical or mechanical method without heat, such as draining, pressing, vacuum filtration, centrifuging, or passing between rollers.

Sludge Gas. Gas obtained as a by-product of the anaerobic sludge digestion unit process from the decomposition of organic matter. It has a high content of methane, varying amounts of carbon dioxide and hydrogen sulfide, and a small amount of nitrogen. It can be both a fire and life safety hazard.

Sludge Gas Vent. A passage to permit the controlled release of gases from anaerobic treatment processes or gas storage facilities.

Sludge Thickening. A sludge treatment process designed to concentrate wastewater sludges by gravity, mechanical means, or air flotation.

Sludge Treatment. The processing of wastewater sludges to render them stable. This can be done by aerobic or anaerobic digestion followed by drying on sand beds, filtering and incineration, filtering and drying, or wet-air oxidation.

Sludge-Drying Systems. Sludge processes using physical or mechanical evaporation techniques with or without the application of heat to achieve solids concentrations greater than 85 percent.

Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

Structure. All construction designed to contain or convey wastewater, sludge, sludge gas, piping, or equipment. Structures can provide access but are not intended for continuous personnel occupancy.

Through-Penetration Firestop. A specific construction consisting of the materials that fill the opening around penetrating items such as cables, cable trays, conduits, ducts, and pipes and their means of support through the wall or floor opening to prevent spread of fire. Its rating is established in accordance with test procedures in ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops.*

Trickling Filter. A treatment unit process consisting of stone, plastic, redwood, or similar media over which wastewater is distributed and through which wastewater trickles to the underdrains and is treated by the microbial slimes formed on the surface of the media.

Tunnel. See definition of *Galleries.*

Utilization Equipment. Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes.

Vacuum Filter. A unit process, used to dewater wastewater sludge, consisting of a cylindrical drum mounted on a hori-

zontal axis, covered with a media, and subjected to an internal vacuum.

Vault. An enclosed structure, usually underground, used to permit personnel access to various types of equipment and instrumentation.

Ventilation Rate. Ventilation rate, as used in this document, is based on air changes per hour and is calculated by the use of 100 percent outside air for the supply air that is exhausted. Air changes per hour is calculated on the basis of the maximum aggregate volume (under normal operating conditions) of the space to be ventilated.

Volatile Liquid. A liquid that evaporates readily at normal temperature and pressure.

Wastewater. The spent water of a community. Combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and storm water that might be present.

Wet Well. That portion of the pumping station that receives and temporarily stores wastewater for the purpose of pumping. A wet well might or might not contain electrical equipment such as pumps, motors, fans, wiring and wiring devices, controls, lights, and other accessories.

Chapter 2 Collection Systems

2-1* General. This chapter provides minimum criteria for protection against fire and explosion hazards in the collection and transportation of municipal wastewater. This chapter shall not apply to on-site systems, force mains, or those sewers that principally convey industrial wastes. Table 2-2 summarizes the various components associated with wastewater collection and transport systems.

2-2* Design and Construction. The design and construction of collection system facilities shall conform to Table 2-2.

Table 2-2 Collection Systems

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
1		MATERIALS USED IN REHABILITATION, RECONSTRUCTION, OR SLIP-LINING OF SEWERS	NA	NA	NA	NA	In accordance with 6-3.1	NA
2		INDUSTRIAL SEWER Sewer transporting industrial wastewater only (no sanitary wastewater)	Not included within the scope of this standard					
3		STORM SEWER Sewer transporting storm water only (no sanitary wastewater)	Possible ignition of flammable gases and floating flammable liquids	NNV	Inside of sewer	Division 2	In accordance with 6-3.1	NR

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
4		STORM WATER PUMPING STATION WET WELLS Liquid side of pumping station serving only a storm sewer system	Possible ignition of flammable gases and floating flammable liquids	NNV	Entire room or space	Division 2	NC, LC, or LFS	CGD if enclosed
5	a	STORM WATER PUMPING STATION DRY WELLS Dry side of a pumping station serving only a storm sewer system and physically separated from wet well	Buildup of vapors from flammable or combustible liquids	D	Entire dry well	Division 2, or unclassified, if space provided with pressurization in accordance with NFPA 496	NC, LC, or LFS	FE
	b			C		Unclassified		
6		PRESSURE SEWER (Force main) Sewer under pressure (flooded discharge pipe from pump or tank)	Not included within the scope of this standard					
7		BUILDING SEWER (Lateral sewer or drain) Sewer serving a house or single building (plumbing)	Not included within the scope of this standard					
8		INDIVIDUAL RESIDENTIAL SEWER Sewer serving one but not more than five dwellings	NA	NNV	Within enclosed space	Unclassified	NR	NR

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
9		INDIVIDUAL RESIDENTIAL PUMPING UNITS Pumping units serving one but not more than five dwellings (e.g., grinder pumps, septic tank effluent pumps, ejector pumps)	NA	NNV	Within enclosed space	Unclassified	NR	NR
10	a	RESIDENTIAL SEWER Sewer transporting primarily residential wastewater	Possible ignition of flammable gases and floating flammable liquids	NNV	Within enclosed space	Division 2	In accordance with 6-3.1	NR
	b			B		Unclassified		
11	a	RESIDENTIAL WASTEWATER PUMPING STATION WET WELL Pumping station transporting primarily residential wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Entire room or space	Division 2	NC, LC, or LFS	CGD
	b			B		Unclassified		
12	a	RESIDENTIAL WASTEWATER PUMPING STATION DRY WELL Dry side of a pumping station transporting primarily residential wastewater	Buildup of vapors from flammable or combustible liquids	D	Entire room or space	Division 2	NC, LC, or LFS	FE
	b			C		Unclassified		
13		OUTFALL SEWER Final discharge pipe from a treatment plant, transporting treated wastewater	NA	NNV	NA	Unclassified	NR	NR

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
14	a	SANITARY SEWER Sewer transporting domestic, commercial, and industrial wastewater	Possible ignition of flammable gases and floating flammable liquids	NNV	Inside of sewer	Division 1	In accordance with 6-3.1	NR
	b			B		Division 2		
15	a	COMBINED SEWER Sewer transporting domestic, commercial, and industrial wastewater and storm water	Possible ignition of flammable gases and floating flammable liquids	NNV	Inside of sewer	Division 1	In accordance with 6-3.1	NR
	b			B		Division 2		
16	a	WASTEWATER PUMPING STATION WET WELLS Liquid side of a pumping station serving a sanitary sewer or combined system	Possible ignition of flammable gases and floating flammable liquids	A	Entire room or space	Division 1	NC, LC, or LFS	CGD
	b			B		Division 2		
17	a	BELOWGRADE OR PARTIALLY BELOWGRADE WASTEWATER PUMPING STATION DRY WELL Pump room physically separated from wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes	Buildup of vapors from flammable or combustible liquids	C	Entire space or room	Unclassified	NC, LC, or LFS	FE
	b			D		Division 2, or unclassified, if space provided with pressurization in accordance with NFPA 496		

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
18		ABOVEGRADE WASTEWATER PUMPING STATION Pump room physically separated with no personnel access to wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes	NA	NR	NA	Unclassified	NC, LC, or LFS	FE
19	a	ABOVEGRADE WASTEWATER PUMPING STATION Pump room not physically separated from wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes	Possible ignition of flammable gases and floating flammable liquids	A	Entire space or room	Division 1	NC	FE
	b			B		Division 2	NC, LC, or LFS	
20	a	ODOR-CONTROL SYSTEM AREAS Areas physically separated from wet well that house systems handling wet well gases	Leakage and ignition of sewage gases	D	Entire area if enclosed	Division 2	NC, LC, or LFS	CGD and FDS
	b			C, or outdoors	Areas within 3 ft (0.9 m) of leakage sources such as fans, dampers, flexible connections, flanges, pressurized unwelded ductwork, and odor-control vessels	Division 2		
	c				Areas beyond 3 ft (0.9 m)	Unclassified		

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
21	a	MAINTENANCE HOLES Access to sewer for personnel entry	Possible ignition of flammable gases and floating flammable liquids	NNV	Inside	Division 1	In accordance with 6-3.1	NR
	b			B		Division 2		
22	a	JUNCTION CHAMBERS Structure where sewers intersect	Buildup of vapors from flammable or combustible liquids	NNV	Inside	Division 1	In accordance with 6-3.1	NR
	b			B	Open and above grade or inside and ventilated	Division 2		
23		INVERTED SIPHONS Depressed section of gravity sewer	Possible ignition of flammable gases and floating flammable liquids	NNV	Interior of inlet and outlet structures	Division 1	NC	NR
24		CATCH BASINS (Curb inlet) Inlet where street water enters a storm or combined sewer	Buildup of vapors from flammable or combustible liquids	NNV	Enclosed space	Division 1	In accordance with 6-3.1	NR
25	a	RESIDENTIAL DIVERSION STRUCTURES Enclosed structures where residential wastewater can be diverted	Buildup of vapors from flammable or combustible liquids	NNV	Enclosed space	Division 2	In accordance with Chapter 6	NR
	b			B		Unclassified		
26	a	RESIDENTIAL BELOWGRADE VALVE VAULT With an exposed residential wastewater surface	Possible ignition of gases and floating flammable liquids	NNV	Enclosed space	Division 2	In accordance with 6-3.1	NR
	b			B		Unclassified		

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
27	a	RESIDENTIAL CONTROL STRUCTURES Enclosed structures where residential wastewater flow is regulated	Buildup of vapors from flammable or combustible liquids	A	Enclosed space	Division 2	In accordance with Chapter 6	NR
	b			B		Unclassified		
28	a	RESIDENTIAL BELOWGRADE METERING VAULT With an exposed residential wastewater surface	Possible ignition of flammable gases and floating flammable liquids	NNV	Enclosed space	Division 2	In accordance with 6-3.1	NR
	b			B		Unclassified		
29	a	DIVERSION STRUCTURES Enclosed structures where wastewater can be diverted	Buildup of vapors from flammable or combustible liquids	NNV	Enclosed space	Division 1	In accordance with Chapter 6	NR
	b			B		Division 2		
30		ABOVEGRADE VALVE VAULT Physically separated from the wet well; valves in vault in closed piping system	NA	NR	NA	Unclassified	NC, LC, or LFS	NR
31	a	BELOWGRADE VALVE VAULT Physically separated from the wet well and with closed piping system	Buildup of vapors from flammable or combustible liquids	NNV	Enclosed space	Division 2	NC, LC, or LFS	NR
	b			C		Unclassified		
32	a	BELOWGRADE VALVE VAULT With an exposed wastewater surface	Possible ignition of gases and floating flammable liquids	NNV	Enclosed space	Division 1	NC	NR
	b			B		Division 2	NC, LC, or LFS	

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 2-2 Collection Systems ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
33	a	CONTROL STRUCTURES	Buildup of vapors from flammable or combustible liquids	A	Enclosed space	Division 1	In accordance with Chapter 6	NR
	b	Enclosed structures where wastewater or storm water flow is regulated		B		Division 2		
34	a	WASTEWATER HOLDING BASINS	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed space	Division 1	NC	NR
	b	Enclosed structures temporarily holding untreated or partially treated wastewater		B		Division 2	NC, LC, or LFS	
35		WASTEWATER HOLDING BASINS, LINED OR UNLINED Open structures holding storm water, combined wastewater, untreated or partially treated wastewater	NR	NR	NR	NR	NR	NR
36	a	BELOWGRADE METERING VAULT	Buildup of vapors from flammable or combustible liquids	NNV	Enclosed space	Division 2	NC, LC, or LFS	NR
	b	Physically separated from the wet well and with closed piping system		C		Unclassified		
37	a	BELOWGRADE METERING VAULT	Possible ignition of flammable gases and floating flammable liquids	NNV	Enclosed space	Division 1	NC	NR
	b	With an exposed wastewater surface		B		Division 2	NC, LC, or LFS	
38		COARSE AND FINE SCREEN FACILITIES *(See Coarse and Fine Screen Facilities in Table 3-2.)*						

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Chapter 3 Liquid Stream Treatment Processes

3-1* General. This chapter provides minimum criteria for protection against fire and explosion hazards associated with liquid stream treatment processes. This chapter shall not apply to treatment systems serving individual structures or treatment systems principally that treat industrial wastes. Table 3-2 summarizes the various components associated with liquid stream treatment processes.

