Public Input No. 389-NFPA 99-2021 [Sections 9.3, 9.4]

Sections 9.3, 9.4

9.3 ~~General~~ Design .

9.3.1 Heating, Cooling, Ventilating, and Process Systems.

9.3.1.1

Heating, cooling, ventilating, and process systems serving spaces or providing health care functions covered by this code or listed within ASHRAE 170, *Ventilation of Health Care Facilities*, shall be provided in accordance with ASHRAE 170.

9.3.1.2

Laboratories shall comply with NFPA 45.

9.3.1.3* Anesthetizing Locations.

Anesthetizing locations shall not be required to have a smoke purge system.

9.3.2 Energy Conservation.

Heating, cooling, and ventilating systems serving spaces or providing health care functions covered by this code shall comply with ASHRAE 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, or another locally adopted energy code.

9.3.3 Commissioning.

9.3.3.1

Heating, cooling, ventilating, and process systems serving spaces or providing health care functions covered by this code shall be commissioned in accordance with ASHRAE 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*.

9.3.3.2*

Commissioning shall follow any publicly reviewed document acceptable to the authority having jurisdiction.

9.3.4 Piping.

Heating, cooling, ventilating, and process systems serving spaces or providing health care functions covered by this code shall utilize piping systems complying with applicable mechanical codes.

9.3.5 Ductwork.

Heating, cooling, ventilating, and process systems serving spaces or providing health care functions covered by this code shall utilize ductwork systems complying with NFPA 90A or applicable mechanical codes.

9.3.6 Medical Gas Storage or Transfilling.

9.3.6.1

All gases, other than medical gases, shall be provided with ventilation per NFPA 55.

9.3.6.2

Outdoor storage/installations for medical gases and cryogenic fluids shall be provided with ventilation per NFPA 55.

9.3.6.3*

Medical gases and cryogenic fluids that are in use per Chapter 11 shall not require special ventilation.

9.3.6.4

Transfilling area shall be provided with ventilation in accordance with NFPA 55.

9.3.6.5

Indoor storage or manifold areas and storage or manifold buildings for medical gases and cryogenic fluids shall be provided with natural ventilation or mechanical exhaust ventilation in accordance with 9.3.6.5.1 through 9.3.6.8.

9.3.6.5.1*

For the purposes of this section the volume of fluid (gas and liquid) to be used in determining the ventilation requirements shall be the volume of the stored fluid when expanded to standard temperature and pressure (STP) of either the largest single vessel in the enclosed space or of the entire volume of the connected vessels that are on a common manifold in the enclosed space, whichever is larger.

9.3.6.5.2 Natural Ventilation.

9.3.6.5.2.1

Natural ventilation shall consist of two nonclosable louvered openings, each having an aggregate free opening area of at least 155 cm^2/35 L (24 $in.^2$/1000 ft^3) of the fluid designed to be stored in the space and in no case less than 465 cm^2 (72 $in.^2$).

9.3.6.5.2.2

One opening shall be located within 30 cm (1 ft) of the floor, and one shall be located within 30 cm (1 ft) of the ceiling.

9.3.6.5.2.3

The openings shall be located to ensure cross ventilation.

9.3.6.5.2.4

Natural ventilation openings shall be directly to the outside atmosphere without ductwork.

9.3.6.5.2.5

Mechanical ventilation shall be provided if natural ventilation requirements cannot be met.

9.3.6.5.3 Mechanical Ventilation.

9.3.6.5.3.1

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.

9.3.6.5.3.2

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

9.3.6.5.3.3

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

9.3.6.5.3.4

Mechanical exhaust air fans shall be supplied with electrical power from the essential electrical system. Where an essential electrical system is not provided, a risk assessment shall be conducted to determine if continuous ventilation shall be provided by alternate means.

9.3.6.5.3.5

Dedicated exhaust systems shall not be required, provided that the system does not connect to spaces that contain combustible or flammable materials.

