

# NFPA 820

## Standard for Fire Protection in Wastewater Treatment and Collection Facilities

### 2003 Edition



NFPA, 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

### 2003 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 NFPA at its May Association Technical Meeting held May 18–21, 2003, in Dallas, TX. It was issued by the Standards Council on July 18, 2003, with an effective date of August 7, 2003, and supersedes all previous editions.

This edition of NFPA 820 was approved as an American National Standard on July 18, 2003.

### 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*.

For the 2003 edition, the entire document has been reformatted to conform to the NFPA's *Manual of Style*. Definitions have been revised to conform to the NFPA's *Glossary of Terms*.

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

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

**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.

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**NFPA 820****Standard for****Fire Protection in Wastewater Treatment and Collection Facilities****2003 Edition**

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

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, Annex F lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

**Chapter 1 Administration****1.1 Scope.**

**1.1.1\* General.** This standard shall establish 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.

**1.1.2** 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 3.3.67.1)

**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 3.3.68.1)

- (3) Pressure sewer systems (see 3.3.61.8, definition of Pressure Sewer)
- (4) Building drain systems and appurtenances (see 3.3.8, definition of Building Drain)
- (5) Industrial sewer systems and appurtenances (see 3.3.61.5, definition of Industrial Sewer)
- (6) Personnel safety from toxic and hazardous materials or products of combustion
- (7) Separate nonprocess-related structures (see 3.3.67.2)

**1.2 Purpose.**

**1.2.1** The purpose of this standard shall be to provide a degree of fire and explosion protection for life, property, continuity of mission, and protection of the environment.

**1.2.2** The purpose of this standard shall be 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.

**1.3 Application.**

**1.3.1\* New Installations.** The requirements of this standard shall apply to new installations.

**1.3.1.1** When additions or modifications are made to existing facilities, the modifications shall reflect the requirements of this document.

**1.3.1.2** 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 Toxicity and Biological Hazards.**

**1.3.2.1** This standard shall apply to the fire and explosion hazards of various substances associated with wastewater treatment and conveyance.

**1.3.2.2** 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.

**1.3.3 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.

**1.3.4 Ventilation Practices.** Ventilation rates required by this standard shall be to minimize fire and explosion hazards, because insufficient ventilation rates can expose personnel to toxic and biological hazards.

**1.3.5 Materials Selection.** When conditions or applications warrant the selection of combustible, limited-combustible, or low flame spread materials, 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.

**CAUTION:** Because 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.

**1.4 Retroactivity.** The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

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

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

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

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

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

**1.5.2** The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

**1.6 Units and Formulas.** Metric units of measurement used within this standard are in accordance with the modernized metric system known as the International System of Units (SI).

**1.6.1** Values of measurement are followed by an approximate equivalent value in U.S. customary units.

**1.6.2** For metric conversion practices, see ANSI/IEEE 268.

**1.7 Document Organization.** This document shall be divided into 10 chapters.

**1.7.1** Chapters 1, 3, 7, 8, 9, and 10 shall apply generally.

**1.7.2** Chapters 4, 5, and 6 shall apply to specific processes and functions.

**1.8\* National Electrical Code® Criteria.**

**1.8.1** NFPA 820 is based on the criteria established by Article 500 of NFPA 70 but shall not supersede or conflict with the requirements therein.

**1.8.2** Once an area is classified, NFPA 70 shall be used to specify the types of equipment and the wiring methods that are required.

## Chapter 2 Referenced Publications

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

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

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2002 edition.

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

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2003 edition.

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

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 2003 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2002 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2003 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2003 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2002 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2002 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2003 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 2000 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2003 edition.

NFPA 54, *National Fuel Gas Code*, 2002 edition.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*, 2002 edition.

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

NFPA 69, *Standard on Explosion Prevention Systems*, 2002 edition.

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

NFPA 70E, *Standard for Electrical Safety Requirements for Employee Workplaces*, 2000 edition.

NFPA 72®, *National Fire Alarm Code®*, 2002 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 1999 edition.

NFPA 85, *Boiler and Combustion Systems Hazards Code*, 2001 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2002 edition.

NFPA 101®, *Life Safety Code®*, 2003 edition.