3-2* Design and Construction. The design and construction of liquid stream treatment processes shall conform to Table 3-2.

Table 3-2 Liquid Stream Treatment Processes

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
1	a	COARSE AND FINE SCREEN FACILITIES Removal of screenings from raw wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed — entire space	Division 1	NC	FE, H, and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[2,3]			
2		PUMPING STATIONS *(See Collection Systems, Table 2-2.)*						
3	a	FLOW EQUALIZATION TANKS Storage of raw or partially treated wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed — entire space	Division 1	NC	FE, H, and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[2,3]			

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]Open channels and open structures upstream from the unit processes are to be classified the same as the downstream processes they supply.

[2]The area beyond the envelope is unclassified.

[3]Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 in. (0.46 m) above the top of the tank and extending 18 in. (0.46 m) beyond the exterior wall; and envelope 18 in. (0.46 m) above grade extending 10 ft (3 m) horizontally from the exterior tank walls.

A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
4	a	GRIT REMOVAL TANKS Separation of grit from raw wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed — entire space	Division 1	NC	FE, H, and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[2,3]			
5	a	PRE-AERATION TANKS Conditioning of wastewater prior to further treatment	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed — entire space	Division 1	NC	H and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[2,3]			

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]Open channels and open structures upstream from the unit processes are to be classified the same as the downstream processes they supply.

[2]The area beyond the envelope is unclassified.

[3]Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 in. (0.46 m) above the top of the tank and extending 18 in. (0.46 m) beyond the exterior wall; and envelope 18 in. (0.46 m) above grade extending 10 ft (3 m) horizontally from the exterior tank walls.

A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FDS — Fire detection system
FE — Portable fire extinguisher
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
6	a	PRIMARY SEDIMENTATION TANKS Separation of floating or settleable solids from raw wastewater	Possible ignition of flammable gases and floating flammable liquids	A	Enclosed — entire space	Division 1	NC	H and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 in. (0.46 m) above the top of the tank and extending 18 in. (0.46 m) beyond the exterior wall; envelope 18 in. (0.46 m) above grade extending 10 ft (3 m) horizontally from the exterior tank walls			

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.
[1]Open channels and open structures upstream from the unit processes are to be classified the same as the downstream processes they supply.
[2]The area beyond the envelope is unclassified.
[3]Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 in. (0.46 m) above the top of the tank and extending 18 in. (0.46 m) beyond the exterior wall; and envelope 18 in. (0.46 m) above grade extending 10 ft (3 m) horizontally from the exterior tank walls.
A — No ventilation or ventilated at less than 12 air changes per hour
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LC — Limited-combustible material
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NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NNV — Not normally ventilated
NR — No requirement

Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
7		AERATION BASIN, POND, LAGOON, OXIDATION DITCH, AEROBIC SUSPENDED GROWTH SYSTEMS, SEQUENCING BATCH REACTORS Aerobic treatment of wastewater open to the atmosphere		NA		Unclassified (If process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	NR	H
8	a	ENCLOSED AERATION BASIN OR AEROBIC SUSPENDED GROWTH SYSTEMS Aerobic treatment of wastewater not preceded by primary treatment	Possible ignition of flammable gases or floating flammable liquids	A	Entire enclosed space not routinely entered by personnel	Division 1	NC	NR
	b			B		Division 2	NC, LC, or LFS	
9		ENCLOSED AERATION BASIN OR AEROBIC SUSPENDED GROWTH SYSTEMS Aerobic treatment of wastewater preceded by primary treatment	NA	NR	Entire enclosed space	Unclassified	NC, LC, or LFS	NR

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]Open channels and open structures upstream from the unit processes are to be classified the same as the downstream processes they supply.

[2]The area beyond the envelope is unclassified.

[3]Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 in. (0.46 m) above the top of the tank and extending 18 in. (0.46 m) beyond the exterior wall; and envelope 18 in. (0.46 m) above grade extending 10 ft (3 m) horizontally from the exterior tank walls.

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FDS — Fire detection system
FE — Portable fire extinguisher
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
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Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
10		TRICKLING FILTER, BIOTOWER, AEROBIC FIXED-FILM SYSTEMS Aerobic biological treatment of wastewater	Not normally a significant hazard; however, these processes might contain materials that are combustible under certain conditions	NA		Unclassified (If unit process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	NR	H
11	a	ANAEROBIC TOWERS, ANAEROBIC FIXED-FILM SYSTEM Anaerobic biological treatment if sealed from atmosphere	Normally produces combustible gas as treatment process by-product	NA	Tank interior	Division 1	NC	FE and H
	b			NA	10-ft (3-m) envelope around tank	Division 2	NC, LC, or LFS	
12	a	GAS-HANDLING SYSTEMS FOR LIQUID TREATMENT PROCESSES	Combustible gas, often under pressure	A	Enclosed — entire space	Division 1	NC	FE and H
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment[2]			
13		OXYGEN AERATION TANKS Tanks for aerobic treatment of wastewater using high-purity oxygen rather than air	Ignition of flammable gases and floating flammable liquids in an oxygen-enriched environment	NA	Enclosed space	Division 2 (If unit process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	Any equipment or material within the reactor space shall be safe for exposure to volatile hydrocarbons in an oxygen-enriched atmosphere	Special provision for LEL monitoring and automatic isolation of equipment and oxygen supply

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Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
14		INTERMEDIATE, SECONDARY, OR TERTIARY SEDIMENTATION TANKS Separate floating and settleable solids from wastewater at various treatment stages		NA	NA	Unclassified (If unit process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	NR	H
15		FLASH MIXER OR FLOCCULATION TANKS Tanks for mixing various treatment chemicals with wastewater		NA	NA	Unclassified (If unit process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	NR	H
16		NITRIFICATION AND DENITRIFICATION TANKS Tertiary treatment of wastewater to reduce or remove nitrogen		NA	NA	Unclassified (If unit process is not preceded by primary sedimentation, see Primary Sedimentation Tanks in Table 3-2 for classification.)	NR	H

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Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

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		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
17		BREAKPOINT CHLORINATION TANKS AND CHLORINE CONTACT TANKS Application of chlorine in aqueous solution to wastewater		NA	NA	Unclassified	NR (These unit processes use corrosive chemicals that require the use of specific materials of construction. Special consideration shall be given to these materials of construction.)	H
18		AMMONIA STRIPPING TOWERS	*(See Trickling Filter in Table 3-2.)*	NA	NA	Unclassified	NR (These unit processes use corrosive chemicals. Special consideration shall be given to these materials of construction.)	H
19		INTERMEDIATE OR FINAL PUMPING STATIONS Pump(s) at intermediate stage or end of the treatment process		NA	NA	Unclassified	NR	H
20		GRAVITY AND PRESSURE FILTERS Filtering of treated wastewater through sand or other media		NA	NA	Unclassified	NR	H

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Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
21		CARBON COLUMN OR TANKS Vessels containing carbon for tertiary treatment of wastewater	Significant hazard from combustible carbon material	NA	NA	Unclassified	NR	H
22		ON-SITE OZONE GENERATION SYSTEM AND OZONE CONTACT TANKS Ozone generation and purification for disinfection of wastewater	Similar to oxygen generation with addition of being highly corrosive *(see Table D-1.1)*	NA	NA	Not covered in this standard	NR	NR
23		BACKWASH WATER AND WASTE BACKWASH WATER HOLDING TANKS Tanks for temporary storage of backwash water	NA	NA	NA	Unclassified	NR	H
24		ULTRAVIOLET DISINFECTION UNIT Disinfection of wastewater by ultraviolet radiation		NA	NA	Unclassified	NR	H
25		EFFLUENT STRUCTURES Various structures conveying treated wastewater away from treatment processes		NA	NA	Unclassified	NR	H

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Table 3-2 Liquid Stream Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area[1]**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
26	a	ODOR-CONTROL SYSTEM AREAS Areas physically separated from processes that house systems handling flammable gases	Leakage and ignition of flammable gases	D	Entire area if enclosed	Division 2	NC, LC, or LFS	CGD, FDS, and FE
	b			C	Areas within 3 ft (0.9 m) of leakage sources such as fans, dampers, flexible connections, flanges, pressurized unwelded ductwork, and odor-control vessels	Division 2		
	c				Areas beyond 3 ft (0.9 m)	Unclassified		

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Chapter 4 Solids Treatment Processes

4-1* General. This chapter provides minimum criteria for protection against fire and explosion hazards associated with solids treatment processes. This chapter shall not apply to the treatment of solids from industrial waste treatment processes.

Tables 4-2(a) and 4-2(b) summarize the various components associated with solids treatment processes.

4-2* Design and Construction. The design and construction of solids treatment processes shall conform to Tables 4-2(a) and 4-2(b).

Table 4-2(a) Solids Treatment Processes

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
1		COARSE AND FINE SCREENINGS–HANDLING BUILDINGS Storage, conveying, or dewatering of screenings (no exposed flow of wastewater through building or area)	NA	NR	NA	Unclassified	NC, LC, or LFS	H, FE, and FAS
2		GRIT-HANDLING BUILDING Storage, conveying, and dewatering of heavy small screenings and grit (no exposed flow of wastewater through building or area)	NA	NR	NA	Unclassified	NC, LC, or LFS	H, FE, and FAS

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[1]The area beyond the envelope is unclassified.
[2]See NFPA 54, *National Fuel Gas Code;* NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment;* NFPA 8501, *Standard for Single Burner Boiler Operation;* and NFPA 8502, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers.*
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Table 4-2(a) Solids Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
3	a	SCUM-HANDLING BUILDING OR AREA Holding, dewatering, or storage	Possible grease or flammable liquids carryover	A	Enclosed space	Division 2	NC, LC, or LFS	H, FE, and CGD if enclosed
	b			B		Unclassified		
	c			Not enclosed, open to atmosphere	NA			
4	a	SCUM PITS	Buildup of vapors from flammable or combustible liquids	A	Enclosed — entire space	Division 1	NC	H, FE, and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[1]			
5	a	SCUM-PUMPING AREAS Pumping of scum, wet side of pumping station	Carryover of floating flammable liquids	A	Enclosed — entire space	Division 1	NC	H, FE, and CGD if enclosed
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Within a 10-ft (3-m) envelope around equipment and open channel[1]			
6	a	SCUM-PUMPING AREAS Pumping of scum, dry side of pumping station	Not significant	D	Enclosed space	Division 2	NC, LC, or LFS	FE
	b			C		Unclassified		
	c			Not enclosed, open to atmosphere	NA			

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Table 4-2(a) Solids Treatment Processes *(Continued)*

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
7		SCUM INCINERATORS[2] Elimination of scum through burning	Firebox explosion from possible carryover of flammable scum	NR	Incinerator area if separated from scum storage	Unclassified	NC, LC, or LFS	FSS (if indoors), H, and FE
8	a	SLUDGE THICKENER (CLARIFIER) Sludge concentration and removal, gravity, or dissolved air flotation	Possible generation of methane from sludge; carryover of floating flammable liquids	A	Enclosed — entire space	Division 1	NC	
	b			B		Division 2	NC, LC, or LFS	H, FE, and CGD if enclosed
	c			Not enclosed, open to atmosphere	Envelope 18 in. (0.46 m) above water surface and 10 ft (3 m) horizontally from wetted walls[1]			
9	a	SLUDGE PUMPING STATION DRY WELLS Dry side of a sludge pumping station	Buildup of methane gas or flammable vapors	D	Entire dry well when physically separated from a wet well or separate structures	Division 2	NC, LC, or LFS	H and FE
	b			C	Entire dry well when physically separated from a wet well or separate structures	Unclassified		
10	a	SLUDGE STORAGE WET WELLS, PITS, AND HOLDING TANKS Retaining of sludge	Possible generation of methane gas in explosive concentrations; carryover of floating flammable liquids	A	Enclosed — entire space	Division 1	NC	CGD, H, and FE if tank enclosed in structure
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Envelope 18 in. (0.46 m) above water surface and 10 ft (3 m) horizontally from wetted walls[1]			NR

