NFPA® 150

Fire and Life Safety in Animal Housing Facilities Code

2025 Edition

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NFPA® 150

Fire and Life Safety in Animal Housing Facilities Code

2025 Edition

This edition of NFPA 150, *Fire and Life Safety in Animal Housing Facilities Code*, was prepared by the Technical Committee on Animal Housing Facilities and acted on by the NFPA membership during the 2024 NFPA Technical Meeting held June 20, 2024. It was issued by the Standards Council on August 29, 2024, with an effective date of September 18, 2024, and supersedes all previous editions.

This edition of NFPA 150 was approved as an American National Standard on September 18, 2024.

Origin and Development of NFPA 150

After a series of disastrous fires in racetrack stables in 1975, NFPA established the Committee on Firesafety in Racetrack Stables. This committee began its work in 1976 with the establishment of three working subcommittees covering construction, occupancy requirements, and fire protection. NFPA 150, *Standard on Firesafety in Racetrack Stables*, was first published in 1979. In the 1985 edition, minor changes were made to the standard that included the printing of Table 3 from NFPA 220, *Standard on Types of Building Construction*, in Appendix A. Changes to both the 1991 and 1995 editions consisted of editorial improvements and clarifications of the existing text.

The 2000 edition added a section on equivalency and revised other portions of the text to reflect the *Manual of Style for NFPA Technical Committee Documents* for use of mandatory language.

In 2004, the scope of NFPA 150 expanded to include life and safety requirements for both humans and animals in all types of animal housing facilities. In July 2004, the Standards Council approved the expansion and changed the name of the document to *Standard on Fire and Life Safety in Animal Housing Facilities*. The expanded NFPA 150 provided better guidance to authorities having jurisdiction by addressing all types of animal housing facilities and made possible the consistent treatment of such facilities from jurisdiction to jurisdiction.

The 2009 edition included several updates to referenced codes and standards and to some of the extracted text. A new provision allowing the use of the room-corner test from NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, was introduced to allow an alternative test protocol to evaluate interior finish materials. These refinements continued and a new chapter on performance-based design approaches was added for the 2013 edition. Other changes for that edition included supplemental provisions for the built-in fire protection systems that are mandated by the standard.

Changes for the 2016 edition included several clarifications and additions, including scoping criteria with regard to how the standard should be applied to existing buildings, classification of all agricultural animals in the Category B scheme for protection purposes, and a provision that extends automatic sprinkler and smoke control systems into all facilities that board or house horses.

For the 2019 edition, the entire document was rewritten and changed from a standard to a code, the format reflecting the layout of NFPA *101*®, *Life Safety Code*®, with core and occupancy chapters. Also included were seven new animal categories, some of which were broken down into subcategories, each with specific requirements tailored to the facilities' specific hazards and safety needs. In addition, a new annex was developed that featured a table summarizing fire protection requirements for each animal category.

The 2022 edition included new requirements for risk management in research facilities. New options for emergency forces notification and requirements for annual inspections were added to the agricultural chapter. Updates were also made to the references and extracted text.

The 2025 edition includes a new chapter and related definitions for medical gas systems and a new fire safety checklist annex. Multiple changes to Chapter 17 include new requirements for

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emergency access openings and automatic fire sprinklers and revisions to requirements for automatic detection. Updates have been made to the references and extracted text.

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Committee Scope: This Committee shall have primary responsibility for documents on the loss of animal and human life and property from fire in animal housing facilities, including, but not limited to the following: barns; stables; kennels; animal shelters; animal hospitals; veterinary facilities; zoos, special amusement parks; agricultural facilities; laboratories; and racetrack stable and kennel areas including those stable and kennel areas, barns, and associated buildings at state, county, and local fairgrounds. This Committee does not cover building code or life safety code requirements that are handled by other committees.

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

Chapter 1 Administration

1.1 Scope.

1.1.1* This *Code* shall provide the minimum requirements for the design, construction, fire protection, and classification of animal housing facilities.

1.1.2* Animal housing facilities shall be designed, constructed, and maintained in accordance with the adopted building, fire, and life safety codes and the requirements herein.

1.1.3 Where requirements of this *Code* differ from the adopted fire prevention, life safety, and building codes, the requirements of this *Code* shall govern the protection of the animal occupants and animal handlers.

1.2 Purpose. The purpose of this *Code* shall be to prevent the loss of animal life, human life, and property from fire or other emergencies by providing the minimum requirements for the design, construction, operation, and maintenance of facilities where animals are housed, including, but not limited to, rest, feed, work, exercise, and production areas.

1.3 Application.

Δ **1.3.1*** This *Code* shall apply to animal housing facilities that are subject to local, state, or federal licensing or permitting requirements, including, but not limited to, the following:

(1) Animal hospitals and veterinary facilities
(2) Barns and stables
(3) Laboratories
(4)* Animal shelters and adoption centers
(5) Zoos, special amusement parks, and traveling exhibitions
(6)* General board and care facilities
(7) Agricultural facilities
(8) Emergency facilities

1.3.2 This *Code* shall apply to new animal housing facilities.

1.3.3* This *Code* shall also apply to existing facilities where any one of the following conditions applies:

(1) A change of use or occupancy classification occurs where animals are introduced.
(2) A change is made in the category or quantity of the animals housed.
(3) A facility undergoes rehabilitation that is classified by Chapter 43 of NFPA *101* as a modification, reconstruction, addition, or change of use or occupancy classification.
(4) A building or structure with an animal housing facility is relocated.
(5) A building with an animal housing facility is considered damaged, unsafe, or a fire hazard.
(6) A property line that affects compliance with any provision of this *Code* is created or relocated.

1.3.4* This *Code* shall apply to temporary structures housing animals solely for the purposes of developing a disaster/emergency management program in accordance with 4.3.4.

1.4 Retroactivity. The provisions of this *Code* provide an acceptable degree of protection from the hazards addressed in this *Code* at the time the *Code* was issued.

1.4.1 Unless otherwise specified, the provisions of this *Code* 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 *Code*. Where specified, the provisions of this *Code* shall be retroactive.

1.4.2 This *Code* shall apply to existing installations that are determined by the authority having jurisdiction (AHJ) to constitute imminent danger to animal occupant or animal handler safety.

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

1.5 Equivalency. Nothing in this *Code* 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 *Code*.

1.5.1 Technical documentation shall be submitted to the AHJ to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the AHJ.

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1.5.3 Alternative systems, methods, or devices approved as equivalent by the AHJ shall be recognized as being in compliance with this *Code*.

1.6 Units.

1.6.1 SI Units. Metric units in this *Code* are in accordance with the modernized metric system known as the International System of Units (SI).

1.6.2 Primary and Equivalent Values. If a value for a measurement as given in this *Code* is followed by an equivalent value in other units, the first stated value shall be regarded as the requirement. A given equivalent value might be approximate.

1.7 Enforcement. This *Code* shall be administered and enforced by the AHJ designated by the governing authority. *(See Annex B for sample wording for enabling legislation.)*

Chapter 2 Referenced Publications

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

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

NFPA 1, *Fire Code,* 2024 edition.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2025 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes,* 2025 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies,* 2025 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2023 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* 2024 edition.

NFPA 54/ANSI Z223.1, *National Fuel Gas Code,* 2024 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2024 edition.

NFPA 70®, National Electrical Code®, 2023 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2025 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives,* 2025 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* 2024 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems,* 2024 edition.

NFPA 92, *Standard for Smoke Control Systems,* 2024 edition.

NFPA 99, *Health Care Facilities Code,* 2024 edition.

NFPA *101®, Life Safety Code®,* 2024 edition.

NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives,* 2025 edition.

NFPA 204, *Standard for Smoke and Heat Venting,* 2024 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances,* 2024 edition.

NFPA 220, *Standard on Types of Building Construction,* 2024 edition.

NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls,* 2024 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies,* 2022 edition.

NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies,* 2022 edition.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth,* 2024 edition.

NFPA 288, *Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance–Rated Assemblies,* 2022 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 2023 edition.

NFPA 1140, *Standard for Wildland Fire Protection,* 2022 edition.

NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response and Recovery,* 2024 edition.

NFPA 5000®, Building Construction and Safety Code®, 2024 edition.

2.3 Other Publications.

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

ICC/ANSI A117.1, *American National Standard for Accessible and Usable Buildings and Facilities*, 2019.