NFPA 204, *Standard for Smoke and Heat Venting*, 2002 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, 2000 edition.

NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*, 2003 edition.

NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*, 2003 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*, 2000 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2000 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2000 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2001 edition.

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

### 2.3 Other Publications.

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

ANSI/IEEE 268, *Metric Practices*, 1997.

## Chapter 3 Definitions

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

### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

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

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

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

**3.2.5 Shall.** Indicates a mandatory requirement.

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

**3.2.7 Standard.** 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 or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

### 3.3 General Definitions.

**3.3.1 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.

**3.3.2 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.

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

**3.3.4 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.*)

**3.3.5\* Anaerobic Digestion.** A unit process designed to biologically convert organic matter (sludge) through the action of microorganisms in the absence of elemental oxygen.

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

**3.3.7 Building.** Any structure used or intended for supporting or sheltering any use or occupancy. [*101:3.3*]

**3.3.8 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).

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

### 3.3.10 Chamber.

**3.3.10.1 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.

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

**3.3.11 Combustible.** Capable of undergoing combustion.

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

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

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

**3.3.15 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 them up to the surface.

**3.3.16 Drying Bed.** A confined, underdrained, shallow layer of sand or gravel structures on which digested sludge is distributed for draining and air drying; also an underdrained, shallow, diked earthen structure used for drying sludge.

**3.3.17 Enclosed Space.** The interior space 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.

**3.3.18 Equipment.** A general term that includes items such as material, fittings, devices, appliances, and fixtures and apparatus, used as part of, or in connection with, a mechanical, instrumentation, or electrical installation.

**3.3.18.1\* 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 such gas.

**3.3.18.2 Utilization Equipment.** Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. [70:100.I]

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

**3.3.20 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 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. [70:100.I]

**3.3.21 Filter.**

**3.3.21.1 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.

**3.3.21.2 Pressure or Gravity Filter.** A filter used to pass liquid through a medium to remove suspended solids.

**3.3.21.3 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.

**3.3.21.4 Vacuum Filter.** A unit process, used to dewater wastewater sludge, consisting of a cylindrical drum mounted on a horizontal axis, covered with a media, and subjected to an internal vacuum.

**3.3.22 Filter Press.** A plate and frame press used in a unit process that is operated hydraulically and mechanically to produce a semisolid sludge cake from a slurry.

**3.3.23 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.

**3.3.24 Fire Loading.** The amount of combustibles present in a given area, expressed in  $\text{kJ}/\text{m}^2$  ( $\text{Btu}/\text{ft}^2$ ). [851:1.4]

**3.3.25 Fire Prevention.** Measures directed toward avoiding the inception of fire. [801:1.5]

**3.3.26 Fire Protection.** Methods of providing for fire control or fire extinguishment. [801:1.5]

**3.3.27 Fire-Rated Penetration Seal.** An assembly provided in an opening in a fire barrier for the passage of pipes, cable trays, and so forth, to maintain the fire resistance rating of the fire barrier. [801:1.5]

**3.3.28 Flammable Limits.**

**3.3.28.1 Lower Flammable Limit (LFL).** The minimum concentration of a gas-air or vapor-air mixture that supports flame, if ignited.

**3.3.28.2 Upper Flammable Limit (UFL).** The maximum concentration of a gas-air or vapor-air mixture that, if ignited, supports flame.

**3.3.29 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.

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

**3.3.31 Flocculator.** A device used in a unit process used for the formation of floc in wastewater.

**3.3.32\* 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.

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

**3.3.34\* Galleries.** Long tunnels or walkways connecting separate buildings or structures that are generally underground, without windows, and with limited entrances and exits.

**3.3.35 Gas.**

**3.3.35.1 Digester Gas.** See definition of *Sludge Gas*.

**3.3.35.2\* Fuel Gas.** A 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.

**3.3.35.3\* Sewer Gas.** Gas resulting from the 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.

**3.3.35.4\* Sludge Gas.** Gas obtained as a by-product of the anaerobic sludge digestion unit process from the decomposition of organic matter.

**3.3.36 Hazardous (Classified) Location.** A location that is classified based 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.

**3.3.37 Hydrogen Sulfide ( $\text{H}_2\text{S}$ ).** A toxic and lethal gas produced in sewers and digesters by anaerobic decomposition of wastewater solids or other anaerobic wastewater or sludge treatment processes.