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Table 4-2(a) Solids Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
11	a	SLUDGE-BLENDING TANKS AND HOLDING WELLS Retaining of sludge with some agitation	Possible generation of methane gas in explosive concentrations; carryover of floating flammable liquids	A	Enclosed — entire space	Division 1	NC	H, FE, and CGD if tank enclosed in structure
	b			B		Division 2	NC, LC, or LFS	
	c			Not enclosed, open to atmosphere	Envelope 18 in. (0.46 m) above water surface and 10 ft (3 m) horizontally from wetted walls[1]			NR
12		DEWATERING BUILDINGS CONTAINING CENTRIFUGES, GRAVITY BELT THICKENERS, BELT AND VACUUM FILTERS, AND FILTER PRESSES Removal of water from sludge and the conveyance of sludge or sludge cake	NA	NR	NA	Unclassified	NC, LC, or LFS	FE, FDS, and FAS
13		INCINERATORS[2] AND INCINERATOR BUILDINGS Conveying and burning of sludge cake	Firebox explosion	NR	NA	Unclassified	NC, LC, or LFS	FSS (if indoors), H, and FE
14		HEAT TREATMENT UNITS, LOW- OR HIGH-PRESSURE OXIDATION UNITS Closed oxidation of sludge	None, other than in high-pressure systems	NR	NA	Unclassified	NC, LC, or LFS	H and FE

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		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
15	a	ANAEROBIC DIGESTERS, BOTH FIXED ROOF AND FLOATING COVER Generation of sludge gas from digesting sludge	Leakage of gas from cover, piping, emergency relief valves, and appurtenances	Not enclosed, open to atmosphere	Tank interior; areas above and around digester cover; envelope 10 ft (3 m) above the highest point of cover, when cover is at its maximum elevation, and 5 ft (1.5 m) from any wall	Division 1	NC	H and FE
	b				Envelope 15 ft (4.6 m) above Division 1 area over cover and 5 ft (1.5 m) beyond Division 1 area around tank walls	Division 2		
	c			A	For digester tanks enclosed in a building: tank interior; entire area inside building	Division 1	NC	CGD if enclosed
	d			B	For digester tanks enclosed in a building: tank interior; areas above and around digester cover; envelope 10 ft (3 m) above highest point of cover, when cover is at its maximum elevation, and 5 ft (1.5 m) from any wall of digester tank	Division 1	NC	CGD if enclosed
	e				Remaining space in enclosed area	Division 2	NC, LC, or LFS	

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Table 4-2(a) Solids Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
16	a	ANAEROBIC DIGESTER CONTROL BUILDING Storage, handling, or burning of sludge gas	Leaking and ignition of sludge gas	A	Entire building	Division 1	NC	CGD, H, and FE
	b			B	Enclosed areas that contain gas-handling equipment	Division 2	NC, LC, or LFS	
	c			C	Physically separated from gas-handling equipment	Unclassified		
17	a	DIGESTER GAS–PROCESSING ROOMS Gas compression, handling, and processing	Sludge gas ignition	A	Entire room	Division 1	NC	CGD, H, and FE
	b			B		Division 2	NC, LC, or LFS	
	c			B	Within 5 ft (1.5 m) of equipment	Division 1	NC, LC, or LFS	
18		ANAEROBIC DIGESTER GAS STORAGE Storage of sludge gas	Gas storage piping and handling	NNV	Within a 10-ft (3-m) envelope of tanks, valves, and appurtenances	Division 1	NC, LC, or LFS	H, FE, and CGD
19		CHLORINE OXIDATION UNITS Chlorine reaction with sludge	Chlorine is a very strong oxidizing agent	NR	NA	Unclassified	NR (These unit processes use corrosive chemicals that require the use of specific materials of construction. Special consideration shall be given to such materials of construction.)	H and FE

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]The area beyond the envelope is unclassified.

[2]See NFPA 54, *National Fuel Gas Code;* NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment;* NFPA 8501, *Standard for Single Burner Boiler Operation;* and NFPA 8502, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers.*

A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 air changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FAS — Fire alarm system
FDS — Fire detection system
FE — Portable fire extinguisher
FSS — Fire suppression system (e.g., automatic sprinkler, water spray, foam, gaseous, or dry chemical)
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NR — No requirement

Table 4-2(a) Solids Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
20	a	UNDERGROUND (PIPING) TUNNELS CONTAINING NATURAL GAS PIPING OR SLUDGE GAS PIPING Transmission of gas, sludge, water, air, and steam via piping; also might contain power cable and conduit	Ignition of natural gas or sludge gases	D	Within 10 ft (3 m) of valves and appurtenances	Division 1		
	b			D	Entire tunnel	Division 2	NC, LC, or LFS	CGD, FDS, and FE
	c			C	Areas within 10 ft (3 m) of valves, meters, gas check valves, condensate traps, and other piping appurtenances	Division 2		
	d			C	Areas beyond 10 ft (3 m)	Unclassified		
21		UNDERGROUND (PIPING) TUNNELS NOT CONTAINING NATURAL GAS PIPING OR SLUDGE GAS PIPING Transmission of sludge, water, air, and steam piping; also might contain power cable and conduit	NA	NR	NA	Unclassified	NC, LC, or LFS	FDS and FE
22	a	COMPOSTING PILES Aerobic sludge reduction	Liberation of ammonia and toxic gas (composting materials can self-ignite)	D	Enclosed area	Division 2	NC, LC, or LFS	H and FDS
	b			C		Unclassified		

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]The area beyond the envelope is unclassified.

[2]See NFPA 54, *National Fuel Gas Code;* NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment;* NFPA 8501, *Standard for Single Burner Boiler Operation;* and NFPA 8502, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers.*

A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 air changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FAS — Fire alarm system
FDS — Fire detection system
FE — Portable fire extinguisher
FSS — Fire suppression system (e.g., automatic sprinkler, water spray, foam, gaseous, or dry chemical)
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NR — No requirement

Table 4-2(a) Solids Treatment Processes ***(Continued)***

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class I, Group D)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
23	a	IN-VESSEL COMPOSTING Aerobic sludge reduction	Liberation of ammonia and toxic gas (composting materials can self-ignite)	As required by process	If enclosed, interior of reactor vessel plus a 10-ft (3-m) envelope around reactor vessel	Division 2	NC	H and FDS
	b				Areas beyond 10 ft (3 m)	Unclassified		
24	a	ODOR-CONTROL SYSTEM AREAS Areas physically separated from processes that house systems handling flammable gases	Leakage and ignition of flammable gases	D	Entire area if enclosed	Division 2	NC, LC, or LFS	CGD, FDS, and FE
	b			C	Areas within 3 ft (1.5 m) of leakage sources such as fans, dampers, flexible connections, flanges, pressurized unwelded ductwork, and odor-control vessels	Division 2		
	c				Areas beyond 3 ft (1.5 m)	Unclassified		
25		PUMPING OF DRAINAGE FROM DIGESTED SLUDGE-DEWATERING PROCESSES Pumping of centrate, filtrate, leachate, drying beds, and so forth	NA	NR	NA	Unclassified	NC, LC, or LFS	H

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and, therefore, Table 7-3.1 also has no requirements.

[1]The area beyond the envelope is unclassified.

[2]See NFPA 54, *National Fuel Gas Code;* NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment;* NFPA 8501, *Standard for Single Burner Boiler Operation;* and NFPA 8502, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers.*

A — No ventilation or ventilated at less than 12 air changes per hour
B — Continuously ventilated at 12 air changes per hour or in accordance with Chapter 7
C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 7
CGD — Combustible gas detection system
D — No ventilation or ventilated at less than 6 air changes per hour
FAS — Fire alarm system
FDS — Fire detection system
FE — Portable fire extinguisher
FSS — Fire suppression system (e.g., automatic sprinkler, water spray, foam, gaseous, or dry chemical)
H — Hydrant protection in accordance with 5-2.4
LC — Limited-combustible material
LFS — Low flame spread material
NA — Not applicable
NC — Noncombustible material
NEC — In accordance with NFPA 70, *National Electrical Code*
NR — No requirement

Table 4-2(b) Solids Treatment Processes — Sludge Drying

		A	B	C	D	E	F	G
		Location and Function	**Fire and Explosion Hazard**	**Ventilation**	**Extent of Classified Area**	***NEC*-Area Electrical Classification (All Class II, Group G)**	**Material of Construction for Buildings or Structures**	**Fire Protection Measures**
1		SLUDGE-DRYING PROCESSES[1]	Potential for ignition of dust	NR	Entire room[2]	Division 1[3]	NC (Construction in accordance with NFPA 68 and NFPA 69)	H, FAS, and FSS *(See NFPA 61 and NFPA 69.)*

Note: The NR designation in column C indicates that no ventilation requirements are established for the space and,therefore, Table 7-3.1 also has no requirements.
[1]See NFPA 54, *National Fuel Gas Code;* NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment;* NFPA 8501, *Standard for Single Burner Boiler Operation;* and NFPA 8502, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers.*
[2]The area beyond the envelope is unclassified.
[3]If acceptable to the authority having jurisdiction, it shall be permitted to be determined in accordance with classifications in NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.*
FAS — Fire alarm system
FSS — Fire suppression system (e.g., automatic sprinkler, water spray, foam, gaseous, or dry chemical)
H — Hydrant protection in accordance with 5-2.4
NEC — In accordance with NFPA 70, *National Electrical Code*
NC — Noncombustible material
NR — No requirement

Chapter 5 Fire and Explosion Prevention and Protection

5-1* Scope. This chapter establishes minimum requirements for overall protection against fire and explosion hazards in wastewater facilities and associated collection systems. The conditions created by the existence of gases, liquids, and solids are grouped into the following two categories:

(1) Flammable/combustible hazards

(2) Safety and health hazards

This standard deals with the flammability aspects of a particular substance, process, or area within wastewater and collection facilities. Additional requirements to protect against safety and health hazards are contained in NFPA 70E, *Standard for Electrical Safety Requirements for Employee Workplaces*, and NFPA *101®*, *Life Safety Code®*.

5-2 Fire Protection Measures.

5-2.1 General.

5-2.1.1 Collection systems, liquid stream treatment processes, and solids-handling processes shall be provided with fire protection for the fire hazards, as described in Tables 2-2, 3-2, 4-2(a), and 4-2(b).

5-2.1.2 Enclosed spaces classified as an explosion hazard area under this document shall be physically separated from all unclassified enclosures.

5-2.1.3 In addition to the fire protection specified in Chapter 6, buildings, structures, and process elements, under some conditions, shall be provided with automatic-extinguishing systems in accordance with this chapter.

5-2.2 Automatic Sprinkler Systems. An automatic sprinkler system where required by this standard or by referenced publications shall conform to NFPA 13, *Standard for the Installation of Sprinkler Systems,* and shall be approved by the authority having jurisdiction.

Exception: In certain areas of the wastewater treatment plant, such as chemical storage, underground tunnels or structures, areas where electrical hazard is a principal concern, or where water damage would seriously impair the integrity of the treatment plant, other automatic-extinguishing systems shall be permitted.

5-2.3 Other Automatic-Extinguishing Systems. Where required or used in place of automatic sprinkler systems, special hazard–extinguishing systems and nonwater automatic-extinguishing systems shall be designed, installed, and maintained in accordance with the following standards, as applicable:

(1) NFPA 11, *Standard for Low-Expansion Foam*

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

(3) NFPA 11C, *Standard for Mobile Foam Apparatus*

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

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

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

(7) NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*

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

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

5-2.4 Water Supplies, Standpipes, Hose Systems, and Hydrants.

5-2.4.1 Water supplies shall be capable of delivering the total demand of sprinklers, hose streams, and foam systems. In areas where there is no public water supply or where the supply is inadequate, treatment plant effluent shall be permitted for fire protection use. Where connections are made from public water supplies, it might be necessary to guard against possible contamination of the public supply. The requirements of the public health authority having jurisdiction shall be determined and followed.

5-2.4.2 Water supplies and hydrants shall be installed in accordance with the following standards, as applicable:

(1) NFPA 22, *Standard for Water Tanks for Private Fire Protection*
(2) NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*
(3) NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*

5-2.4.3 Standpipes and hose systems shall be installed and inspected in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

5-2.4.4 Where fire pumps are used as a separate and sole source of supply, the system shall provide capacity to meet simultaneous fire water flow requirements for both manual and automatic fire suppression systems. A standby power supply shall be provided. Pumps shall be automatic starting and manual shutdown. Pumps shall be installed in accordance with NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps.*

5-2.5 Portable Fire Extinguishers. Portable fire extinguishers shall be installed, located, and maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

Exception: With the concurrence of the authority having jurisdiction, the requirement for portable fire extinguishers shall be permitted to be waived where areas are not commonly occupied.