2.3.2 ASCE Publications. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE/SEI 7, *Minimum Design Loads for Buildings and Other Structures*, 2022 edition.

N **2.3.3 ASSE Publications.** American Society of Sanitary Engineering, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448.

ASSE 6010, *Professional Qualifications Standard for Medical Gas Systems Installers*, 2021.

ASSE 6030, *Professional Qualifications Standard for Medical Gas Systems Verifiers*, 2021.

2.3.4 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM A269/A269M, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*, 2022.

ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, 2022a.

ASTM B88, *Standard Specification for Seamless Copper Water Tube*, 2022.

ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*, 2020.

ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, 2019.

ASTM D396, *Standard Specification for Fuel Oils*, 2021.

ASTM D3699, *Standard Specification for Kerosene*, 2019.

ASTM D6448, *Industrial Burner Fuels from Used Lube Oils*, 2016, reapproved 2022.

ASTM D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuel*, 2023a.

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ASTM D6823, *Standard Specification for Commercial Boiler Fuels with Used Lubricating Oils*, 2008, reapproved 2021.

ASTM D7666, *Standard Specification for Triglyceride Burner Fuel*, 2012, reapproved 2019.

ASTM E84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, 2023b.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2022.

ASTM E814, *Standard Test Method for Fire Tests of Penetration Fire Stop Systems*, 2023a.

ASTM E1354, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*, 2023.

ASTM E1591, *Standard Guide for Obtaining Data for Fire Growth Models*, 2020.

ASTM E1966, *Standard Test Method for Fire-Resistive Joint Systems*, 2015, reapproved 2019.

ASTM E2307, *Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Apparatus*, 2023a.

N **2.3.5 CGA Publications.** Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151-2923.

CGA G-4.1, *Cleaning Equipment for Oxygen Service*, 2018.

CGA G-8.1, *Standard for Nitrous Oxide Systems at Customer Sites*, 2013.

N **2.3.6 MSS Publications.** Manufacturer's Standardization Society (MSS) of the Valve and Fittings Industry, 127 Park Street NE, Vienna, VA 22180-4602.

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

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

UL 9, *Fire Tests of Window Assemblies*, 2009, revised 2020.

UL 10B, *Fire Tests of Door Assemblies*, 2008, revised 2020.

UL 10C, *Positive Pressure Fire Tests of Door Assemblies*, 2016, revised 2021.

UL 217, *Smoke Alarms*, 8th edition, 2020, revised 2022.

UL 263, *Fire Tests of Building Construction and Materials*, 2011, revised 2022.

UL 268, *Smoke Detectors for Smoke Alarm Systems*, 2023.

UL 296A, *Waste Oil-Burning Air-Heating Appliances*, 2018.

UL 555, *Fire Dampers*, 2006, revised 2020.

UL 555S, *Smoke Dampers*, 2014, revised 2020.

UL 647, *Unvented Kerosene-Fired Room Heaters and Portable Heaters*, 1993, revised 2010.

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2018, revised 2023.

UL 1037, *Antitheft Alarms and Devices*, 2016, revised 2023.

UL 1479, *Fire Tests of Penetration Firestops*, 2015, revised 2023.

UL 2079, *Tests for Fire Resistance of Building Joint Systems*, 2015, revised 2020.

2.3.8 Other Publications.

ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*, 2019.

ASME A17.3, *Safety Code for Existing Elevators and Escalators*, 2020.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2020.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code*, 2024 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2022 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2022 edition.

NFPA 96, *Standard for Ventilation and Control and Fire Protection of Commercial Cooking Operations*, 2024 edition.

NFPA 99, *Health Care Facilities Code*, 2024 edition.

NFPA *101®, Life Safety Code®*, 2024 edition.

NFPA 5000®, Building Construction and Safety Code®, 2024 edition.

Chapter 3 Definitions

Δ 3.1 General.

N **3.1.1** The definitions contained in this chapter shall apply to the terms used in this *Code*.

N **3.1.2** Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used.

N **3.1.3** *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

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

3.2.3* Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

3.2.4 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.

3.2.5* 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

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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.

3.2.6 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1 Addition. An increase in the building area, aggregate floor area, building height, or number of stories of a structure. [**5000,** 2024]

3.3.2 Animal. For the purposes of this *Code*, an air-breathing vertebrate.

N **3.3.2.1** ***Animal Patient.*** Any animal that is present in any animal care category that is being treated for any medical, wellness, injury, or behavioral condition.

3.3.2.2* ***Confined Animals.*** Animals housed such that human intervention is required for their release and evacuation in case of emergency.

3.3.3* Animal Handler. A person responsible for the handling, grooming, and care of confined animals, or reasonably expected to assist in their handling and evacuation in case of emergency.

3.3.4* Animal Housing Facility. Area of a building or structure, including interior and adjacent exterior spaces, where animals are fed, rested, worked, exercised, treated, exhibited, or used for production.

3.3.5 Animal Housing Facility Categories.

3.3.5.1* ***Category 1 — Animal Health Care.*** Animal housing facilities used for short-term care, maintenance, or medical attention of animals.

3.3.5.2 ***Category 1 Class A.*** Facilities where animals are observed overnight, not constantly attended, for short-term care, maintenance, or medical attention.

3.3.5.3 ***Category 1 Class B.*** Facilities where animals are housed temporarily and constantly attended for short-term care, maintenance, or medical attention.

3.3.5.4 ***Category 2 — Horse Facilities.*** Facilities used for temporary or permanent housing for horses.

3.3.5.5 ***Category 2 Class A.*** Facilities where horses are housed for general board and care in a commercial or professional facility greater than 5000 ft^2 (465 m^2).

3.3.5.6 ***Category 2 Class B.*** Facilities where horses are housed for general board and care in a small commercial or professional facility less than 5000 ft^2 (465 m^2).

3.3.5.7 ***Category 2 Class C.*** Facilities where horses are housed in small family stables.

3.3.5.8 ***Category 3 — Research.*** Facilities used for experimentation, education, or scientific experimentation or production research on animals in a controlled environment.

3.3.5.9* ***Category 5 — Exhibition/Public Viewing.*** Facilities that allow public access for the purpose of exhibition or public viewing of animals.

3.3.5.10 ***Category 5 Class A.*** Facilities where public attraction animals are permanently housed.

3.3.5.11 ***Category 5 Class B.*** Facilities where public attraction animals are temporarily housed.

3.3.5.12* ***Category 6 — General Board and Care.*** Facilities used for temporary or permanent housing of animals used for providing a service or participating in a sport or for the purposes of providing general board and care.

3.3.5.13 ***Category 6 Class A.*** Facilities where animals are housed without constant supervision.

3.3.5.14 ***Category 6 Class B.*** Facilities where animals are housed with constant supervision.

3.3.5.15 ***Category 7 — Agriculture.*** Animal housing facilities used for housing agricultural animals used for food or commodity production.

3.3.5.16 ***Category 7 Class A.*** Facilities where agricultural animals are housed for commercial use.

3.3.5.17 ***Category 7 Class B.*** Facilities where agricultural animals are housed in private residential-type animal housing.

3.3.5.18 ***Category 7 Class C.*** Facilities where agricultural animals are housed outdoors.

3.3.5.19 ***Category 8 — Emergency.*** Facilities used for the shelter or care of animals during an emergency event that are either temporary or not typically used for animal occupancy.

N **3.3.6 Animal Patient.** See 3.3.2.1

3.3.7 Building Height. The vertical distance from the grade plane to the average elevation of the highest roof surface. [**5000,** 2024]

3.3.8 Cage. A box or enclosure from which an animal or animals cannot normally escape without human intervention.

3.3.9 Confined Animals. See 3.3.2.2.

3.3.10 Feed Room. See 3.3.24.

3.3.11 Fire Resistance Rating. The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as determined by the tests, or methods based on tests, prescribed by this *Code*. [**5000,** 2024]

3.3.12 General Public. People who do not have an intimate knowledge of the layout of the building or structure, or the general behavior of the animals at the facility, and are not intended personnel.

3.3.13 Intended Personnel. People working in the animal housing facility with an intimate knowledge of the layout of the building or structure and the general behavior of the animals at the facility, such as employees or students, who are not considered the general public.