**3.3.38 Identified (as applied to equipment).** Recognizable as suitable for the specific purpose, function, use, environment, application, etc., where described in a particular code requirement. [79:3.3]

**3.3.39 Imhoff Tank.** A deep, two-story wastewater treatment tank consisting of an upper continuous-flow sedimentation chamber and a lower sludge digestion chamber.

**3.3.40 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.

**3.3.41 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.

**3.3.42 Intrinsically Safe.** As applied to equipment and wiring, equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. [99:3.3]

**3.3.43 Liquid.**

**3.3.43.1\* Combustible Liquid.** A liquid that has a closed-cup flash point at or above 37.8°C (100°F).

**3.3.43.2\* Flammable Liquid.** A liquid that has a closed-cup flash point that is below 37.8°C (100°F) and a maximum vapor pressure of 2068 mm Hg (40 psia) at 37.8°C (100°F).

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

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

**3.3.45 Maintenance Hole.** A structure located on top of an opening in a gravity sewer, or an opening in the top or side of an enclosed vessel to allow personnel entry; also referred to as manhole or manway.

**3.3.46 Material.**

**3.3.46.1 Limited-Combustible Material.** A building construction material that does not comply 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 (8141kJ/kg) (see NFPA 259), and that complies with either of the following (a) or (b). Materials subject to an increase in combustibility or flame-spread rating beyond the limits herein established through the effects of age, moisture, or other atmospheric conditions shall be considered combustible. (a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm), and with a flame-spread rating not greater than 50. (b) Materials in the form and thickness used, other than as described in (a), having neither a flame-spread rating 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 rating greater than 25 nor evidence of continued progressive combustion. [5000:3.3]

**3.3.46.2 Noncombustible Material.** A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E 136 shall be considered noncombustible materials. [220:2.1]

**3.3.47 Methane (CH<sub>4</sub>).** 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.)

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

**3.3.49 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.

**3.3.50 Oxygen-Enriched Atmosphere.** Air atmospheres containing more than 23.5 percent oxygen by volume at one standard atmosphere pressure. [1670:1.3]

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

**3.3.52\* Physically Separated.** A gastight partition between two adjacent spaces, or two nonadjacent spaces, with no means of gas communication between the spaces.

**3.3.53 Primary Wastewater Treatment.** The first major treatment in a wastewater treatment plant, generally consisting of screening, comminution or grinding, grit removal, sedimentation, skimming, or any combination of such unit processes.

**3.3.54\* Pumping Station.** A structure that contains pumps and appurtenant piping, valves, and other mechanical and electrical equipment for pumping wastewater or other liquid.

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

**3.3.56 Rating.**

**3.3.56.1 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. [150:1.4]

**3.3.56.2\* Low Flame Spread Rating.** A flame spread rating of 25 or less.

**3.3.57 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).

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

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

**3.3.60\* Sedimentation.** The unit process of subsidence of suspended matter carried by water, wastewater, or other liquids by gravity.

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

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

**3.3.61.2 Building Sewer.** In plumbing, a sewer that consists of the extension from the building drain to the public sewer or other place of disposal; also called house connection or lateral.

**3.3.61.3 Collector Sewer.** A sewer that consists of 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.

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

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

**3.3.61.6 Interceptor Sewer.** 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 water to a point for treatment or disposal; also called main sewer.

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

**3.3.61.8 Pressure Sewer.** 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.

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

**3.3.61.10 Relief Sewer.** 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.

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

**3.3.61.12 Sanitary Sewer.** 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.

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

**3.3.61.14 Trunk Sewer.** A sewer consisting of the principal pipe or conduit to which one or more collector sewers or branch sewers are tributaries; also called main sewer.

**3.3.62 Sludge.** A semiliquid mass of accumulated settled solids deposited from raw or treated wastewater in tanks or basins; also referred to as biosolids.

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

**3.3.64 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.

**3.3.65 Sludge Gas Vent.** A passage that allows the controlled release of gases from anaerobic treatment processes or gas storage facilities.

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

**3.3.67 Structure.** That which is built or constructed. [101:3.3]

**3.3.67.1 Ancillary Structure.** A structure that is an integral part of the wastewater treatment or collection process.