5-3 Fire Detection and Alarm Systems.

5-3.1 Fire detection and alarm systems for each treatment and collection facility area shall be provided as identified in Tables 2-2, 3-2, 4-2(a), and 4-2(b) or by referenced publications.

5-3.2 Fire detection and alarm systems shall be installed and maintained in accordance with NFPA 72, *National Fire Alarm Code®.*

5-4 Combustible Gas Detection.

5-4.1* Combustible gas detectors shall be located in accordance with Tables 2-2, 3-2, and 4-2(a).

5-4.2* The selection of combustible gas detector types and their placement shall be determined by a qualified person.

5-4.3 Combustible gas detectors shall be listed. The installation of combustible gas detectors shall be in accordance with their listing requirements and the manufacturers' instructions.

5-4.4 Combustible gas detection equipment located in hazardous (classified) locations, as defined in accordance with NFPA 70, *National Electrical Code,* shall be listed for use in such atmospheres. The detectors shall be set to alarm at 10 percent of the lower explosive limit (LEL) in accordance with the manufacturers' calibration instructions and shall be connected to alarm signaling systems.

Exception: Alarm limits shall be permitted to be set at a higher percentage of the explosive limit where experience indicates ambient levels are too high and spurious alarms are probable.

5-5 Ventilation Monitoring and Signaling Systems.

5-5.1 All continuous ventilation systems shall be fitted with flow detection devices connected to alarm signaling systems to indicate ventilation system failure.

5-5.2 Local and remote alarms for both ventilation system failure and combustible gas detection shall be provided for all hazardous areas classified in accordance with the following:

(1) Article 500 of NFPA 70, *National Electrical Code*
(2) Any space pressurized in accordance with Chapters 2, 3, and 4
(3) Chapter 7 and NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*

5-5.3* The alarms required in 5-5.2 shall be displayed in accordance with Table 5-5.3.

Table 5-5.3 Ventilation System Alarm Devices for Areas Indicated in 5-5.2

Location/Supervision	Alarm Devices and Supervision
Entrance(s) to such spaces[1]	Visual and audible alarms
Within such spaces	Visual and audible alarms
Local (within treatment plant or building)	Visual and audible alarms
Remote (for distant super-vision)[2]	Visual and audible alarms

[1]Where locations are not constantly attended, the use of a nonaudible signal is permissible if a dual light system is used. A dual light system shall include a "go"/"no go" or green light/red light type of warning system instead of the audible alarm.
[2]In situations where this is impractical, a telephone dialer shall be allowed to meet the intent of this portion of the table.

5-5.4 Signaling systems shall be in accordance with the requirements for supervised signaling systems as set forth in NFPA 72, *National Fire Alarm Code.*

5-6 Laboratories. Fire protection for laboratories shall be in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals.*

5-7 Special Fire Protection Measures.

5-7.1 Fire Protection During Construction. Fire protection measures during construction at both new and existing wastewater facilities shall be provided in accordance with NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* and NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites.*

5-7.2 Lightning Protection. Lightning protection shall be provided in accordance with NFPA 780, *Standard for the Installation of Lightning Protection Systems.*

5-7.3 Drainage.

5-7.3.1 Provisions shall be made in all fire areas of the plant for removal of all liquids for containment in the fire area without flooding of equipment and without endangering other areas.

5-7.3.2 The provisions for drainage and any associated drainage facilities shall be sized to simultaneously accommodate all of the following:

(1) The spill of the largest single container of any flammable or combustible liquids in the area
(2) The maximum expected number of fire hose lines [500 gal/min (31.5 L/sec) minimum] operating for a minimum of 10 minutes
(3) The maximum design discharge of fixed fire suppression systems operating for a minimum of 10 minutes

Chapter 6 Materials of Construction

6-1 General.

6-1.1 This chapter provides minimum criteria for selecting materials of construction for buildings, structures, and process elements for protection against fire and explosion in wastewater treatment plants and associated collection systems. In general, materials of construction and interior coatings and finishes shall provide a maximum degree of fire resistance with the minimum amount of flame spread and smoke generation associated with a particular application.

6-1.2 Materials shall be selected that reduce or eliminate the effects of fire and explosion by maintaining structural integrity, controlling flame spread and smoke generation, minimizing the release of toxic products of combustion, and maintaining the serviceability and operation of critical processes. The criteria for selecting materials of construction is not intended to provide protection of personnel from the risk of exposure to an asphyxiating or toxic atmosphere generated during a fire.

Exception: In general, criteria for selecting materials of construction do not apply to nonprocess contents of the building, structure, or assembly where such contents are not a part of the building, structure, or assembly, including, but not limited to, equipment or equipment enclosures, grating, walkways, ladders, railings, weirs, process piping and appurtenances, process media, aeration devices, slide and sluice gates, pump packing and seal material, electrical conduit, hardware, liners for basins that are open to the atmosphere, or materials used in rehabilitation or for lining existing sewer pipes.

6-1.3 In areas where corrosive environments are present, including classified areas, special attention shall be given to the mitigation of corrosion problems in the selection and use of materials for nonstructural assemblies, including the use of corrosion-resistant metallic or nonmetallic grating, railings, steps and stairs, conduit, and electric equipment enclosures.

6-2 Materials Selection.

6-2.1 Materials shall be selected based on the criteria for a particular application. Selection criteria shall include the following:

(1) Structural requirements
(2) Location and operating environment
(3) Fire rating
(4) Flame spread value
(5) Smoke density generation factors
(6) Products of combustion
(7) Corrosion resistance

6-2.2 For the purpose of this document, materials of construction are divided into the following four basic categories:

(1) Combustible
(2) Noncombustible
(3) Limited-combustible
(4) Low flame spread

6-2.3 Materials of construction used for unit processes located in areas with an NFPA 70, *National Electrical Code,* classification of Class I, Division 1 or Division 2, and Class II shall be selected based on an overall evaluation, including the fire risk of the material attributes, the economic impact of replacing the unit process, and the potential environmental dangers caused by having the unit process out of service for an extended period of time due to fire or explosion.

6-3 Applications.

6-3.1* Sewers and Appurtenances. Materials of construction for sewers and appurtenances such as maintenance holes, junction chambers, and catch basins shall be based on the results of a written materials risk assessment.

6-3.2 Pumping Facilities. Materials selected for wastewater pumping facilities shall be in accordance with Table 2-2.

Exception No. 1: When conditions or applications warrant the selection of combustible materials for pumping facilities, consideration to flame spread, smoke generation, corrosion resistance, products of combustion, and the impact that a fire or explosion will have on the structural integrity, operability of the pumping facility, and the economic and environmental consequences of having the pumping facility out of service shall be included in the fire risk evaluation.

Exception No. 2: Small aboveground pumping facilities with a floor area of 100 ft^2 (9.3 m^2) or less and physically separated from the wet well and that do not present a fire hazard to other buildings or structures shall be permitted to be constructed of any appropriate materials.

6-3.3 Buildings and Structures.

6-3.3.1 General. Buildings and structures, including domes and covers, shall be constructed of materials in accordance with Tables 2-2, 3-2, 4-2(a), and 4-2(b).

Exception No. 1: When conditions or applications warrant the selection of combustible materials for buildings and structures, consideration to flame spread, smoke generation, corrosion resistance, products of combustion, and the impact that a fire or explosion will have on the structural integrity, operability of the facility, and the economic and environmental consequences of having the facility out of service shall be included in the fire risk evaluation.

Exception No. 2: Small aboveground buildings and structures, including domes and covers, with a floor or surface area of 100 ft^2 (9.3 m^2) or less and physically separated from other buildings or structures and that do not present a fire hazard to other buildings or structures shall be permitted to be constructed of any appropriate materials.

Exception No. 3: Materials other than those required by Tables 2-2, 3-2, 4-2(a), and 4-2(b) shall be permitted in buildings or structures that are fully sprinklered in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

6-3.3.2 Critical Unit Processes.

6-3.3.2.1 Buildings and structures, including domes and covers, containing unit processes that are critical to maintaining

the integrity of the treatment plant (e.g., headworks, main pumping facility, primary clarifiers, etc.), and that if out of service for even a few hours could permanently or unacceptably damage the environment or endanger public health by allowing the release of raw wastewater or sludge, shall be constructed of materials meeting the definition of noncombustible.

Exception: Except as indicated by the Exceptions to 6-3.3.1.

6-3.3.2.2 Where structural assemblies and partitions are required in these areas for fire separation in accordance with the fire risk evaluation, they shall have a minimum 3-hour fire rating.

6-3.3.2.3 Nonstructural assemblies such as ventilation ducts and piping shall be constructed of noncombustible, limited-combustible, or low flame spread materials.

6-3.3.3 Essential Unit Processes.

6-3.3.3.1 Buildings or structures, including domes and covers, containing unit processes that are essential to maintaining the integrity of the treatment plant (e.g., secondary biological treatment, secondary clarifiers, disinfection facilities, etc.), and that if out of service for short periods of time would not permanently or unacceptably damage the environment or endanger public health but would become critical if continued for several days, shall be constructed of materials meeting the definitions of noncombustible, limited-combustible, or low flame spread.

Exception: Except as indicated by the Exceptions to 6-3.3.1.

6-3.3.3.2 Where structural assemblies and partitions are used in these areas for fire separation, they shall have a minimum 2-hour fire rating.

6-3.3.3.3* Nonstructural assemblies such as ventilation ducts and piping shall be constructed of noncombustible, limited-combustible, or low flame spread materials.

6-3.3.4 Other Unit Processes.

6-3.3.4.1 Buildings and structures containing unit processes, including sludge-processing operations, that are not critical or essential to maintaining the integrity of the treatment plant, and where being out of service for long periods of time (i.e., a week or more) would not permanently or unacceptably damage the environment or endanger public health, shall be constructed of materials considered applicable by the authority having jurisdiction.

Exception: Except as indicated by the Exceptions to 6-3.3.1.

6-3.3.4.2 Where structural assemblies and partitions are used in these areas for fire separation, they shall have a minimum 1-hour fire rating.

6-3.3.4.3 Nonstructural assemblies such as ventilation ducts and piping shall be constructed of materials meeting the definitions of noncombustible, limited-combustible, or low flame spread.

6-3.3.5 Combustible Gas Generation and Combustion Processes. Buildings and structures containing unit processes that generate, process, or utilize combustible gases (e.g., anaerobic wastewater treatment processes, anaerobic digesters, compressors, storage spheres, piping, waste gas burners, gas-fired equipment including sludge incinerators, etc.) shall be constructed of materials meeting the definition of noncombustible.

Exception: Except as indicated by the Exceptions to 6-3.3.1.

6-3.3.6 Air Supply and Exhaust. Noncombustible, limited-combustible, or low flame spread materials shall be used for air supply and exhaust systems. Systems supplying or exhausting air at a rate greater than 2000 ft^3/min (56.6 m^3/min) shall include listed smoke dampers, listed fire dampers, and smoke detection and shall cause the ventilation system to shut down upon detection of smoke. Separate smoke ventilation systems shall be used where applicable.

Exception: Smoke venting shall be permitted to be integrated into installed ventilation systems using automatic or manually positioned dampers and motor speed control in accordance with NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems. Also NFPA 204, Guide for Smoke and Heat Venting, shall be reviewed for further information. Smoke venting also shall be permitted to be accomplished through the use of portable smoke ejectors.

6-3.3.7 Miscellaneous Materials. Cellular or foamed plastic materials shall only be used in accordance with NFPA *101*, *Life Safety Code*. Roof coverings shall be Class A in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*. Metal roof deck construction shall be Class I or shall be fire classified.

Exception: Class II metal roof deck construction shall be permitted in buildings or structures that are fully sprinklered in accordance with Chapter 5.

Chapter 7 Ventilation

7-1 General.

7-1.1 Scope.

7-1.1.1 The minimum criteria for ventilation for protection against fire and explosion of wastewater treatment and pumping facilities shall be in accordance with Chapters 2, 3, and 4 for the designated electrical classifications. Where this standard requires certain ventilation practices, they are intended to minimize fire and explosion hazards; these ventilation standards are not intended to protect personnel from the toxic effects of exposure to gases present. This chapter is limited to the ventilation of enclosed wastewater pumping and process-related areas. It does not establish criteria applicable to spaces devoted to administrative areas, laboratories, or other ancillary spaces. Because of the unpredictable nature of materials and events encountered in the operation of wastewater systems, the ventilation criteria established in this standard might not be adequate for protection against all hazards that might be encountered.