3.3.14 Mechanical Utility Room. A room that primarily contains mechanical, electrical, plumbing, ventilation, or other utility equipment.

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N **3.3.15 Medical Gas 1 Space.** Space in which failure of equipment or a system is likely to cause major injury or death of patients, staff, or visitors.

N **3.3.16 Medical Gas 2 Space.** Space in which failure of equipment or a system is likely to cause minor injury to patients, staff, or visitors.

3.3.17 Modification. The reconfiguration of any space, the addition or elimination of any door or window, the addition or elimination of load-bearing elements, the reconfiguration or extension of any system, or the installation of any additional equipment. [**5000,** 2024]

Δ **3.3.18 Occupancy.** See NFPA *101*.

N **3.3.19 Patient Care Space.** Any space within a veterinary, shelter medicine, animal health, animal transport, animal laboratory, animal research, or other animal care facility wherein animals are intended to be examined, treated or studied, or have procedures performed on them.

3.3.20* Protection. A device, material, or system that provides a specified level of safety to achieve a desired outcome.

3.3.21 Qualified. A competent and capable person who has met the requirements and training for a given field acceptable to the AHJ. [**96,** 2024]

3.3.22 Reconstruction. The reconfiguration of a space that affects an exit, or a corridor shared by more than a single tenant; or reconfiguration of space such that the rehabilitation work area is not permitted to be occupied because existing means of egress and fire protection systems, or their equivalent, are not in place or continuously maintained. [**5000,** 2024]

3.3.23 Renovation. The replacement in kind, strengthening, or upgrading of building elements, materials, equipment, or fixtures that does not result in a reconfiguration of the building or spaces within. [**5000,** 2024]

3.3.24 Stall. A room or compartment that normally houses one or more animals.

3.3.25 Tack. Stable gear; also harnesses, bridles, saddles, and other accessories used in riding or driving horses.

N **3.3.26 Waste Anesthetic Gas Disposal (WAGD).** Exhaust systems specifically designed to remove exhalation and waste anesthetic gases to the outdoors, which are also known as veterinary scavenger systems.

Chapter 4 General Requirements

4.1* Goals and Objectives.

4.1.1* Goals. The primary goals of this *Code* shall be safety and facility usability for both human and animal occupants, including property protection as it relates to the primary goals.

4.1.2* Objectives. To achieve the goals stated in 4.1.1, the goals and objectives of 4.1.3 and 4.1.4 shall be satisfied.

4.1.3 Safety. The intent of the safety goal of this *Code* shall be to reduce the probability of injury or death to both animal and human occupants from fire, similar emergencies, and facility use.

4.1.3.1 Safety from Fire.

4.1.3.1.1* Safety-from-Fire Goals. The fire safety goals of this *Code* shall be as follows:

(1) To provide a safe environment for human occupants inside an animal housing facility
(2) To provide a safe environment for animal occupants inside or adjacent to a structure
(3) To provide a level of safety for firefighters and emergency responders during search-and-rescue operations for animal and human occupants
(4) To minimize loss of property and interruption of facility operations from fire and similar emergencies to a level that is as low as reasonably practical

4.1.3.1.2 Safety-from-Fire Objectives.

4.1.3.1.2.1 Facilities shall be designed and constructed to protect human and animal occupants not intimate with the initial fire development for the time needed to evacuate, relocate, or defend in place.

4.1.3.1.2.2* Facilities shall be designed and constructed to allow firefighters and emergency responders the ability to conduct search-and-rescue operations for animal and human occupants without sustaining permanent disabilities if conducted.

4.1.3.1.2.3 Facilities shall be designed and constructed to provide access to the structure for emergency responders.

4.1.3.2 Safety During Facility Use.

4.1.3.2.1* Safety-During-Facility-Use Goal. The safety-during-facility-use goal of this *Code* shall be to provide an environment for both the human and animal occupants of the facility that minimizes hazards and provides an approved means of egress at all times.

4.1.3.2.2 Safety-During-Facility-Use Objectives.

4.1.3.2.2.1 Facilities shall be designed and constructed to allow occupants to evacuate or defend in place during emergency or nonemergency operations without sustaining a permanent disability.

4.1.3.2.2.2 Facilities shall be designed and constructed to allow occupants to recognize the development of an unwanted fire at its incipient stage.

4.1.3.2.2.3* Facilities shall be designed and constructed to allow human occupants to evacuate animal occupants or provide defend-in-place measures depending on the animal category.

4.1.4 Usability Goal. The intent of the usability goal of this *Code* shall be to ensure that the facility is capable of functioning at the level for which it was designed.

4.1.4.1 Function.

4.1.4.1.1* Function Goal. The intent of the function goal of this *Code* shall be to ensure that a facility and its systems, features, and construction, throughout its life, provide capability of operation to satisfy the other goals of this *Code*.

4.1.4.1.2* Function Objective. Facilities shall be designed and constructed to provide assurance that its systems, features, and construction are capable of performing their intended use to satisfy the objectives of this *Code*.

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4.2 Fundamental Fire and Life Safety Requirements.

4.2.1 Multiple Safeguards.

4.2.1.1 The design of every facility intended for animal and human occupancy shall be such that reliance for property protection and safety to life does not depend solely on any single safeguard.

4.2.1.2 Additional safeguard(s) shall be provided for property protection and life safety in case any single safeguard is ineffective due to inappropriate animal or human actions, building failure, or system failure.

4.2.2 Appropriateness of Safeguards. Every facility shall be provided with means of egress and other fire and life safety safeguards of the kinds, numbers, locations, and capacities appropriate to the individual facility, with due regard to the following:

(1) Character of the occupancy, including fire load
(2) Characteristics and capabilities of both human and animal occupants and their responses to fire protection safeguards
(3) Number of animals and persons exposed
(4) Fire protection available
(5) Height, size, and type of construction of the facility
(6) Other factors necessary to provide animal and human occupants with a reasonable degree of safety
(7) Other factors necessary to protect the facility and contents from unacceptable damage
(8) Available water supplies
(9) Alternate noncombustible and limited-combustible construction techniques or materials

4.2.3 Means of Egress. The minimum number of means of egress for human and animal occupants shall be in accordance with Chapter 8.

4.2.4* Occupant Notification. In every facility of such size, arrangement, or occupancy that a fire itself might not provide adequate occupant warning, fire alarm systems shall be provided where required to warn human occupants of the existence of fire.

4.2.5 System Design and Installation. Any fire protection system, building service equipment, feature of protection, or safeguard provided for fire and life safety shall be designed, installed, and approved in accordance with applicable NFPA codes and standards.

4.2.6 Limiting Fire Spread.

4.2.6.1 The interior surfaces of the facility shall not contribute to an unacceptable rate and magnitude of fire spread and generation of heat and smoke.

4.2.6.2 Where required by other chapters of this *Code*, every building shall be divided into compartments to limit the spread of fire and restrict the movement of smoke.

4.2.7 Structural Integrity. The facility's structural members and assemblies shall be provided with the required degree of fire resistance to limit structural damage, damage to the building and its contents, and damage to adjacent buildings and property.

4.3 General Requirements.

4.3.1 Authority Having Jurisdiction (AHJ).

4.3.1.1 The AHJ shall determine whether the provisions of this *Code* are met.

4.3.1.2 Where it is evident that a reasonable degree of safety is provided, any requirement shall be permitted to be modified if, in the judgment of the AHJ, its application would be hazardous under normal occupancy conditions.

4.3.1.3* Any requirements that are essential for the safety of building occupants and that are not specifically provided for by this *Code* shall be determined by the AHJ.

4.3.2 Provisions in Excess of *Code* Requirements. Nothing in this *Code* shall be construed to prohibit a superior type of building construction, an additional means of egress, or an otherwise safer condition than that specified by the minimum requirements of this *Code*.

4.3.3 Maintenance and Testing.

4.3.3.1 Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature is required for compliance with the provisions of this *Code*, such device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or other feature shall thereafter be continuously maintained.

4.3.3.2 Maintenance shall be provided in accordance with applicable NFPA requirements or requirements developed as part of a performance-based design, or as directed by the AHJ.

4.3.3.3 No existing life safety feature shall be removed or reduced where such feature is a requirement in this *Code*.

4.3.3.4 Existing life safety features obvious to the public, if not required by the code, shall be either maintained or removed.