9.3.6.5.3.6

The exhaust duct material shall be noncombustible.

9.3.6.5.3.7

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

(1) Air shall be permitted 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 shall be permitted to be transferred from a corridor under the door up to the greater of 24 L/sec (50 cfm) or 15 percent of the room exhaust in accordance with NFPA 90A.

(3) Supply air shall be permitted to be provided from any building ventilation system that does not contain flammable or combustible vapors.

9.3.6.6

Discharge from the natural and mechanical ventilation systems shall be sited by a minimum separation distance in accordance with NFPA 55.

9.3.6.7

A storage room shall maintain a temperature not greater than 52°C (125°F).

9.3.6.8

A transfer or manifold room shall maintain a temperature not greater than 52°C (125°F) and not less than −7°C (20°F).

9.3.7 Waste Gas.

9.3.7.1

Removal of excess anesthetic gases from the anesthesia circuit shall be accomplished by waste anesthetic gas disposal (WAGD), as described in Chapter 5, or by an active or passive scavenging ventilation system.

9.3.7.1.1 Active Systems.

A dedicated exhaust system with an exhaust fan shall be provided to interconnect all of the anesthesia gas circuits to provide sufficient airflow and negative pressure in the gas disposal tubing so that cross contamination does not occur in the other circuits connected to the system.

9.3.7.1.2 Passive Systems.

9.3.7.1.2.1

A dedicated exhaust system with an exhaust fan shall be provided to exhaust snorkels at all of the anesthesia gas circuits to provide sufficient airflow to capture the gases, vapors, and particles expelled from the gas disposal tubing.

9.3.7.1.2.2

The snorkel shall include a minimum 25.4 mm (1 in.) diameter tubing connected to the exhaust system.

9.3.7.2

All the exhausted air shall be vented to the external atmosphere.

9.3.7.3

The excess anesthetic gases shall be deposited into the exhaust stream either at the exhaust grille or further downstream in the exhaust duct.

9.3.8 Medical Plume Evacuation.

9.3.8.1*

Plumes from medical procedures, including the use of lasers, shall be captured by one of the following methods:

(1) * Dedicated exhaust system that discharges in accordance with 9.3.8.2

(2) Connection and return or exhaust duct after air cleaning through HEPA and gas phase filtration

(3) Point of use smoke evacuator for air cleaning and return to the space

9.3.8.2

The exhaust shall be located as follows:

(1) Outdoors

(2) At least 7.5 m (25 ft) from any door, window, air intake, or other openings in buildings or places of public assembly

(3) At an elevation different from air intakes

(4) Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust

9.3.9 Emergency Power System Room.

Heating, cooling, and ventilating of the emergency power system shall be in accordance with 6.7.1.3.4.

9.3.10 Ventilation During Construction.

Ventilation during construction shall comply with the applicable volume of FGI guidelines.

9.4 Operations of HVAC Systems

9.4.1 Applicability

9.4.1.1 This section shall apply to the operation of existing HVAC systems in health care facilities.

9.4.2 System Category Criteria. The health care facility's governing body that has the responsibility for the building system components as identified in this section shall designate, in accordance with the function of each space, building system categories in accordance with Sections 4. 1 and 4 .

~~(Reserved)~~

2.

9.4.2.1 Category 1 and 2 Systems and Equipment: Category 1 and 2 systems and equipment shall be maintained per Table 9.4.2: Operating Parameters by Space Type and per manufacturer's recommendations or based on an alternate equipment management strategy.

9.4.2.2 Category 3 and 4 Systems and Equipment: HVAC Category 3 and 4 systems and equipment shall be maintained per facility policy and procedure.