7-1.1.2 Ventilation criteria not addressed by Chapters 2, 3, and 4 shall meet the requirements of Table 7-3.1.

7-1.1.3 This chapter does not apply to at-grade or abovegrade unroofed structures less than 2 ft (0.6 m) deep or 2 ft (0.6 m) to the in-service waterline or to at-grade or abovegrade roofed structures where the following applies:

(1) The roof is at least 10 ft (3 m) above surrounding finished grade
(2) The structure is open on at least three sides

7-1.2 Hazardous classifications as established in Tables 2-2, 3-2, 4-2(a), and 4-2(b) shall be permitted to be reduced to a lower classification, including unclassified, with positive pressurization as provided under Article 500 of NFPA 70, *National Electrical Code*. Positive pressurization shall be as specified in NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment.*

7-2 Installation.

7-2.1 Ventilation systems serving spaces governed by this standard shall be designed in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems.*

Exception: NFPA 90A shall not apply where superseded by a more restrictive provision of this standard.

7-2.2 Ventilation systems serving hazardous areas classified under the provisions of Article 500 of NFPA 70, *National Electrical Code,* shall incorporate fans fabricated in accordance with Air Moving and Control Association (AMCA) Type A or Type B spark-resistant construction.

7-2.3 All mechanically ventilated spaces shall be served by both supply and exhaust fans.

Exception No. 1: For covered process facilities that are not routinely entered by personnel and where mechanically ventilated, the space is permitted to be ventilated by exhaust fans only. In determining the area classification, the induced supply (outside) air shall meet the ventilation rate specified in the applicable chapter.

Exception No. 2: Abovegrade spaces with floor areas of 100 ft^2 (9.3 m^2) or less meeting the requirements of Exception No. 2 to 6-3.3.1 shall be permitted to be ventilated by a supply fan only.

7-2.4 Ventilation systems serving unclassified areas adjacent to classified areas shall maintain a differential pressure relative to ambient air pressure of 0.1 in. water column (25 Pa) under all operating conditions.

7-2.5 Ventilation systems serving classified areas shall maintain a differential pressure relative to ambient air pressure of –0.1 in. water column (–25 Pa) under all operating conditions.

7-2.6 Ventilation systems for hazardous areas that are designed to operate intermittently or only when the space is occupied shall not be permitted for the purpose of downgrading the electrical classification of areas. *(See Chapters 2, 3, and 4 for further information.)*

7-2.7 Air shall be introduced into and exhausted from such spaces in a manner that will encourage scavenging of all portions of the spaces to prevent short-circuiting and to promote the effective removal of both heavier- and lighter-than-air gases and vapors.

7-2.8 Ventilation systems shall not transfer air between unclassified interior spaces and classified interior spaces.

7-2.9 Ventilation systems serving areas governed by this standard shall receive power from electrical equipment that receives power from a primary power source and that also has the means to accept power from alternate power sources. Minimum requirements for the means to accept the alternate source of power include connectors that are designed to connect to devices such as standby generators, portable generators, uninterruptible power supplies, and so forth. Automatic or manual switching to a permanent alternate source of power is also permitted. Power failure of the primary source shall be alarmed.

7-3 Ventilation Criteria.

7-3.1 Ventilation rates are based on air changes per hour and shall be calculated on the basis of the maximum aggregate volume — under normal operating conditions — of the space to be ventilated. Air changes per hour shall be based on 100 percent outside supply air, which shall be exhausted. Ventilation rates shall conform to those listed in Table 7-3.1 in order to obtain the lowest area electrical classification possible in accordance with NFPA 70, *National Electrical Code.*

7-3.2 Dual ventilation rates for NFPA 70, *National Electrical Code,* Class I, Division 1 and Division 2 areas shall be permitted under the provisions of this standard, provided the following.

(a) The low ventilation rate is not less than 50 percent of that specified in Table 7-3.1.

(b) The low ventilation rate is in operation only if the supply air temperature is 50°F (10°C) or less.

(c) The high ventilation rate is not less than that specified in Table 7-3.1.

(d) The high ventilation rate is in operation whenever the supply air temperature is above 50°F (10°C), whenever the ventilated space is occupied, or whenever activated by approved combustible gas detectors set to function at 10 percent of the lower explosive limit (LEL). The high ventilation rate is in operation whenever the supply air temperature is above 50°F (10°C), whenever the ventilated space is occupied, or whenever activated by approved combustible gas detectors set to function at 10 percent of the lower explosive limit.

7-3.3* Recirculation of up to 75 percent of the exhaust airflow rate for unclassified areas shall be permitted provided the following.

(1) The recirculated air and outside airflow rate total is not less than 6 air changes per hour.

(2) Recirculation does not occur during occupancy.

(3) Recirculation does not occur whenever a combustible gas detector senses a lower explosive limit of 10 percent or greater.

Table 7-3.1 Minimum Ventilation Rates

	Description	Ventilation Rate, Air Changes per Hour, or Velocity		
		Class I, Division 1	Class I, Division 2	Unclassified
1	Wet wells, screen rooms, and other enclosed spaces with wastewater exposed to the room atmosphere	<12 air changes per hour	≥12 air changes per hour	
2	Belowgrade spaces such as dry wells, equipment rooms, tunnels, or galleries:			
(a)	With equipment using or processing flammable gas	<12 air changes per hour or <74-ft/min (22.2-m/min) velocity in tunnels or galleries	≥12 air changes per hour or ≥74-ft/min (22.2-m/min) velocity in tunnels or galleries	
(b)	With gas piping		<6 air changes per hour or <37-ft/min (11-m/min) velocity in tunnels or galleries	≥6 air changes per hour or ≥37-ft/min (11-m/min) velocity in tunnels or galleries
(c)	Without gas piping	NR for tunnels and galleries	<6 air changes per hour for dry wells. NR for tunnels and galleries	≥6 air changes per hour for dry wells. NR for tunnels and galleries
3	Abovegrade spaces such as equipment rooms and galleries:			
(a)	With equipment using or processing flammable gas	<12 air changes per hour or <74-ft/min (22.2-m/min) velocity for galleries	≥12 air changes per hour or ≥74-ft/min (22.2-m/min) velocity in galleries	
(b)	With gas piping		<6 air changes per hour or <37-ft/min (11-m/min) velocity in galleries	>6 air changes per hour or >37-ft/min (11-m/min) velocity in galleries
(c)	Without gas piping	NR for galleries	NR for galleries	NR for galleries

Note: NR — No requirement.

Chapter 8 Administrative Controls

8-1 General. This chapter establishes procedures and controls necessary for the execution of the fire prevention and fire protection activities and practices for wastewater treatment and collection facilities.

8-2 Management Policy and Direction.

8-2.1* Management shall establish a policy and institute a fire prevention and protection program at each facility.

8-2.2 Combustible materials shall not be stored in areas used for the storage of toxic or reactive chemicals.

8-3* Fire Risk Evaluation. A complete fire risk evaluation shall be performed during the initial design process.

8-4 Fire Prevention Program. Each plant shall establish a fire prevention program. This program shall include all of the following:

(1) Fire safety information for all employees and contractors. This information shall include, as a minimum, familiarization with fire protection equipment and procedures, plant emergency alarms and procedures, and how to report a fire.
(2) Documented plant inspections, including provisions for handling remedial actions to correct conditions that increase fire hazards.
(3) Description of the general housekeeping procedures and the control of transient combustibles, including control of such materials stored in areas containing toxic or reactive chemicals.
(4) Control of flammable and combustible liquids and gases in accordance with NFPA 30, *Flammable and Combustible Liquids Code,* and NFPA 54, *National Fuel Gas Code.*
(5) Control of ignition sources to include smoking, grinding, welding, and cutting in accordance with NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.*
(6) Fire prevention surveillance in accordance with NFPA 601, *Standard for Security Services in Fire Loss Prevention.*
(7) *Fire report, including an investigation and a statement on the corrective action to be taken.

8-5 Water-Based Fire Protection Systems.

8-5.1 Water-based fire protection systems include fire sprinkler systems, standpipe and hose systems, water spray fixed systems, and foam–water sprinkler systems. Also included are the water supplies that are part of these systems, such as private fire service mains and appurtenances, fire pumps and water storage tanks, and valves that control system flow.

8-5.2 All water-based fire protection systems shall be installed in accordance with the manufacturers' specifications and the NFPA standards referenced throughout this document as summarized in Chapter 9.

8-5.3 All water-based fire protection systems shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*

8-6 Other Fire Protection and Detection Systems.

8-6.1 All other fire protection and detection systems shall be installed in accordance with the manufacturers' specifications and the NFPA standards referenced throughout this document as summarized in Chapter 9.

8-6.2* All other fire protection and detection systems shall be inspected, tested, and maintained in accordance with the NFPA standards in Chapter 9.

8-6.3 Other fire protection system equipment that is not addressed by an NFPA standard as referenced in Chapter 9 (e.g., combustible gas detectors, radio communications equipment, and flame arresters or flame checks) shall be inspected, tested, and maintained in accordance with the manufacturers' specifications.

8-7* Impairments.

8-7.1 A written procedure in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* shall be established to address impairments of all water-based fire protection systems.

8-7.2 A written procedure shall be established to address impairments to other fire protection systems and plant systems that have an impact on the level of fire hazard (e.g., dust collection systems, HVAC systems). These procedures shall include the following:

(1) Identify equipment not available for service
(2) Identify personnel to be notified (e.g., plant fire brigade chief, public fire department)
(3) Increase fire surveillance as needed *[See 8-4(6) for further information.]*

8-7.3 Following repairs, tests shall be conducted on all affected systems to ensure proper operation.

8-7.4 Following restoration, all parties previously notified of the impairment shall be notified of the completion of repairs.

8-8 Fire Emergency Plan. A written fire emergency plan shall be developed. This plan shall include the following:

(1) Response to fire alarms and fire system supervisory alarms
(2) Notification of personnel identified in the plan
(3) Evacuation from the fire area of employees not directly involved in fire-fighting activities
(4) Coordination with security forces or other designated personnel to admit the public fire department and to control traffic and personnel
(5) Fire extinguishment activities
(6) Operators' duties during fire emergencies in critical areas
(7) Approved breathing apparatus to be provided in critical areas

8-9* Fire Brigades.

8-9.1* If a fire brigade is provided, its organization and training shall be identified in written procedures.

8-9.2 Arrangements shall be made to allow rapid entry into the plant by the municipal fire department, police department, or other authorized personnel in the case of fire or other emergency. Plant emergency organizations, where provided, shall be instructed and trained in accordance with NFPA 600, *Standard on Industrial Fire Brigades.*

8-10* Polychlorinated Biphenyls. If polychlorinated biphenyls (PCBs) are contained within the wastewater treatment plant, the owner and the local fire officials shall prepare a con-

tingency plan to protect the plant and the collection system from possible contamination in the event that the PCBs or combustion products are leaked or washed into the drains during a fire.

8-11 Fire and Explosion Prevention. The principal control procedures used to minimize potential fire and explosion incidents at wastewater treatment plants shall include the following:

(1) Ventilation *(See Chapter 7 for further information.)*
(2) Education *(See NFPA 1, Fire Prevention Code, for further information.)*
(3) Risk management and property conservation programs
(4) Procedures for permitting hotwork
(5) Selection of materials of construction *(See Chapter 6 for further information.)*
(6) Selection of equipment

8-11.1 Control of Hazardous Source. In-house training programs [e.g., plant emergency organizations (PEO) and housekeeping or maintenance] that will provide information to understand, identify, prevent, and handle hazardous sources and situations related to potential fire, explosion, and toxicity problems shall be established for all personnel. Close liaison shall be implemented between the local fire department, including other authorized emergency personnel, and wastewater treatment plant safety personnel, so that mutually approved emergency procedures, including familiarity with the plant, are established.

8-11.2 Control of Ignition Sources.