4.3.3.5 Any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature requiring periodic testing, inspection, or operation to ensure its maintenance shall be tested, inspected, or operated as specified elsewhere in this *Code* or as directed by the AHJ.

4.3.3.6 Maintenance, inspection, and testing shall be performed under the supervision of a responsible person who shall ensure that testing, inspection, and maintenance are made at specified intervals in accordance with applicable NFPA standards or as directed by the AHJ.

4.3.4 Disaster/Emergency Management Program.

4.3.4.1* General. Disaster/emergency management programs shall be required in all animal housing facilities to protect and ensure the safety of the animal and human occupants during fire or other similar emergencies.

4.3.4.2 Program Requirements.

4.3.4.2.1* Disaster/emergency management programs shall be developed in accordance with NFPA 1660 and shall include the procedures for reporting emergencies; the occupant and staff response to emergencies; the design and conduct of disaster/emergency drills; the type and coverage of building fire protection systems; a hazard assessment identifying hazards to

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human and animal life; plans to monitor and reduce known hazards; and other items required by the AHJ.

4.3.4.2.2 Required disaster/emergency management programs shall be submitted to the AHJ for review and approval if required.

4.3.4.2.3 Disaster/emergency management programs shall be reviewed and updated annually.

4.3.4.2.4 Revised plans shall be submitted for review and updates shall be provided whenever changes are made in the occupancy or physical arrangement of the building or fire protection systems or features.

4.3.4.2.5 Floor plans shall be provided to the AHJ, if required.

4.3.4.2.6 In accordance with the disaster/emergency management program, equipment designated as necessary for the evacuation or relocation of animals shall be accessible at all times.

4.3.4.2.7 Information regarding the disaster/emergency management program shall be posted for reference.

4.3.4.2.8 Where animals pose a danger to first responder health or safety, the disaster/emergency management program shall be shared with the AHJ and instructional signage indicating hazards and special procedures shall be posted.

4.3.5* Disaster/Emergency Drills.

4.3.5.1 General. Disaster/emergency drills conforming to the provisions of this *Code* shall be conducted in cooperation with the local authorities and as specified by this *Code* or by the AHJ.

4.3.5.2 Drill Frequency.

4.3.5.2.1 Where required by this *Code* or the AHJ, disaster/emergency drills shall be held to familiarize occupants with the drill procedure and to establish conduct of the drill as a matter of routine.

4.3.5.2.2* Disaster/emergency drills shall include procedures to ensure that all persons subject to the drill participate.

Δ Chapter 5 Medical Gas Systems

N 5.1* Applicability.

N 5.1.1 Chapter 5 shall apply to veterinary, shelter medicine, animal health, animal transport, animal laboratory, animal research, or other animal care facilities that require Medical Gas 1 and Medical Gas 2 systems.

N 5.1.2 Medical Gas 1 and Medical Gas 2 piped gas or piped vacuum system requirements shall be applied where any of the following criteria is met:

(1) General anesthesia or deep sedation is performed
(2) The loss of the piped gas or piped vacuum systems is likely to cause major injury or death of patients, staff, or visitors
(3) The facility piped gas or piped vacuum systems are intended for Medical Gas 1 and Medical Gas 2 patient care space

N 5.1.3* Where the terms medical gas or medical support gas occur, the provisions shall apply to all piped systems for oxygen, nitrous oxide, medical air, instrument air, and mixtures thereof as well as vacuum and waste anesthetic gas disposal (WAGD) systems.

N 5.1.4 Wherever the name of a specific gas service occurs, the provision shall apply only to that gas.

N 5.1.5 Continued use of an existing system that is not in strict compliance with the provisions of this chapter shall be permitted if the authority having jurisdiction has determined that such use does not constitute a distinct hazard to life.

N 5.2 Medical Gas 1 and Medical Gas 2 Sources.

N 5.2.1 Central Supply System Operations.

N 5.2.1.1 The use of adapters or conversion fittings to adapt one gas-specific fitting to another shall be prohibited.

N 5.2.1.2 No flammable materials, cylinders containing flammable gases, or containers containing flammable liquids shall be stored in rooms with gas cylinders.

N 5.2.1.3 Cylinders without correct markings or whose markings and gas-specific fittings do not match shall not be used.

N 5.2.1.4 Cryogenic liquid storage units intended to supply gas to the facility shall not be used to trans fill other liquid storage vessels.

N 5.2.1.5 Care shall be exercised when handling cylinders that have been exposed to freezing temperatures or containers that contain cryogenic liquids to prevent injury to the skin.

N 5.2.1.6 Cylinders containing compressed gases and containers for volatile liquids shall be kept away from radiators, steam piping, and like sources of heat.

N 5.2.1.7 When cylinder valve protection caps are supplied, they shall be secured tightly in place unless the cylinder is connected for use.

N 5.2.1.8 Cylinders in use and in storage shall be prevented from reaching temperatures in excess of 125°F (52°C).

N 5.2.2* Central Supply System Locations.

N 5.2.2.1 General. Central supply systems shall be located to meet the criteria in 5.2.2.1.1 through 5.2.2.1.5.

N 5.2.2.1.1 Any of the following systems shall be permitted to be located together in the same outdoor enclosure:

(1) Manifolds for gas cylinders
(2) Manifolds for cryogenic liquid containers
(3) Bulk cryogenic liquid systems

N 5.2.2.1.2 Any of the following systems shall be permitted to be located together in the same indoor enclosure:

(1) Manifolds for gas cylinders
(2) Manifolds for cryogenic liquid containers
(3) In-building emergency reserves

N 5.2.2.1.3 Any of the following systems shall be permitted to be located together in the same room:

(1) Medical air compressor supply sources
(2) Medical-surgical vacuum sources
(3) Waste anesthetic gas disposal (WAGD) sources
(4) Any other compressor, vacuum pump, or electrically powered machinery
(5) Veterinary anesthesia cart bottled isoflurane or other cart-mounted anesthetic
(6) Veterinary anesthesia cart bottled oxygen

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N **5.2.2.1.4** Indoor storage locations for oxygen and other gases shall not communicate with the following:

(1) Areas involved in critical patient care
(2) Anesthetizing locations where moderate sedation, deep sedation, or general anesthesia is administered
(3) Locations storing flammables
(4) Rooms containing open electrical contacts or transformers
(5) Storage tanks for ignitible (flammable or combustible) liquids
(6) Engines
(7) Kitchens
(8) Areas with open flames

N **5.2.2.1.5** Central supply systems for oxygen with a total capacity connected and in storage of 20,000 ft^3 (566,335 L) or more outside of the facility at standard temperature and pressure (STP) shall comply with NFPA 55.

N **5.2.2.2* Design and Construction.** Locations for central supply systems and the storage of positive-pressure gases shall meet all of the following requirements:

(1) They are constructed with access to move cylinders, equipment, and so forth, in and out of the location on hand trucks.
(2) They have lockable doors or gates or are otherwise able to be secured.
(3) If outdoors, they are provided with an enclosure (wall or fencing) constructed of noncombustible materials with a minimum of two entries/exits.
(4) If outdoors, bulk cryogenic liquid systems are provided with a minimum of two entries/exits.
(5) If indoors, they have interior finishes of noncombustible or limited-combustible materials.
(6) If indoors, the room is separated from the rest of the building by walls and floors having a 1-hour fire resistance rating with doors and other opening protectives having a ¾-hour fire protection rating.
(7) They are provided with racks, chains, or other fastenings to secure all cylinders from falling, whether connected, unconnected, full, or empty.
(8) They are supplied with electrical power from an emergency generator or enough uninterruptable power supply (UPS) to carry the load until the generator power is fully functioning or orderly transfer to anesthesia cart-mounted medical gas is completed.
(9) They have racks, shelves, and supports, where provided, constructed of noncombustible materials or limited-combustible materials.
(10) Electrical devices are protected from physical damage.
(11) They allow access by delivery vehicles and management of cylinders (e.g., proximity to loading docks, access to elevators, and passage of cylinders through public areas).
(12) They are designed to meet the operational requirements of 5.2.2 regarding room temperature.

N **5.2.2.3 Ventilation.**

N **5.2.2.3.1 Ventilation for Indoor Locations.** Medical gas storage and transfilling rooms shall be provided with adequate ventilation based on the stored gases in accordance with 5.2.2.3.