**3.3.67.2 Separate Nonprocess-Related Structure.** A structure that is physically separated and does not contain any process-related equipment associated with the collection and treatment of wastewater and solids derived from wastewater treatment processes.

**3.3.68 System.**

**3.3.68.1 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.

**3.3.68.2 Sludge-Drying System.** A processes that uses physical or mechanical evaporation techniques with or without the application of heat to achieve solids concentrations greater than 85 percent.

**3.3.69\* 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.

**3.3.70 Treatment.**

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

**3.3.70.2\* Sludge Treatment.** The processing of wastewater sludges to render them stable.

**3.3.71 Tunnel.** See definition of *Galleries*.

**3.3.72 Unit Process.** A stage or step in the treatment of wastewater.

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

**3.3.74 Ventilation Rate.** A value based on the number of air changes per hour and calculated using 100 percent outside air for the supply air that is exhausted. The number of air changes per hour is calculated on the basis of the maximum aggregate volume (under normal operating conditions) of the space to be ventilated.

**3.3.75 Waste.**

**3.3.75.1 Hazardous Waste.** Waste that is potentially damaging to the environment or human health due to its toxicity, ignitability, corrosivity, or chemical reactivity or another cause.

**3.3.75.2 Industrial Waste.** Generally liquid, solid, or gaseous wastes originating from the manufacture of specific products.

**3.3.76 Wastewater.** The spent water of a community that is a 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.

**3.3.76.1 Domestic Wastewater.** Wastewater derived principally from sources such as dwellings, commercial establishments, and institutions, that might or might not contain small amounts of groundwater, surface water, or storm water.

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

### 3.3.77 Well.

**3.3.77.1\* Dry Well.** The portion of a pumping station designed to provide isolation and shelter or accommodations for controls or equipment associated with pumping of wastewater and are designed to completely and permanently exclude wastewater or wastewater-derived atmospheres.

**3.3.77.2\* Wet Well.** The portion of the pumping station that receives and temporarily stores wastewater for the purpose of pumping.

## Chapter 4 Collection Systems

### 4.1\* General.

**4.1.1** This chapter shall establish minimum criteria for protection against fire and explosion hazards in the collection and transportation of municipal wastewater.

**4.1.2** This chapter shall not apply to on-site systems, force mains, or those sewers that principally convey industrial wastes.

**4.2\* Design and Construction.** The design and construction of collection system facilities shall conform to Table 4.2, which summarizes the various components associated with wastewater collection and transport systems.

**Table 4.2 Collection Systems**

| Row | Line | 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 8.3.1                             | NA                       |
| 2   |      | INDUSTRIAL SEWER<br>Sewer transporting industrial wastewater only (no sanitary wastewater)                | Not included within the scope of this standard                      |             |                           |                                                           |                                                      |                          |
| 3   |      | STORM SEWER<br>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 8.3.1                             | NR                       |
| 4   |      | STORM WATER PUMPING STATION WET WELLS<br>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          |

**Notes:**

(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.

(2) Row and Line columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.

(3) The following codes are used in this table:

- 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 9
- C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9
- 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
- NNV — Not normally ventilated
- NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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 |
|-----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------|---------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------|
| 5   | a    | STORM WATER PUMPING STATION DRY WELLS<br>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<br>Sewer serving one but not more than five dwellings                                                                                  | NA                                                                  | NNV          | Within enclosed space     | Unclassified                                                                                   | NR                                                   | NR                       |
| 9   |      | INDIVIDUAL RESIDENTIAL PUMPING UNITS<br>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<br>Sewer transporting primarily residential wastewater                                                                                            | Possible ignition of flammable gases and floating flammable liquids | NNV          | Within enclosed space     | Division 2                                                                                     | In accordance with 8.3.1                             | NR                       |
|     | b    |                                                                                                                                                                     |                                                                     | B            |                           | Unclassified                                                                                   |                                                      |                          |

## Notes:

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B — Continuously ventilated at 12 changes per hour or in accordance with Chapter 9