NFPA 99 Table 9.4.2: Operating Parameters by Space Type (Note 1)

Space Category	Space Types	Pressure Relationship to Adjacent Areas	Minimum Outdoor ach	Minimum Total ach	Relative Humidity, %	Minimum Filter Efficiency
Category 1	Operating rooms	Positive	2	12	20-60 (3)	MERV14
	Airborne isolation	Negative	2	6	NR	MERV14
	Protective environment rooms	Positive	2	6	NR	HEPA
	Delivery Room (Caesarean)	Positive	2	12	20-60 (3)	MERV14
Category 2	Intensive Care Unit	NR	2	4	20-60 (3)	MERV14
	ER waiting and triage and Radiology waiting	Negative	2	6	NR	MERV14
	Procedure Room	Positive	2	6	NR	MERV 14
	LDRP/LDR	NR	2	2	NR	MERV 14
	Pharmacy Laboratories Sterile Processing Kitchen Imaging/Treatment Other spaces as	-	-	-	-	-

	defined by facility					

Notes

(1) Values included in the table acknowledge the long-life cycle of hospitals and the history of design codes changing requirements. The values listed are intended to be minimum values; best practice or current industry standard may exceed these values. However, for compliance purposes, only the minimum values listed are required for periods of occupancy. For un-occupied periods, turn-down is acceptable.

(2) Spaces that have either specific pressurization cascades, air change rates, filtration, or similar with design criteria from ASHRAE/ASHE Std 170, USP, etc. Utilize design criteria for filtration, pressure, air changes, and humidity for operation criteria.

(3) Target range. Each hospital to document allowable excursion time(s) and remediation methodology.

9.4.3 General

9.4.3.1 HVAC Systems: Heating, ventilating, and air conditioning systems serving spaces providing health care functions covered by this code or listed within ASHRAE/ASHE 170, Ventilation of Health Care Facilities, shall be provided in accordance with Sections 9.4.3.2 through 9.4.3.7

9.4.3.2 HVAC Program. The healthcare facility shall have an HVAC maintenance and operations program including but not limited to visual inspection of filter condition, filter and rack seal, damper actuator and linkage, insulation, lubrication and cleaning per manufacturer's recommendation or based on an alternate equipment management strategy risk and verification of pressure relationships.

9.4.3.2.1 Ventilation. Category 1 and 2 ventilation systems operation shall be in accordance with Table 9.4.2. Category 3 and 4 ventilation systems operation shall be per facility policy and procedure.

9.4.3.2.2 Temperature. Operation within specific temperature ranges shall be determined by the facility. Control shall be provided such that occupants have input to space temperature.

9.4.3.3 Boilers. The healthcare facility shall have a boiler maintenance plan including but not limited to visual inspection, lubrication, pressure, water quality, level and treatment, burner control and cleanliness, flue gas temperatures and composition, blowdown effectiveness, fuel system, insulation, and cleaning.

9.4.3.4 Chillers. The healthcare facility shall have a chiller maintenance plan including but not limited to visual inspection, lubrication, pressure, water quality, level and treatment, compressors, insulation, and cleaning.

9.4.3.5 Cooling Towers. The healthcare facility shall have a cooling tower maintenance plan as part of the facility water management plan that includes schedule for inspections of system cleanliness, drift eliminator and fill condition and water distribution system operation

9.4.3.6 Humidifiers. The healthcare facility shall have a humidifier maintenance plan as part of the facility water management plan that includes schedule for inspections of system cleanliness and water distribution system

operation.

9.4.3.7 HVAC Controls. The healthcare facility shall have a control maintenance plan including but not limited to visual inspection of and calibration of control devices.

Statement of Problem and Substantiation for Public Input

Over the last few decades there has been a growing issue with the proper code or standard to apply to the operations of health care ventilation systems. While ASHRAE/ASHE Standard 170, Ventilation of Health Care Facilities is noted as the industry standard for the design of health care ventilation over the time period it has unwittingly become a “de facto” operational standard when it is declared by facility personnel as the standard by which the maintain their HVAC systems. While this can be an acceptable practice it unfortunately has three major issues:
1) The standard is developed strictly as a design standard and the ranges established in the standard are intended for design purposes and are not intended as an operation ranges.
2) While the best designed HVAC system is intended to be able to meet the ranges within Standard 170 there are always excursions that occur during unplanned for weather events.
3) Determining how to apply the code/standard in effect at the time of design/construction can be difficult especially when specifically trying to apply this to a portion of a system or a single system that is associated with multiple systems.