8-11.2.1 Personnel involved shall be educated in the conditions for and sources of ignition of special hazards and shall be trained for the safe operation of processes. *[See 8-4(6) for further information.]*

8-11.2.2 All personnel shall be trained to report faulty equipment, worn static bonding lines, improperly stored chemicals, and other items needing correction.

8-11.3 Hotwork Permits. Welding, cutting, and similar spark-producing operations shall not be permitted until a written permit authorizing such work has been issued. The permit shall be issued by a person in authority following inspection of the area to ensure that the precautions have been taken and will be followed until the job is completed. *(See NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, for further information.)*

Chapter 9 Referenced Publications

9-1 The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix F.

9-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1, *Fire Prevention Code,* 1997 edition.
NFPA 10, *Standard for Portable Fire Extinguishers,* 1998 edition.
NFPA 11, *Standard for Low-Expansion Foam,* 1998 edition.
NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems,* 1999 edition.
NFPA 11C, *Standard for Mobile Foam Apparatus,* 1995 edition.
NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 1998 edition.
NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems,* 1997 edition.
NFPA 13, *Standard for the Installation of Sprinkler Systems,* 1999 edition.
NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 1996 edition.
NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 1996 edition.
NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems,* 1999 edition.
NFPA 17, *Standard for Dry Chemical Extinguishing Systems,* 1998 edition.
NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps,* 1999 edition.
NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 1998 edition.
NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 1995 edition.
NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 1998 edition.
NFPA 30, *Flammable and Combustible Liquids Code,* 1996 edition.
NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* 1996 edition.
NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* 1999 edition.
NFPA 54, *National Fuel Gas Code,* 1999 edition.
NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities,* 1999 edition.
NFPA 68, *Guide for Venting of Deflagrations,* 1998 edition.
NFPA 69, *Standard on Explosion Prevention Systems,* 1997 edition.
NFPA 70, *National Electrical Code®,* 1999 edition.
NFPA 70E, *Standard for Electrical Safety Requirements for Employee Workplaces,* 1995 edition.
NFPA 72, *National Fire Alarm Code®,* 1999 edition.
NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment,* 1999 edition.
NFPA 90A, *Standard for the Installation of Air- Conditioning and Ventilating Systems,* 1999 edition.
NFPA *101®, Life Safety Code®,* 1997 edition.
NFPA 204, *Guide for Smoke and Heat Venting,* 1998 edition.
NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* 1996 edition.
NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials,* 1999 edition.
NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials,* 1996 edition.
NFPA 256, *Standard Methods of Fire Tests of Roof Coverings,* 1998 edition.
NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 1998 edition.
NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites,* 1993 edition.
NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment,* 1998 edition.
NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas,* 1997 edition.
NFPA 600, *Standard on Industrial Fire Brigades,* 1996 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention,* 1996 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 1997 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting,* 1999 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems,* 1999 edition.

NFPA 8501, *Standard for Single Burner Boiler Operation,* 1997 edition.

NFPA 8502, *Standard for the Prevention of Furnace Explosions/ Implosions in Multiple Burner Boilers,* 1999 edition.

9-1.2 Other Publications.

9-1.2.1 ANSI Publications. American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI/IEEE 268, *Metric Practices,* 1992.

ANSI/ISA RP 12.67, *Installation of Intrinsically Safe Instrument Systems in Class I Hazardous Locations,* 1967.

9-1.2.2 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C (1382°F),* 1994.

ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops,* 1988 (Rev. B-94).

Appendix A Explanatory Material

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

A-1-1.1.1 Other NFPA standards should be consulted for additional requirements relating to wastewater treatment and collection facilities.

A-1-3.1 In existing facilities, it is not always practical to strictly apply the provisions of this standard. Physical limitations could necessitate disproportionate effort or expense with little increase in fire protection. In such cases, the authority having jurisdiction should be satisfied that reasonable fire protection is ensured.

In existing facilities, it is the intent that any condition that represents a serious threat to fire protection should be mitigated by application of appropriate safeguards. It is not the intent to require modification for conditions that do not represent a significant threat to fire protection, even though such conditions are not literally in conformance with the fire protection requirements.

A-1-3.3 For additional information, see NFPA 497, *Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas,* and NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.* While some of these recommended practices are not applicable to wastewater treatment facilities, both documents provide useful information.

A-1-5 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-1-5 Authority Having Jurisdiction. The phrase "authority having jurisdiction" 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-1-5 Combustible Liquid. See NFPA 30, *Flammable and Combustible Liquids Code.*

A-1-5 Flammable Liquid. See NFPA 30, *Flammable and Combustible Liquids Code.*

A-1-5 Fuel Gases. See NFPA 54, *National Fuel Gas Code.*

A-1-5 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-2-1 Additional information on sources of hazards, sources of ignition, and mitigation measures associated with the collection and transmission of municipal wastewater is contained in Appendix D.

A-2-2 See Figures A-2-2(a) through (g), which provide examples for Table 2-2.

Figure A-2-2(a) Wet well or basin serving a storm sewer; illustration of Table 2-2, row 4.

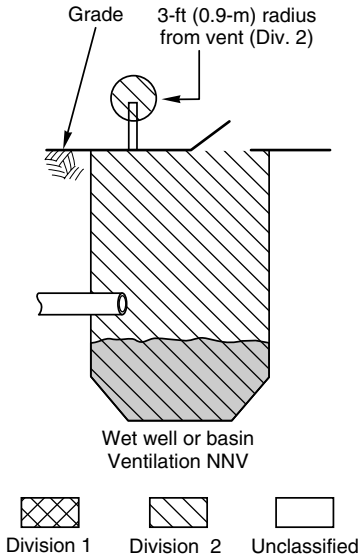


Figure A-2-2(b) Wet well or basin serving a residential sewer; illustration of Table 2-2, row 11.

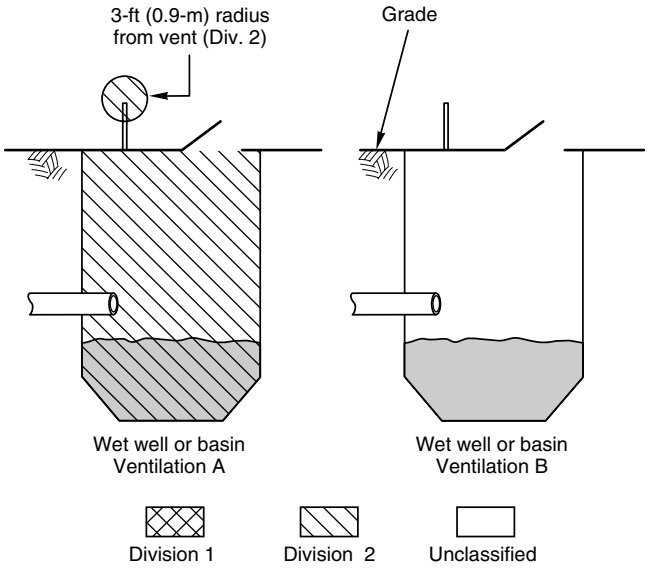


Figure A-2-2(c) Wet well or basin serving separate or combined sanitary sewer; illustration of Table 2-2, rows 16 and 34.

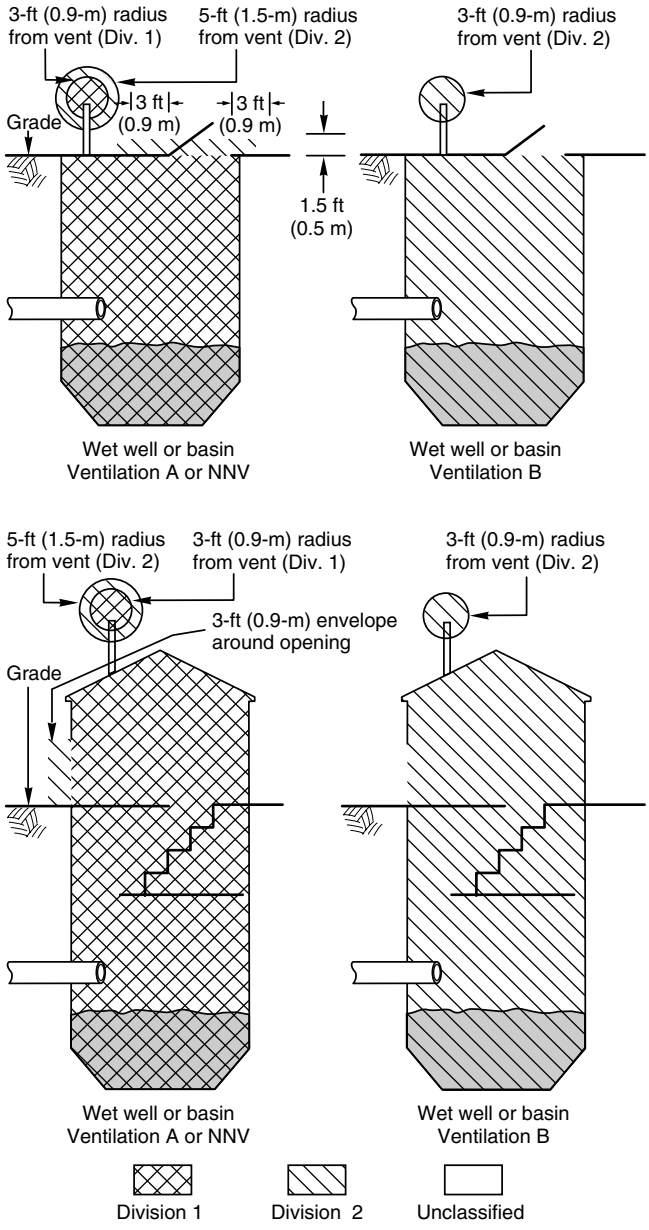


Figure A-2-2(d) Abovegrade equipment housing or vault physically separated from wet well or basin; illustration of Table 2-2, rows 18 and 30.

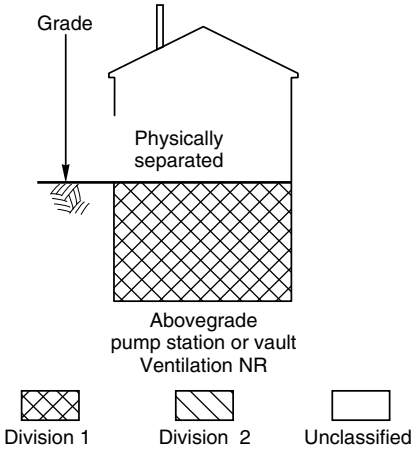


Figure A-2-2(e) Belowgrade or partially belowgrade equipment housing or vault physically separated from wet well or basin; illustration of Table 2-2, rows 5, 12, 17, 31, and 36.

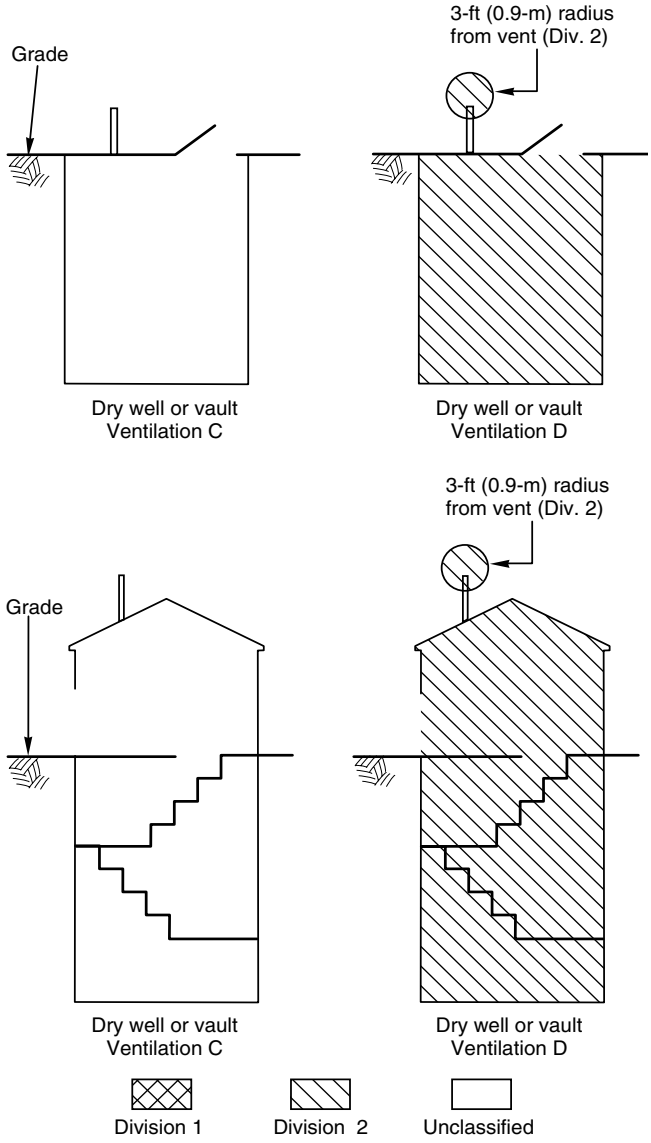


Figure A-2-2(f) Abovegrade equipment housing or vault not physically separated from wet well or basin; illustration of Table 2-2, row 19.