N **5.2.2.3.2 Natural Ventilation.**

N **5.2.2.3.2.1** Natural ventilation shall consist of two nonclosable louvered openings, each having an aggregate free opening area of at least 24 in^2 per 1000 ft^3 (155 cm^2 per 35 L) of the fluid designed to be stored in the space and not less than 72 in^2 (465 cm^2).

N **5.2.2.3.2.2** One opening shall be located within 1 ft (300 mm) of the floor, and one shall be located within 1 ft (300 mm) of the ceiling.

N **5.2.2.3.3 Mechanical Ventilation.**

N **5.2.2.3.3.1** Mechanical exhaust to maintain a negative pressure in the space shall be provided continuously, unless an alternative design is approved by the authority having jurisdiction.

N **5.2.2.3.3.2** Mechanical exhaust shall be at a rate of 1 cfm of airflow for each 5 ft^3 (1 L/sec per 300 L of fluid) designed to be stored in the space and not less than 50 cfm (24 L/sec) nor more than 500 cfm (235 L/sec).

N **5.2.2.3.3.3** Mechanical exhaust inlets shall be unobstructed and shall draw air from within 1 ft (300 mm) of the floor and adjacent to the cylinder or containers.

N **5.2.2.3.3.4** Dedicated exhaust systems shall not be required, provided that the system does not connect to spaces that contain ignitible (flammable or combustible) materials.

N **5.2.2.3.3.5** The exhaust duct material shall be noncombustible.

N **5.2.2.3.3.6** A means of make-up air shall be provided according to one of the following:

(1) Air provided via noncombustible ductwork to be transferred from adjacent spaces, from outside the building, or from spaces that do not contain combustible or flammable materials.
(2) Air transferred from a corridor under the door up to 50 cfm (24 L/sec) or 15 percent of the room exhaust, whichever is greater.
(3) Supply air provided from any building ventilation system that does not contain flammable or combustible vapors.

N **5.2.2.3.4 Venting of Relief Valves.** Indoor supply systems shall have all relief valves vented.

N **5.2.2.3.5 Ventilation for Motor-Driven Equipment.** The following source locations shall be adequately ventilated to prevent accumulation of heat:

(1) Medical air sources
(2) Medical–surgical vacuum sources
(3) Waste anesthetic gas disposal (WAGD) sources

N **5.2.2.3.6 Ventilation for Outdoor Locations.** Ventilation for outdoor locations shall comply with all the following:

(1) Outdoor locations surrounded by impermeable walls, except fire barrier walls, have protected ventilation openings located at the base of each wall to allow free circulation of air within the enclosure.
(2) Walls that are shared with other enclosures or with buildings are permitted to not have openings.
(3) The fire barrier wall has no openings or penetrations, except conduit or piping, provided that the penetration is

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protected with a firestop system in accordance with the building code.

N 5.2.2.4 Storage of Unconnected Gas Cylinders.

N 5.2.2.4.1 Full or empty medical gas cylinders, when not connected, shall be stored in accordance with 5.2.2.4.

N 5.2.2.4.2 Unconnected gas cylinders shall be permitted to be in the same rooms or enclosures as their respective central supply systems.

N 5.2.2.4.3 Storage of volumes between 300 ft^3 (8495 L) and 3000 ft^3 (84,950 L) shall be stored in locations that are outdoors or in an interior enclosure of noncombustible or limited-combustible construction.

N 5.2.2.4.4 Indoor locations shall include all of the following:

(1) Restriction of oxidizing gases from being stored with any flammable gas, liquid, or vapor.
(2) Separation of oxidizing gases from combustibles or flammables by a minimum distance of 20 ft (6.1 m) or a distance of 5 ft (1.5 m) where the entire storage location is sprinklered or a gas cabinet.
(3) Regulation of temperatures.
(4) Appropriate restraints and cylinder valve protection caps.
(5) Smoking, open flames, electric heating elements, prohibited from location and within 20 ft (6.1 m) outside location.

N 5.2.3 Central Supply Systems.

N 5.2.3.1 General. Central supply systems shall be obtained from a supplier or manufacturer familiar with their proper construction and use and installed in accordance with the manufacturer's instructions.

N 5.2.3.2 Permitted Locations for Medical Gases. Central supply systems and medical gas outlets for oxygen, medical air, nitrous oxide, carbon dioxide, and all other patient medical gases shall be piped only into areas where the gases will be used under the direction of licensed veterinary medical professionals.

N 5.2.3.3* Materials. Materials used in central supply systems shall meet all of the following requirements:

(1) In those portions of systems intended to handle oxygen at gauge pressures greater than 350 psi (2413 kPa), interconnecting hose contains no polymeric materials.
(2) In those portions of systems intended to handle oxygen or nitrous oxide material, construction is compatible with oxygen under the temperatures and pressures to which the components can be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen.
(3) If potentially exposed to cryogenic temperatures, materials are designed for low temperature service.
(4) If intended for outdoor installation, materials are installed as per the manufacturer's requirements.

N 5.2.3.4 Final Line Pressure Regulators.

N 5.2.3.4.1 All positive pressure supply systems shall be provided with duplex line pressure regulators piped in parallel with all of the following characteristics:

(1) They are provided with isolation valves on the source side of each regulator.
(2) They are provided with isolation or check valves on the patient side of each regulator.
(3) A pressure indicator(s) is located downstream (patient or use side) of each regulator or immediately downstream of the isolating valves for the regulators.
(4) They are piped to allow either regulator to be serviced without interrupting supply.
(5) Each regulator is be sized for 100 percent of the peak calculated demand.
(6) They are constructed of materials deemed suitable by the manufacturer.

N 5.2.3.4.2 Central supply systems for positive pressure gases shall include one or more relief valves, all meeting the following requirements:

(1) They are located between each final line regulator and the source valve.
(2) They have a relief setting that is 50 percent above the normal system operating pressure.

N 5.2.4 Emergency Plan. The facility staff shall develop their emergency plan to address the loss of piped medical gas and the loss of medical–surgical vacuum.

N 5.3 Valves.

N 5.3.1 General.

N 5.3.1.1 Gas and Vacuum Shutoff Valves. Shutoff valves shall be provided to isolate sections or portions of the piped distribution system for maintenance, repair, or planned future expansion need and to facilitate periodic testing.

N 5.3.1.2 Labeling. All valves shall be labeled as to the gas supplied and the area(s) controlled.

N 5.4* Station Outlets/Inlets.

N 5.4.1 Each station outlet/inlet for medical gases or vacuums shall be gas-specific, whether the outlet/inlet is threaded or is a noninterchangeable quick coupler.

N 5.4.2 Each outlet/inlet shall be legibly identified.

N 5.4.3 Station outlets/inlets shall be permitted to be recessed or otherwise protected from damage.

N 5.4.4 When multiple wall outlets/inlets are installed, they shall be spaced to allow the simultaneous use of adjacent outlets/inlets with any of the various types of therapy equipment.

N 5.4.5 Station outlets in systems having nonstandard operating pressures shall meet all of the following additional requirements:

(1) They are gas-specific.
(2) They are pressure-specific where a single gas is piped at more than one operating pressure [e.g., a station outlet for oxygen at 80 psi (550 kPa) does not accept an adapter for oxygen at 50 psi (345 kPa)].
(3) If operated at a pressure in excess of 80 psi (550 kPa), they are either DISS connectors or comply with 5.4.5(4).
(4) If operated at a gauge pressure between 200 psi and 300 psi (1380 kPa and 2070 kPa), the station outlet is designed to prevent the removal of the adapter until the pressure has been relieved to prevent the adapter from injuring the user or others when removed from the outlet.

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N **5.4.6** WAGD networks shall provide a WAGD inlet in all locations where halogenated anesthetic gas is intended to be administered.

N **5.4.6.1** Station inlets for WAGD service shall have the following additional characteristics:

(1) They are not interchangeable with any other systems, including medical–surgical vacuum.
(2) Components necessary for the maintenance of WAGD specificity are legibly marked to identify them as components of a WAGD inlet.
(3) They are of a type appropriate for the flow and vacuum level required by the facility's gas anesthetic machines.
(4) They are be located to avoid physical damage to the inlet.