C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9

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

NNV — Not normally ventilated

NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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    | RESIDENTIAL WASTEWATER PUMPING STATION WET WELL<br>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<br>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<br>Final discharge pipe from a treatment plant, transporting treated wastewater                                  | NA                                                                  | NNV         | NA                        | Unclassified                                              | NR                                                   | NR                       |
| 14  | a    | SANITARY SEWER<br>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 8.3.1                             | NR                       |
|     | b    |                                                                                                                                |                                                                     | B           |                           | Division 2                                                |                                                      |                          |
| 15  | a    | COMBINED SEWER<br>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 8.3.1                             | NR                       |
|     | b    |                                                                                                                                |                                                                     | B           |                           | Division 2                                                |                                                      |                          |
| 16  | a    | WASTEWATER PUMPING STATION WET WELLS<br>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                                                |                                                      |                          |

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C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9

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

NNV — Not normally ventilated

NR — No requirement

Table 4.2 Continued

| Row | Line | 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 |
|-----|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|---------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------|
| 17  | a    | BELOWGRADE OR PARTIALLY BELOWGRADE WASTEWATER PUMPING STATION DRY WELL<br>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 |                                                      |                          |
| 18  |      | ABOVEGRADE WASTEWATER PUMPING STATION<br>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<br>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                                       |                          |

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NC — Noncombustible material

NEC — In accordance with NFPA 70

NNV — Not normally ventilated

NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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    | ODOR-CONTROL SYSTEM AREAS<br>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 0.9 m (3 ft) of leakage sources such as fans, dampers, flexible connections, flanges, pressurized unwelded ductwork, and odor-control vessels | Division 2                                                |                                                      |                          |
|     | c    |                                                                                                                  |                                                                     |                | Areas beyond 0.9 m (3 ft)                                                                                                                                  | Unclassified                                              |                                                      |                          |
| 21  | a    | MAINTENANCE HOLES<br>Access to sewer for personnel entry                                                         | Possible ignition of flammable gases and floating flammable liquids | NNV            | Inside                                                                                                                                                     | Division 1                                                | In accordance with 8.3.1                             | NR                       |
|     | b    |                                                                                                                  |                                                                     | B              |                                                                                                                                                            | Division 2                                                |                                                      |                          |

## Notes:

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- FDS — Fire detection system
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- LC — Limited-combustible material
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- NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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 |
|-----|------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|-----------------------------------------------|-----------------------------------------------------------|------------------------------------------------------|--------------------------|
| 22  | a    | JUNCTION CHAMBERS<br>Structure where sewers intersect                                                | Buildup of vapors from flammable or combustible liquids             | NNV         | Inside                                        | Division 1                                                | In accordance with 8.3.1                             | NR                       |
|     | b    |                                                                                                      |                                                                     | B           | Open and above grade or inside and ventilated | Division 2                                                |                                                      |                          |
| 23  |      | INVERTED SIPHONS<br>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<br>(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 8.3.1                             | NR                       |
| 25  | a    | RESIDENTIAL DIVERSION STRUCTURES<br>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 8                         | NR                       |
|     | b    |                                                                                                      |                                                                     | B           |                                               | Unclassified                                              |                                                      |                          |
| 26  | a    | RESIDENTIAL BELOWGRADE VALVE VAULT<br>With an exposed residential wastewater surface                 | Possible ignition of gases and floating flammable liquids           | NNV         | Enclosed space                                | Division 2                                                | In accordance with 8.3.1                             | NR                       |
|     | b    |                                                                                                      |                                                                     | B           |                                               | Unclassified                                              |                                                      |                          |
| 27  | a    | RESIDENTIAL CONTROL STRUCTURES<br>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 8                         | NR                       |
|     | b    |                                                                                                      |                                                                     | B           |                                               | Unclassified                                              |                                                      |                          |

## Notes:

(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.

(2) Row and Line columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.