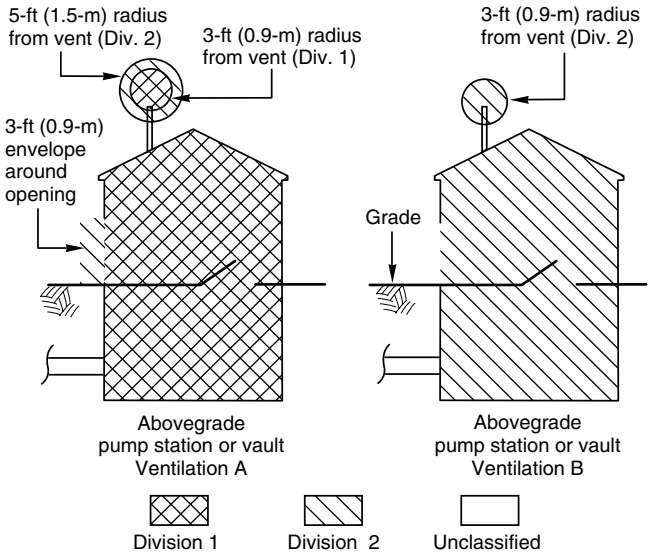
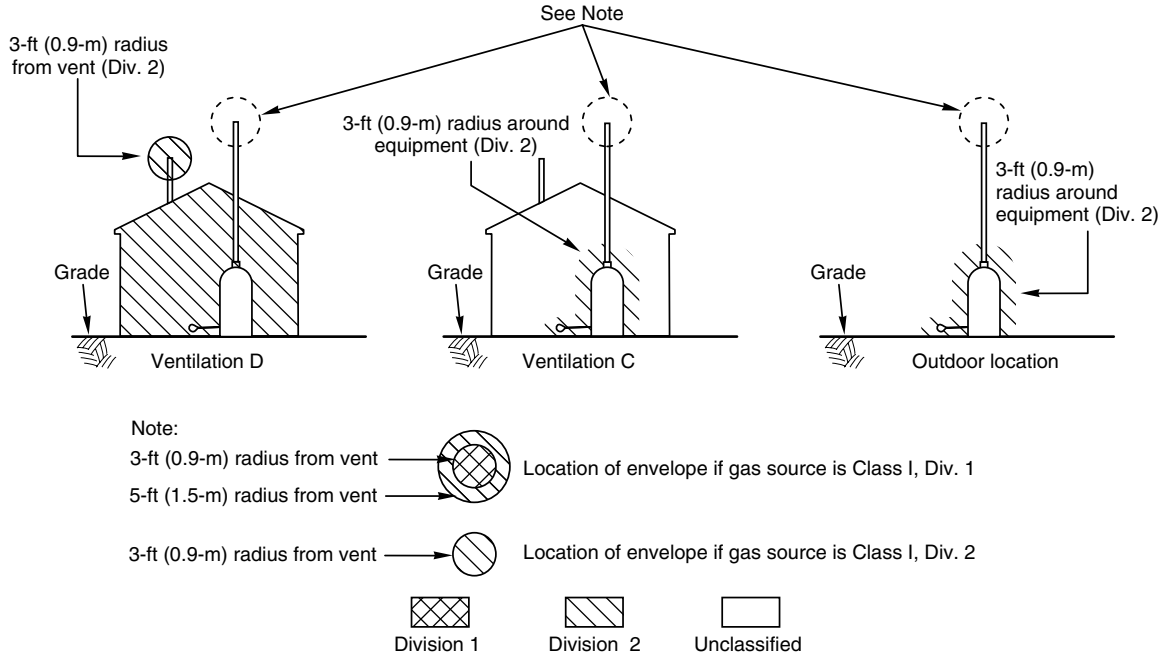


Figure A-2-2(g) Odor-control system location physically separated from wet well; illustration of Table 2-2, row 20.



A-3-1 Additional information on sources of hazards ignition, sources of, and mitigation measures associated with liquid stream treatment processes is contained in Appendix D.

A-3-2 See Figure A-3-2, which provides an example for Table 3-2.

A-4-1 Additional information on sources of hazards, sources of ignition, and mitigation measures associated with solids treatment processes is contained in Appendix D.

A-4-2 See Figures A-4-2(a) through (g), which provide examples for Table 4-2(a).

Figure A-3-2 Primary sedimentation tank; illustration of Table 3-2, row 6.

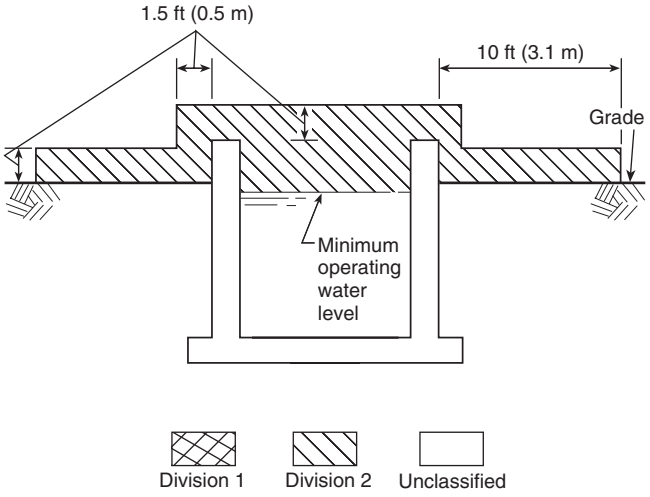


Figure A-4-2(a) Anaerobic digester with fixed or floating cover above grade not enclosed in a building; illustration of Table 4-2(a), rows 15a and 15b.

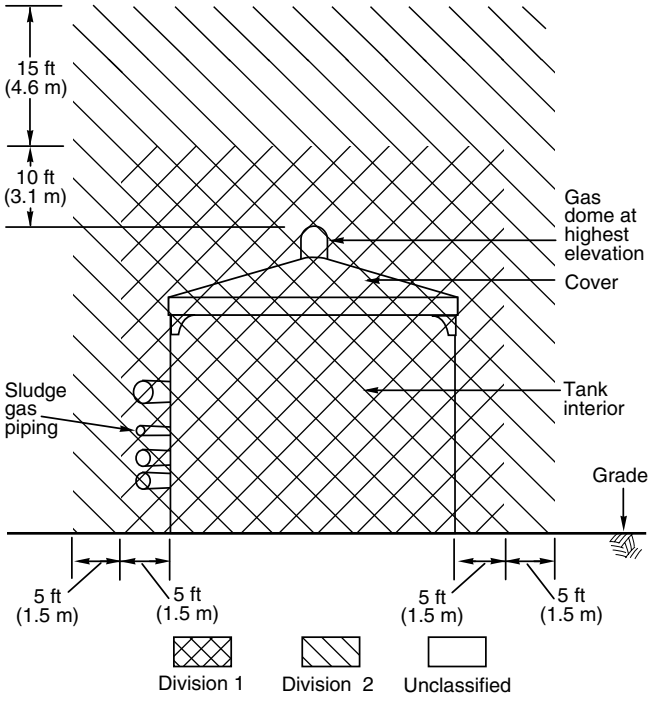


Figure A-4-2(b) Anaerobic digester control building containing sludge gas piping and with ventilation A; illustration of Table 4-2(a), row 16a.

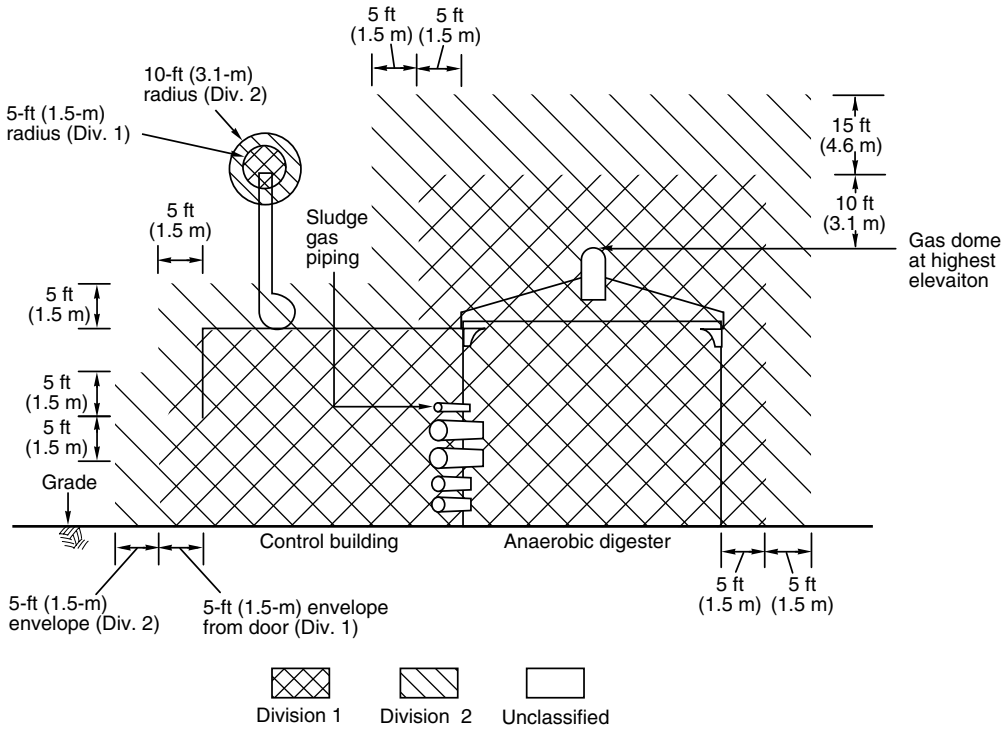


Figure A-4-2(c) Anaerobic digester control building containing sludge gas piping and with ventilation C; illustration of Table 4-2(a), row 16c.

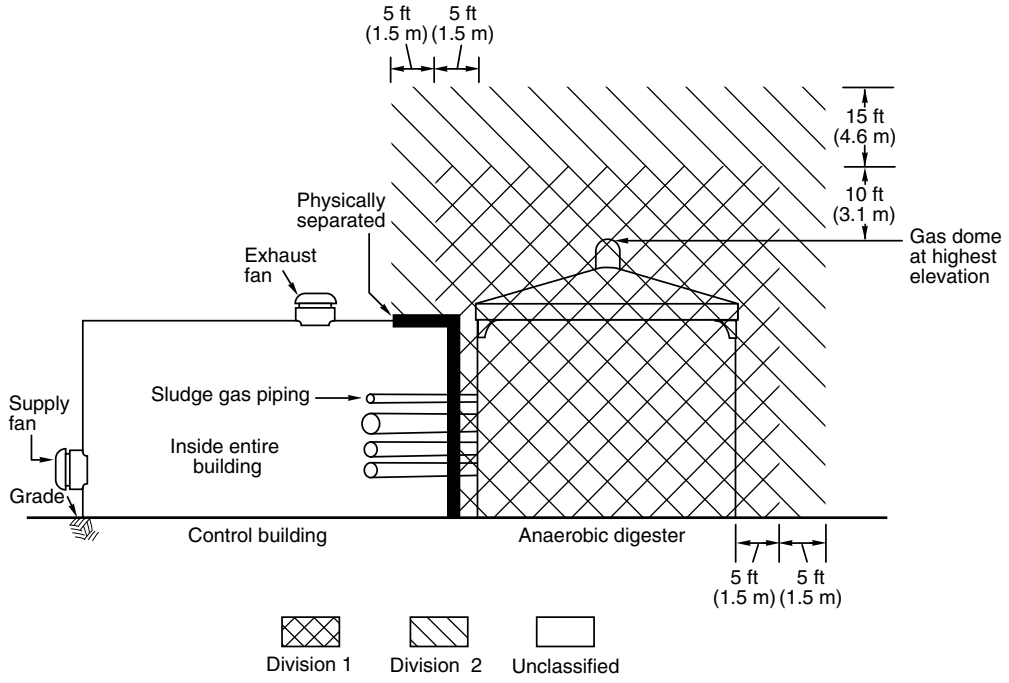


Figure A-4-2(d) Anaerobic digester control building containing sludge gas–processing equipment physically separated and with ventilation B for the processing room and ventilation C for the control building; illustration of Table 4-2(a), rows 16c and 17b.