N **5.5 Medical Gas 1 and Medical Gas 2 Warning Systems.**

N **5.5.1 General.** All master, area, and local alarm systems used for medical gas and vacuum systems shall include all of the following:

(1) Separate visual indicators for each condition monitored, except as permitted for local alarms that are displayed on master alarm panels
(2) Means to indicate a lamp or LED failure and audible failure
(3) Visual and audible indication that the communication with an alarm-initiating device is disconnected
(4) Labeling of each indicator, indicating the condition monitored
(5) Labeling of each alarm panel for its area of surveillance
(6) Reinitiation of the audible signal if another alarm condition occurs while the audible alarm is silenced
(7) Power for master, area alarms, sensors, and switches from the emergency power system
(8) Communication devices that do not use electrical wiring for signal transmission are supervised such that failure of communication shall initiate an alarm

N **5.5.2 Master Alarms.** A master alarm system shall be provided to monitor the operation and condition of the source of supply and the pressure in the main lines of each medical gas and vacuum piping system.

N **5.5.2.1** Master alarm panels for medical gas and vacuum systems shall each include the following signals:

(1) Alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure
(2) Alarm indication when the medical–surgical vacuum pressure in the main line of each vacuum system drops to or below 12 in. (300 mm) gauge HgV
(3) WAGD low alarm when the WAGD vacuum level or flow is below effective operating limits

N **5.6 Medical Gas 1 and Medical Gas 2 Distribution.**

N **5.6.1 Piping Materials for Field Installed Positive Pressure Medical Gas Systems.**

N **5.6.1.1** Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service by the manufacturer prior to installation in accordance with the mandatory requirements of CGA G-4.1, *Cleaning Equipment for Oxygen Service*, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.

N **5.6.1.2** Each length of tube shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation.

N **5.6.1.3** Fittings, valves, and other components shall be delivered sealed and labeled and kept sealed until prepared for installation.

N **5.6.1.4*** Tubes shall be hard-drawn seamless copper in accordance with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*; medical gas tube; or Type L, except Type K, which shall be used where operating pressures are above a gauge pressure of 185 psi (1275 kPa) and the pipe sizes are larger than NPS 3 [3⅛ in. OD (DN80)].

N **5.6.1.5** ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems,* medical gas tube shall be identified by the manufacturer's markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue (Type L) or green (Type K).

N **5.6.1.6** The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of 5.6.1.1.

N **5.6.2 Piping Materials for Field Installed Medical–Surgical Vacuum and WAGD Systems.**

N **5.6.2.1 Tubes for Vacuum.**

(1) Hard-drawn seamless copper tube in accordance with the following:
   (a) ASTM B88, *Standard Specification for Seamless Copper Water Tube*, copper tube (Type K, Type L, or Type M)
   (b) ASTM B280, *Standard Specification for Seamless Copper Tubing for Air Conditioning and Refrigeration Field Service*, copper ACR tube
   (c) ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, copper medical gas tubing (Type K or Type L)
(2) Stainless steel tube in accordance with the following:
   (a) ASTM A269, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*, TP304L or 316L
   (b) ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, TP304L or 316L
   (c) ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, TP 304L/316L, Sch. 5S pipe, and A403WP304L/316L, Sch. 5S fittings

N **5.6.3 Prohibited Joints.** The following joints shall be prohibited throughout medical gas and vacuum distribution pipe-line systems:

(1) Flared and compression-type connections, including connections to station outlets and inlets, alarm devices, and other components
(2) Other straight-threaded connections, including unions
(3) Pipe-crimping tools used to permanently stop the flow of medical gas and vacuum piping
(4) Removable and nonremovable push-fit fittings that employ a quick assembly push-fit connector

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N 5.6.4 Installation of Piping and Equipment.

N 5.6.4.1 Pipe Sizing.

N 5.6.4.1.1 Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.

N 5.6.4.1.2 Mains and branches in medical gas piping systems shall be not less than NPS ½ [⅝ in. OD (DN15)] size.

N 5.6.4.1.3 Mains and branches in medical–surgical vacuum systems shall be not less than NPS ¾ [⅞ in. OD (DN20)] size.

N 5.6.4.1.4 Drops to individual station outlets and inlets shall be not less than NPS ½ [⅝ in. OD (DN15)] size.

N 5.6.4.1.5 Runouts to alarm panels and connecting tubing for gauges and alarm devices shall be permitted to be NPS ¼ [⅜ in. OD (DN8)] size.

N 5.6.4.2 Protection of Piping. Piping shall be protected against freezing, corrosion, and physical damage.

N 5.6.4.2.1 Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected.

N 5.6.4.2.2 Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.

N 5.6.4.3 Location of Piping.

N 5.6.4.3.1 Piping risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.

N 5.6.4.3.2 Piping shall not be installed in kitchens, elevator shafts, elevator machine rooms, areas with open flames, and areas prohibited under *NFPA 70*.

N 5.6.4.4 Pipe Support.

N 5.6.4.4.1 Piping shall be supported from the building structure.

N 5.6.4.4.2 Hangers and supports shall comply with and be installed in accordance with MSS SP-58, *Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation*.

N 5.6.4.4.3 Supports for copper tube shall be sized for copper tube.

N 5.6.4.4.4 In potentially damp locations, copper tube hangers or supports that are in contact with the tube shall be plastic-coated or otherwise be electrically insulated from the tube by a material that will not absorb moisture.

N 5.6.4.4.5 Maximum support spacing shall be in accordance with Table 5.6.4.4.5.

N 5.6.4.4.6 Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code.

N 5.6.4.5 Prohibited System Interconnections.

N 5.6.4.5.1 Two or more medical gas or vacuum piping systems shall not be interconnected for installation, testing, or any other reason, except as permitted by 5.6.4.5.2.

N Table 5.6.4.4.5 Maximum Pipe Support Spacing

Pipe Size	Hanger Spacing	
	mm	ft
DN8 (NPS ¼) (⅜ in. O.D.)	1520	5
DN10 (NPS ⅜) (½ in. O.D.)	1830	6
DN15 (NPS ½) (⅝ in. O.D.)	1830	6
DN 20 (NPS ¾) (⅞ in. O.D.)	2130	7
DN25 (NPS 1) (1 ⅛ in. O.D.)	2440	8
DN32 (NPS 1 ¼) (1 ⅜ in. O.D.)	2740	9
DN40 (NPS 1 ½) (1 ⅝ in. O.D.) and larger	3050	10
Vertical risers, all sizes, every floor, but not to exceed	4570	15

N 5.6.4.5.2 Medical gas and vacuum systems with the same contents shall be permitted to be interconnected with an in-line valve installed between the systems.

N 5.6.4.5.3 Leak testing shall be accomplished by separately charging and testing each individual piping system.

N 5.6.4.6 Manufacturer's Instructions.

N 5.6.4.6.1 The installation of individual components shall be made in accordance with the instructions of the manufacturer.

N 5.6.4.6.2 Manufacturer's instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper operation, testing, and maintenance of the medical gas and vacuum systems.

N 5.6.4.6.3 Copies of the manufacturer's instructions shall be left with the system owner.

N 5.6.4.7 Qualification of Installers.

N 5.6.4.7.1 The installation of medical gas and vacuum systems shall be completed by qualified, competent technicians who are experienced in performing such installations, including all personnel who actually install the piping system.

N 5.6.4.7.2 Installers of medical gas and vacuum piped distribution systems, all appurtenant piping supporting pump and compressor source systems, and appurtenant piping supporting source gas manifold systems, not including permanently installed bulk source systems, shall be certified in accordance with ASSE 6010, *Professional Qualification Standard for Medical Gas Systems Installers*.

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N 5.7* Labeling, Identification, and Operating Pressure. Color and pressure requirements shall be in accordance with Table 5.7.

N 5.7.1 Pipe Labeling.

N 5.7.1.1 Piping shall be labeled by stenciling or adhesive markers that identify the medical gas, WAGD piping, or the vacuum system and include the following:

(1) Name of the gas or vacuum system or the chemical symbol per Table 5.7
(2) Gas or vacuum system color code per Table 5.7

N 5.7.1.2 Pipe labels shall be located as follows:

(1) At intervals of not more than 20 ft (6.1 m)
(2) At least once in or above every room
(3) On both sides of walls or partitions penetrated by the piping
(4) At least once in every story height traversed by risers

N 5.7.1.3 Medical gas piping shall not be painted.

N 5.7.2 Shutoff Valves.