(3) The following codes are used in this table:

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 9

C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9

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

NNV — Not normally ventilated

NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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 |
|-----|------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|---------------------------|-----------------------------------------------------------|------------------------------------------------------|--------------------------|
| 28  | a    | RESIDENTIAL BELOWGRADE METERING VAULT<br>With an exposed residential wastewater surface                   | Possible ignition of flammable gases and floating flammable liquids | NNV         | Enclosed space            | Division 2                                                | In accordance with 8.3.1                             | NR                       |
|     | b    |                                                                                                           |                                                                     | B           |                           | Unclassified                                              |                                                      |                          |
| 29  | a    | DIVERSION STRUCTURES<br>Enclosed structures where wastewater can be diverted                              | Buildup of vapors from flammable or combustible liquids             | NNV         | Enclosed space            | Division 1                                                | In accordance with Chapter 8                         | NR                       |
|     | b    |                                                                                                           |                                                                     | B           |                           | Division 2                                                |                                                      |                          |
| 30  |      | ABOVEGRADE VALVE VAULT<br>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<br>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<br>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                                       |                          |
| 33  | a    | CONTROL STRUCTURES<br>Enclosed structures where wastewater or storm water flow is regulated               | Buildup of vapors from flammable or combustible liquids             | A           | Enclosed space            | Division 1                                                | In accordance with Chapter 8                         | NR                       |
|     | b    |                                                                                                           |                                                                     | B           |                           | Division 2                                                |                                                      |                          |

## Notes:

(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.

(2) Row and Line columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.

(3) The following codes are used in this table:

- 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 9
- C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9
- 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
- NNV — Not normally ventilated
- NR — No requirement

Table 4.2 *Continued*

| Row | Line | 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 |
|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|---------------------------|-----------------------------------------------------------|------------------------------------------------------|--------------------------|
| 34  | a    | WASTEWATER HOLDING BASINS<br>Enclosed structures temporarily holding untreated or partially treated wastewater                                     | Possible ignition of flammable gases and floating flammable liquids | A           | Enclosed space            | Division 1                                                | NC                                                   | NR                       |
|     | b    |                                                                                                                                                    |                                                                     | B           |                           | Division 2                                                | NC, LC, or LFS                                       |                          |
| 35  |      | WASTEWATER HOLDING BASINS, LINED OR UNLINED<br>Open structures holding storm water, combined wastewater, untreated or partially treated wastewater | NR                                                                  | NR          | NR                        | NR                                                        | NR                                                   | NR                       |
| 36  | a    | BELOWGRADE METERING VAULT<br>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                                              |                                                      |                          |
| 37  | a    | BELOWGRADE METERING VAULT<br>With an exposed wastewater surface                                                                                    | Possible ignition of flammable gases and floating flammable liquids | NNV         | Enclosed space            | Division 1                                                | NC                                                   | NR                       |
|     | b    |                                                                                                                                                    |                                                                     | B           |                           | Division 2                                                | NC, LC, or LFS                                       |                          |
| 38  |      | COARSE AND FINE SCREEN FACILITIES<br>(See <i>Coarse and Fine Screen Facilities</i> in Table 5.2.)                                                  |                                                                     |             |                           |                                                           |                                                      |                          |

## Notes:

- (1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.
- (2) Row and Line columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.
- (3) The following codes are used in this table:

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 9  
 C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9  
 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  
 NNV — Not normally ventilated  
 NR — No requirement

## Chapter 5 Liquid Stream Treatment Processes

### 5.1\* General.

**5.1.1** This chapter shall establish minimum criteria for protection against fire and explosion hazards associated with liquid stream treatment processes.

**5.1.2** This chapter shall not apply to treatment systems serving individual structures or treatment systems that principally treat industrial wastes.

**5.2\* Design and Construction.** The design and construction of liquid stream treatment processes shall conform to Table 5.2.

**Table 5.2 Liquid Stream Treatment Processes**

| Row | Line                             | Location and Function                                                          | Fire and Explosion Hazard                                           | Ventilation | Extent of Classified Area <sup>1</sup>                                         | 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<br>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                                |                                                                                |                                                                     | Division 2  |                                                                                | NC, LC, or LFS                                            |                                                      |                            |
|     | Not enclosed, open to atmosphere |                                                                                |                                                                     |             | Within a 3-m (10-ft) envelope around equipment and open channel <sup>2,3</sup> |                                                           |                                                      |                            |
| 2   |                                  | PUMPING STATIONS<br>(See Collection Systems, Table 4.2.)                       |                                                                     |             |                                                                                |                                                           |                                                      |                            |

Notes:

(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.

(2) Row and Line columns are used to refer to the figure in A.5.2 and specific requirements for each location and function.