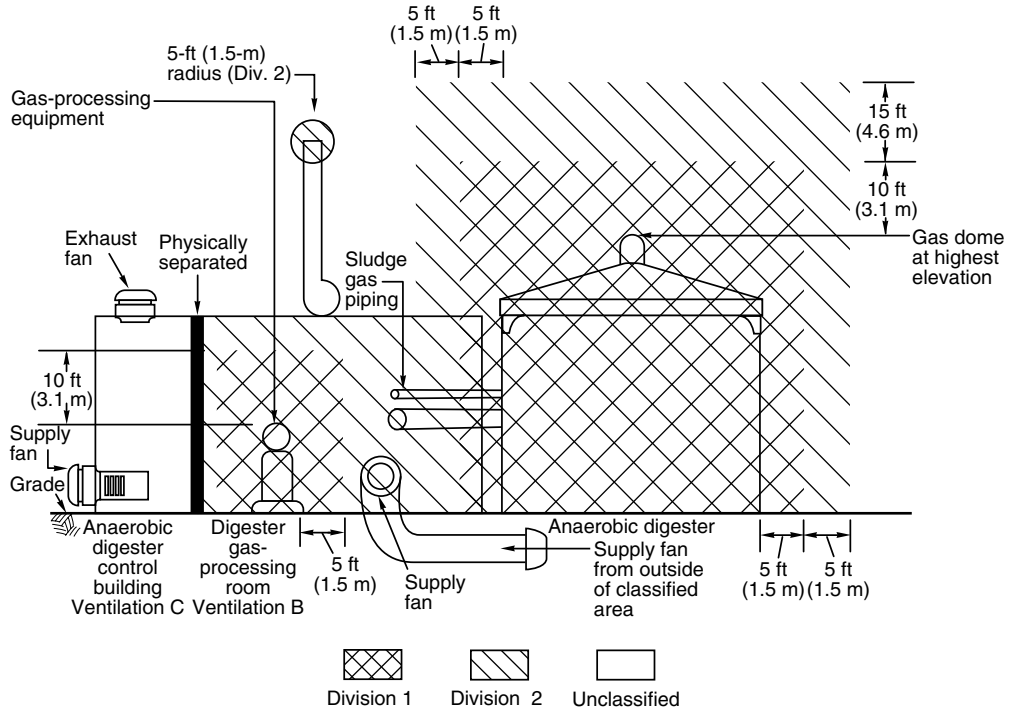


Figure A-4-2(e) Anaerobic digester control building containing sludge gas–processing equipment not physically separated and with ventilation A; illustration of Table 4-2(a), row 16.

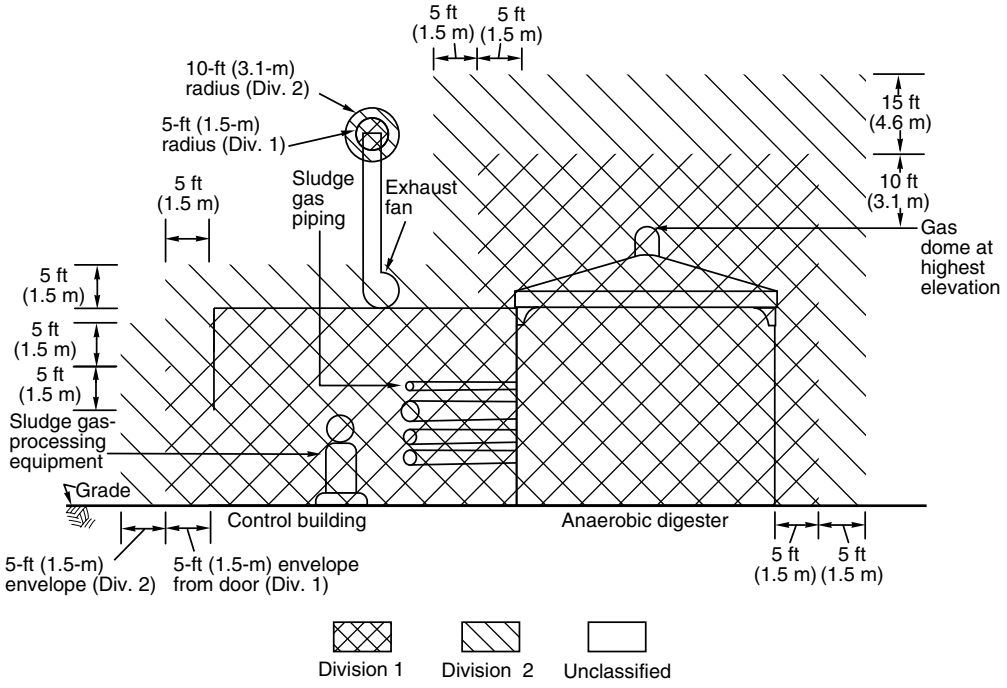


Figure A-4-2(f) Underground tunnel containing natural gas or sludge gas piping with ventilation D; illustration of Table 4-2(a), rows 20a and 20b.

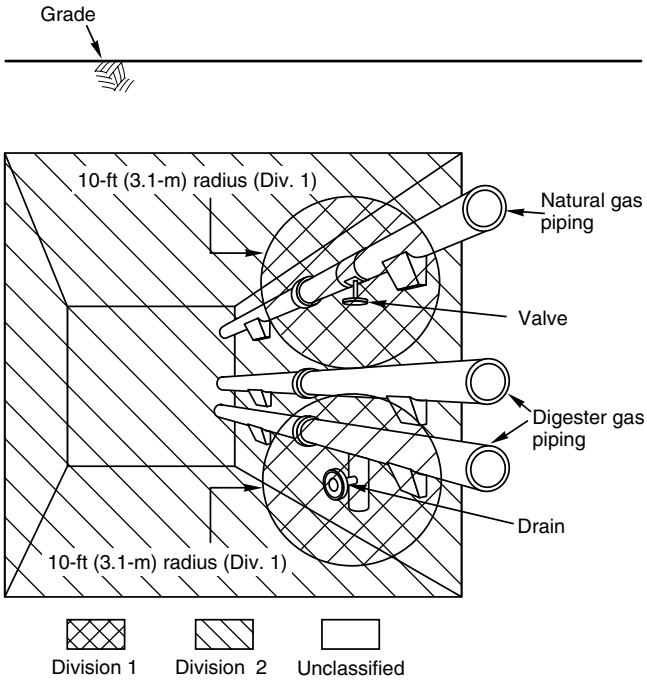
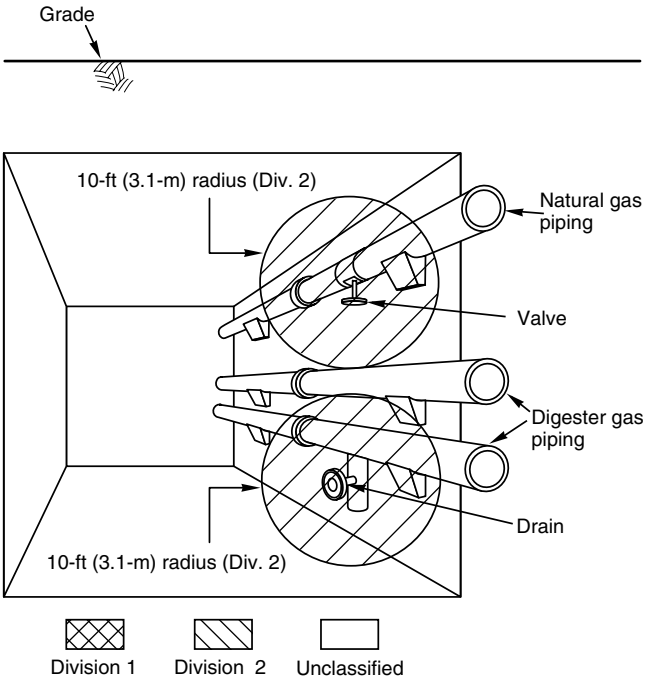


Figure A-4-2(g) Underground tunnel containing natural gas or sludge gas piping with ventilation C; illustration of Table 4-2(a), rows 20c and 20d.



A-5-1 Additional information is contained in Appendix D.

A-5-4.1 For further information, see NFPA 328, *Recommended Practice for the Control of Flammable and Combustible Liquids and Gases in Manholes, Sewers, and Similar Underground Structures.*

A-5-4.2 Other types of detectors, such as heat and smoke detectors, have standards recommending spacing usually based on a certain area per detector. There are no known recognized standards or guidelines for the locating or spacing of combustible gas detectors.

Whether natural or mechanical, air movement is a very important consideration in installing combustible gas detectors. This aspect should be carefully investigated, including the effect of doors, windows, vents, and other openings. It could be necessary to conduct a ventilation study that could involve a nontoxic smoke movement analysis.

Dispersion characteristics can also affect detector placement. Vapors and gases will disperse inversely proportional to their specific density in a quiescent environment. Vapors and gases with densities less than that of air will diffuse quickly at first until the vapor or gas becomes diluted. Heavier-than-air vapors and gases will tend to settle at a low area and not diffuse into the atmosphere unless dispersed by ventilation or temperature currents. Vapors with densities close to that of air will exhibit little mixing effect and will be transported largely by air currents.

There are various types of sensing devices. It is important to select the proper sensing device for each application and for the environment in which it will be placed. Most organic and inorganic compounds can be safely monitored with a catalytic combustion–type sensor. However, organic and metallic solvents containing lead, silicones, plasticizers, or halogens can poison the catalytic element.

A-5-5.3 In all cases, standard "Danger" signs identifying the purpose of the lights and audible alarms and warning against entry when there is an alarm condition should be posted as near as practical to the warning devices.

A-6-3.1 See Appendix C of this document and NFPA 328, *Recommended Practice for the Control of Flammable and Combustible Liquids and Gases in Manholes, Sewers, and Similar Underground Structures.*

A-6-3.3.3.3 Plastic or fiberglass-reinforced plastic products are often used as materials of construction in unit processes such as rotating biological contactors (RBC), bio-towers, trickling filters, inclined plate (tube) settlers, ventilation ducts, and other equipment that might be subject to corrosion. Under normal operating conditions, these plastic or fiberglass-reinforced plastic materials might be submerged. However, during maintenance or repair they can become exposed. During maintenance and repair operation, extreme care should be taken with open flame such as cutting torches, as these exposed plastic or fiberglass-reinforced plastic materials might present a considerable fuel load if ignited.

A-7-3.3 Ventilation rates and procedures established by this standard might not be sufficient to protect personnel from exposure to toxic gases that might be present in enclosed spaces.

A-8-2.1 Proper preventive maintenance of operating and fire protection equipment, as well as operator training, are important aspects of a viable fire prevention program.

A-8-3 A fire risk evaluation of the plant should result in recommendations to integrate the fire prevention and fire protection required in this document into the plant specific considerations regarding design, layout, and anticipated operating requirements. The evaluation should result in a list of recommended fire prevention features to be provided based on acceptable means for the separation or control of common and special hazards, the control or elimination of ignition sources, and the suppression of fires.

This evaluation should focus on materials of construction in ventilation systems and in processes that normally operate in a wet condition — for example, plastic media trickling filters, bio-towers, and rotating biological contactors. These systems and process units can represent a considerable fuel load if ignition occurs during operation. Maintenance, fire spread, and smoke production should be considered in the selection of materials.

Consideration should also be given to locating process areas — for example, screen room, areas containing gas management equipment, and so forth — that represent a significant explosion hazard remote from other process areas to reduce the risk of consequent damage should an explosion occur.

A-8-4(7) For an example of a fire report, see Figure A-8-4(7).