N 5.7.2.1 Shutoff valves shall be identified with all of the following:

(1) Name or chemical symbol for the specific medical gas or vacuum system
(2) Room or areas served
(3) Caution to not close or open the valve except in emergency

N 5.7.3 Station Outlets and Inlets.

N 5.7.3.1 Station outlets and inlets shall be identified as to the name or chemical symbol for the specific medical gas or vacuum provided.

N 5.7.3.2 Where medical gas systems operate at pressures other than the standard gauge pressure of 50 psi to 55 psi (345 kPa to 380 kPa) or a gauge pressure of 160 psi to 185 psi (1100 kPa to 1275 kPa) for nitrogen, the station outlet identification shall include the nonstandard operating pressure in addition to the name of the gas.

N 5.7.4 Alarm Panels.

N 5.7.4.1 Labeling of alarm panels for each indicator shall indicate the condition monitored and its area of surveillance.

N Table 5.7 Standard Designation Colors and Operation Pressures for Gas and Vacuum Systems

Gas Service	Abbreviated Name	Colors (Background/Text)	Standard Gauge	
			kPa	psi
Medical air	Med air	Yellow/black	345-380	50-55
Carbon dioxide	CO_2	Gray/black of gray/white	345-380	50-55
Helium	He	Brown/white	345-380	50-55
Nitrogen	N_2	Black/white	1100-1275	160-185
Nitrous oxide	N_2O	Blue/white	345-380	50-55
Oxygen	O_2	Green/white or white/green	345-380	50-55
Oxygen/carbon dioxide mixtures	O_2/CO_{2n} % (n = % of CO_2)	Green/white	345-380	50-55
Medical-surgical vacuum	Med vac	White/black	380 mm to 760 mm (15.in. to 30 in.) HgV	
Waste anesthetic gas disposal	WAGD	Violet/white	Varies with system type	
Other mixtures	Gas A%/Gas B%	Colors as above Major gas for background/minor gas for text	None	
Nonmedical air (Category 3 gas-powered device)		Yellow and white diagonal stripe/black	None	
Nonmedical and Category 3 vacuum		White and black diagonal stripe/black boxed	None	
Laboratory air		Yellow and white checkerboard/black	None	
Laboratory vacuum		White and black checkerboard/black boxed	None	
Instrument air		Red/white	110-1275	160-185

[**99:**Table 5.1.11]

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N 5.8* Performance Criteria and Testing — Medical Gas 1 and Medical Gas 2 (Gases, Medical–Surgical Vacuum, and WAGD).

N 5.8.1 General.

N 5.8.1.1 Inspection and testing shall be performed on all new piped gas systems, additions, renovations, temporary installations, or repaired systems to ensure, by a documented procedure, that all applicable provisions of this document have been adhered to and system integrity has been achieved or maintained.

N 5.8.1.2 Inspection and testing shall include all components of the system, or portions thereof, including, but not limited to, gas bulk source(s); manifolds; compressed air source systems (e.g., compressors, dryers, filters, regulators); source alarms and monitoring safeguards; master alarms; pipelines; isolation valves; area alarms; zone valves; and station inlets (vacuum) and outlets (pressure gases).

N 5.8.1.3 All systems that are breached and components that are subject to additions, renovations, or replacement (e.g., new gas sources, bulk, manifolds, compressors, dryers, alarms) shall be inspected and tested.

N 5.8.1.4 Systems shall be deemed breached at the point of pipeline intrusion by physical separation or by system component removal, replacement, or addition.

N 5.8.1.5 Breached portions of the systems subject to inspection and testing shall be confined to only the specific altered zone and components in the immediate zone or area that is located upstream for vacuum systems and downstream for pressure gases at the point or area of intrusion.

N 5.8.1.6 The inspection and testing reports shall be submitted directly to the party that contracted for the testing, who submits the report through channels to the responsible facility authority and any others that are required.

N 5.8.1.7 Reports shall contain detailed listings of all findings and results.

N 5.8.2 Installer-Performed Tests.

N 5.8.2.1 General.

N 5.8.2.1.1 The tests required by 5.8.2 shall be performed and documented by the installer prior to the tests listed in 5.8.3.

N 5.8.2.1.2 The test gas shall be oil-free, dry nitrogen National Formulary (NF).

N 5.8.2.1.3 Where manufactured assemblies are to be installed, the tests required by 5.8.2 shall be performed as follows:

(1) After completion of the distribution piping, but before the standing pressure test
(2) Prior to installation of manufactured assemblies supplied through flexible hose or flexible tubing
(3) At all station outlets/inlets on installed manufactured assemblies supplied through copper tubing

N 5.8.2.2 Initial Piping Blowdown. Piping in medical gas and vacuum distribution systems shall be blown clear by means of oil-free, dry nitrogen NF after installation of the distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, pressure relief valves, manifolds, source equipment).

N 5.8.2.3 Initial Pressure Test.

N 5.8.2.3.1 Each section of the piping in medical gas and vacuum systems shall be pressure tested.

N 5.8.2.3.2 Initial pressure tests shall be conducted as follows:

(1) After blowdown of the distribution piping
(2) After installation of station outlet/inlet rough-in assemblies
(3) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves)

N 5.8.2.3.3 The source shutoff valve shall remain closed during the tests.

N 5.8.2.3.4 The test pressure for pressure gases and vacuum systems shall be 1.5 times the system operating pressure but not less than a gauge pressure of 150 psi (1035 kPa).

N 5.8.2.3.5 Leaks, if any, shall be located, repaired (if permitted) or replaced (if required), and retested.

N 5.8.2.4 Initial Cross-Connection Test. It shall be determined that no cross-connections exist between the various medical gas and vacuum piping systems.

N 5.8.2.4.1 All piping systems shall be reduced to atmospheric pressure.

N 5.8.2.4.2 Sources of test gas shall be disconnected from all piping systems, except for the one system being tested.

N 5.8.2.4.3 The system under test shall be charged with oil-free, dry nitrogen NF to a gauge pressure of 345 kPa (50 psi).

N 5.8.2.4.4 After the installation of the individual faceplates with appropriate adapters matching outlet/inlet labels, each individual outlet/inlet in each installed medical gas and vacuum piping system shall be checked to determine that the test gas is being dispensed only from the piping system being tested.

N 5.8.2.5 Initial Piping Purge Test. The outlets in each medical gas piping system shall be purged to remove any particulate matter from the distribution piping.

N 5.8.2.5.1 Using appropriate adapters, each outlet shall be purged with an intermittent high-volume flow of test gas until the purge produces no discoloration in a clean white cloth.

N 5.8.2.5.2 The purging shall be started at the closest outlet/inlet to the zone valve and continue to the furthest outlet/inlet within the zone.

N 5.8.2.6 Standing Pressure Test for Positive Pressure Medical Gas Piping. After successful completion of the initial pressure tests, medical gas distribution piping shall be subject to a standing pressure test.

N 5.8.2.6.1* Tests shall be conducted after the final installation of station outlet valve bodies, faceplates, and other distribution system components.

N 5.8.2.6.2 The source valve shall be closed during this test.

N 5.8.2.6.3 The piping systems shall be subjected to a 24-hour standing pressure test using oil-free, dry nitrogen NF.

N 5.8.2.6.4 Test pressures shall be 20 percent above the normal system operating line pressure.

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N **5.8.2.6.5*** At the conclusion of the tests, there shall be no change in the test pressure except that attributed to specific changes in ambient temperature.

N **5.8.2.6.6** Leaks, if any, shall be located, repaired (if permitted) or replaced (if required), and retested.

N **5.8.2.7 Standing Vacuum Test for Vacuum Piping.** After successful completion of the initial pressure tests, vacuum distribution piping shall be subjected to a standing vacuum test.

N **5.8.2.7.1** Tests shall be conducted after installation of all components of the vacuum system.

N **5.8.2.7.2** The piping systems shall be subjected to a 24-hour standing vacuum test.

N **5.8.2.7.3** Test pressure shall be between 12 in. (300 mm) HgV and full vacuum.

N **5.8.2.7.4** During the test, the source of test vacuum shall be disconnected from the piping system.

N **5.8.2.7.5*** At the conclusion of the test, there shall be no change in the vacuum other than that attributed to changes of ambient temperature.

N **5.8.2.7.6** Leaks, if any, shall be located, repaired (if permitted) or replaced (if required), and retested.