(3) The following codes are used in this table:

- 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 9
- C — Continuously ventilated at 6 air changes per hour or in accordance with Chapter 9
- CGD — Combustible gas detection system
- D — No ventilation or ventilated at less than 6 air changes per hour
- FE — Portable fire extinguisher
- H — Hydrant protection in accordance with 7.2.4
- LC — Limited-combustible material
- LFS — Low flame spread material
- NA — Not applicable
- NC — Noncombustible material
- NEC — In accordance with NFPA 70
- NR — No requirement

<sup>1</sup>Open channels and open structures upstream from the unit processes are classified the same as the downstream processes they supply.

<sup>2</sup>The area beyond the envelope is unclassified.

<sup>3</sup>Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: (1) Interior of the tank from the minimum operating water surface to the top of the tank wall; (2) Envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; (3) Envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls.

Table 5.2 Continued

| Row | Line                             | Location and Function                                                     | Fire and Explosion Hazard                                           | Ventilation | Extent of Classified Area <sup>1</sup>                                         | NEC-Area Electrical Classification (All Class I, Group D) | Material of Construction for Buildings or Structures | Fire Protection Measures   |
|-----|----------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------|----------------------------|
| 3   | a                                | FLOW EQUALIZATION TANKS<br>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                                |                                                                           |                                                                     | Division 2  |                                                                                | NC, LC, or LFS                                            |                                                      |                            |
|     | Not enclosed, open to atmosphere |                                                                           |                                                                     |             | Within a 3-m (10-ft) envelope around equipment and open channel <sup>2,3</sup> |                                                           |                                                      |                            |
| 4   | a                                | GRIT REMOVAL TANKS<br>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                                |                                                                           |                                                                     | Division 2  |                                                                                | NC, LC, or LFS                                            |                                                      |                            |
|     | Not enclosed, open to atmosphere |                                                                           |                                                                     |             | Within a 3-m (10-ft) envelope around equipment and open channel <sup>2,3</sup> |                                                           |                                                      |                            |

## Notes:

(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space and, therefore, Table 9.1.1.4 also has no requirements.

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<sup>1</sup>Open channels and open structures upstream from the unit processes are classified the same as the downstream processes they supply.

<sup>2</sup>The area beyond the envelope is unclassified.

<sup>3</sup>Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: (1) Interior of the tank from the minimum operating water surface to the top of the tank wall; (2) Envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; (3) Envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls.

Table 5.2 *Continued*

| Row | Line | Location and Function                                                                          | Fire and Explosion Hazard                                           | Ventilation | Extent of Classified Area <sup>1</sup> | NEC-Area Electrical Classification (All Class I, Group D) | Material of Construction for Buildings or Structures                                                                                                                                                                                                                                                       | Fire Protection Measures |
|-----|------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|----------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 5   | a    | PRE-AERATION TANKS<br>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    |                                                                                                |                                                                     | Division 2  |                                        | NC, LC, or LFS                                            |                                                                                                                                                                                                                                                                                                            |                          |
|     | c    |                                                                                                |                                                                     |             | Not enclosed, open to atmosphere       |                                                           | Within a 3-m (10-ft) envelope around equipment and open channel <sup>2,3</sup>                                                                                                                                                                                                                             |                          |
| 6   | a    | PRIMARY SEDIMENTATION TANKS<br>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    |                                                                                                |                                                                     | 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 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls |                          |

## Notes:

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LC — Limited-combustible material

LFS — Low flame spread material

NA — Not applicable

NC — Noncombustible material

NEC — In accordance with NFPA 70

NR — No requirement

<sup>1</sup>Open channels and open structures upstream from the unit processes are classified the same as the downstream processes they supply.

<sup>2</sup>The area beyond the envelope is unclassified.

<sup>3</sup>Where liquid turbulence is not induced by aeration or other factors, the following criteria apply: (1) Interior of the tank from the minimum operating water surface to the top of the tank wall; (2) Envelope 0.46 m (18 in.) above the top of the tank and extending 0.46 m (18 in.) beyond the exterior wall; (3) Envelope 0.46 m (18 in.) above grade extending 3 m (10 ft) horizontally from the exterior tank walls.