N **5.8.3 System Verification.**

N **5.8.3.1 General.**

N **5.8.3.1.1** Verification tests shall be performed only after all tests required in 5.8.2 have been completed.

N **5.8.3.1.2** The test gas shall be oil-free, dry nitrogen NF or the system gas where permitted.

N **5.8.3.1.3** Testing shall be conducted by a party technically competent and experienced in the field of medical gas and vacuum pipeline testing and meeting the requirements of ASSE 6030, *Professional Qualifications Standard for Medical Gas Systems Verifiers*.

N **5.8.3.1.4** Testing shall be performed by a party other than the installing contractor.

N **5.8.3.2 Alarm Test.**

N **5.8.3.2.1 General.**

N **5.8.3.2.1.1** All warning systems for each medical gas and vacuum system(s) shall be tested to ensure that all components function properly prior to placing the system in service.

N **5.8.3.2.1.2** Permanent records of these tests shall be maintained.

N **5.8.3.2.1.3** Warning systems that are part of an addition to an existing piping system shall be tested prior to the connection of the new piping to the existing system.

N **5.8.3.2.2 Master Alarms.**

N **5.8.3.2.2.1** The master alarm system tests shall be performed for each of the medical gas and vacuum piping systems.

N **5.8.3.2.2.2** Permanent records of these tests shall be maintained.

N **5.8.3.2.2.3** The audible and noncancelable visual signals shall indicate if the pressure in the main line increases or decreases 20 percent from the normal operating pressure.

N **5.8.3.2.2.4** The operation of all master alarm signals referenced in 5.5.2.1 shall be verified.

N **5.8.3.3 Piping Purge Test.** In order to remove any traces of particulate matter deposited in the pipelines as a result of construction, a heavy, intermittent purging of the pipeline shall be done.

N **5.8.3.3.1** The appropriate adapter shall be obtained from the facility or manufacturer and high purge rates of at least 8 SCFM (225 Nl/min) put on each outlet.

N **5.8.3.3.2** After the purge is started, it shall be rapidly interrupted several times until the purge produces no discoloration in a white cloth loosely held over the adapter during the purge.

N **5.8.3.3.3** In order to avoid possible damage to the outlet and its components, this test shall not be conducted using any implement other than the proper adapter.

N **5.8.3.4 Medical Air Compressor Systems.**

N **5.8.3.4.1** Tests of the medical air compressor system shall include the purity test for air quality and the test of the alarm sensors after calibration and setup per the manufacturer's instructions, as well as lead-lag controls.

N **5.8.3.4.2** Tests shall be conducted at the sample port of the medical air system.

N **5.8.3.4.3** The operation of the system control sensors, such as dewpoint, air temperature, and all other air quality monitoring sensors and controls, shall be checked for proper operation and function before the system is put into service.

N **5.8.3.4.4** The quality of medical air as delivered by the compressor air supply shall be verified after installation of new components prior to use by veterinary patients.

N **5.8.3.4.5** The air quality tests shall be conducted after the medical air source system has been operating normally but with the source valve closed under a simulated load for an elapsed time of at least 12 hours.

N **5.8.3.5 Medical–Surgical Vacuum Systems.** The proper functioning of the medical–surgical vacuum source system(s) shall be tested before it is put into service.

N **5.9* Medical Gas 1 and Medical Gas 2 Operation and Management.**

N **5.9.1 Special Precautions—Patient Gas, Vacuum, WAGD, and Medical Support Gas Systems.**

N **5.9.1.1*** Piping systems shall not be used for the distribution of flammable anesthetic gases.

N **5.9.1.2** Piping systems shall not be used as a grounding electrode.

N **5.9.1.3*** Liquid or debris shall not be introduced into the medical–surgical vacuum or WAGD systems for disposal.

N **5.9.1.4*** The medical–surgical vacuum and WAGD systems shall not be used for nonmedical applications.

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N 5.9.2 Maintenance of Medical Gas, Vacuum, WAGD, and Medical Support Gas Systems.

N 5.9.2.1* General. Animal care facilities with installed medical gas, vacuum, WAGD, or medical support gas systems, or combinations thereof, shall develop and document periodic maintenance programs for these systems and their subcomponents as appropriate to the equipment installed.

N 5.9.3 Medical Gas and Vacuum Systems Information and Warning Signs.

N 5.9.3.1 The gas content of medical gas and vacuum piping systems shall be labeled in accordance with 5.7.1.

N 5.9.3.2 Labels for shutoff valves shall be in accordance with 5.7.2 and updated when modifications are made changing the areas served.

N 5.9.3.3 Station inlets and outlets shall be identified in accordance with 5.7.3.

N 5.9.4 Medical Gas and Vacuum Systems Maintenance and Record Keeping.

N 5.9.4.1 Permanent records of all tests required shall be maintained in the organization's files.

N 5.9.4.2 Central supply systems for nonflammable medical gases shall conform to all of the following:

(1) They are inspected annually.
(2) They are maintained by a qualified representative of the equipment owner.
(3) A record of the annual inspection is available for review by the authority having jurisdiction.

N 5.9.4.3 Whenever modifications are made that breach the pipeline, the installer and verification tests specified in this *Code* shall be conducted on the downstream portions of the medical gas piping system.

N 5.9.4.4 Audible and visual alarm indicators shall meet all of the following requirements:

(1) They are periodically tested to determine that they are functioning properly.
(2) Records of the test are maintained until the next test is performed.

Chapter 6 Animal Housing Categories

6.1 General.

6.1.1* Occupancy Classification.

6.1.1.1 The general occupancy classification of a facility housing animals shall be determined in accordance with Chapter 6 of *NFPA 5000* or Chapter 6 of NFPA *101*.

6.1.1.2 Animal housing facility categories shall be subject to the ruling of the AHJ where there is a question of classification.

6.1.2 Occupancy Separations. The separations required between different occupancies shall be in accordance with Chapter 6 of *NFPA 5000* or Chapter 6 of NFPA *101*.

6.2 Animal Housing Facility Categories. The occupancy of a facility housing animals shall be subclassified in accordance with this section.

6.2.1 Category 1 — Animal Health Care.

6.2.1.1* Definition. Animal housing facilities used for short-term care, maintenance, or medical attention of animals.

6.2.1.2* Category 1 Class A. Facilities where animals are observed overnight, not constantly attended for short-term care, maintenance, or medical attention.

6.2.1.3* Category 1 Class B. Facilities where animals are housed temporarily and constantly attended for short-term care, maintenance, or medical attention.

6.2.2 Category 2 — Horse Facilities.

6.2.2.1* Definition. Facilities used for temporary or permanent housing for horses.

6.2.2.2* Category 2 Class A. Facilities where horses are housed for general board and care in a commercial or professional facility greater than 5000 ft^2 (465 m^2).

6.2.2.3* Category 2 Class B. Facilities where horses are housed for general board and care in a small commercial or professional facility less than 5000 ft^2 (465 m^2).

6.2.2.4* Category 2 Class C. Facilities where horses are housed in small family stables.

6.2.3 Category 3 — Research.

6.2.3.1* Definition. Facilities used for experimentation, education, or scientific experimentation or production research on animals in a controlled environment.

6.2.4 Category 4. (Reserved)

6.2.5 Category 5 — Exhibition/Public Viewing.

6.2.5.1* Definition. Facilities that allow public access for the purpose of exhibition or public viewing of animals.

6.2.5.2* Category 5 Class A. Facilities where public attraction animals are permanently housed.

6.2.5.3* Category 5 Class B. Facilities where public attraction animals are temporarily housed.

6.2.6 Category 6 — General Board and Care.

6.2.6.1* Definition. Facilities used for temporary or permanent housing of animals used for providing a service, participating in a sport, or the purposes of providing general board and care.

6.2.6.2* Category 6 Class A. Facilities where animals are housed without constant supervision.

6.2.6.3* Category 6 Class B. Facilities where animals are housed with constant supervision.

6.2.7 Category 7 — Agriculture.

6.2.7.1 Definition. Animal housing facilities used for housing agricultural animals used for food or commodity production animals.

6.2.7.2* Category 7 Class A. Facilities where agricultural animals are housed for commercial use.

6.2.7.3* Category 7 Class B. Facilities where agricultural animals are housed in private residential-type animal housing.

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