Due to these issues the American Society for Health Care Engineers (ASHE) of the American Hospital Association has promoted health care organizations to develop facility specific HVAC management plans. While these have been successfully implemented in many organizations there have still been occurrences where authorities having jurisdiction have been hesitant to accept these management plans. In collaboration with Providence health care system the ASHE Regulatory Affairs Committee developed recommendations for existing health care facility ventilation systems.

Providence has 51 hospitals in seven western states with regional operational responsibility and “shared services” across all regions that combined make up its Real Estate Strategy and Operations (RESO) division. In late 2019 a cross-regional group started work on updating what’s now called the Critical Air Environments Technical Standard for RESO. As a part of that effort, internal experts on accreditation, operations, design and construction weighed in over a nearly year-long effort to better align our operations in critical spaces for air change rates, pressurization, temperature, filtration, and relative humidity. As a result of that effort, it has underscored the challenges of knowing and understanding the “code in force at time of construction” and whether those or ASHE/ASHRAE 170 are the de facto operations requirements. With the long life-span of our facilities, turn-over, and renovation/expansion projects the end result for our facility managers is an extremely challenging amalgamation of requirements.

The effort captured in the attached proposal attempts to create a code minimum criteria for operations within existing health care facilities. That effort included reviewing existing Providence facility data, historical code data, and merging them together into a table that could be utilized industry wide. It also includes minimum criteria for maintaining mechanical equipment. It is anticipated that over time this format will allow for continuous improvement, but also consistency of requirements resulting in a greatly simplified set of requirements for operations.

Submitter Information Verification

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Street Address:	

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Submittal Date: Tue Jun 01 16:12:29 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: CI-906-NFPA 99-2021

Statement: The committee recognizes the challenges related to application of design and construction standards for accreditation reviews for existing facilities, and finds that the submitted public input can present a means of addressing this important healthcare topic. Public comment is encouraged as this is a unique new approach within this section.

Public Input No. 194-NFPA 99-2021 [Section No. 9.3.7.1.1]

9.3.7.1.1 Active Systems.

A dedicated exhaust system with an exhaust fan shall be provided to interconnect all of the anesthesia gas circuits to provide sufficient airflow and negative pressure in the gas disposal tubing so that cross contamination does not occur in the other circuits connected to the system. Requirements for active systems are included in Chapter 5.

Statement of Problem and Substantiation for Public Input

A reference to Chapter 5 will refer the user to the many other requirements they will need to observe.

Submitter Information Verification

Submitter Full Name: Mark Allen
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Submittal Date: Tue May 18 13:28:56 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: CI-905-NFPA 99-2021
Statement: Request specific sections or list of requirements for a dedicated exhaust fan system that addresses the safety concerns of the PI.

Public Input No. 193-NFPA 99-2021 [New Section after 9.3.8]

A 9.3.8 There is no overall standard for plume capture or disposal systems in the U.S. Users needing more details or specific information are directed to the ISO 16571 or CSA Z305.13 standards.

Statement of Problem and Substantiation for Public Input

Plume is a much larger subject than these two short paragraphs admit. It would seem appropriate to guide a user in need of more information to one of the fully developed standards which are now in publication and use.

Submitter Information Verification

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Submittal Date: Tue May 18 13:23:57 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: FR-907-NFPA 99-2021
Statement: The Technical Committee agrees with the submitter that further informational guidance is helpful for users of the standard.

Public Input No. 191-NFPA 99-2021 [Section No. 9.3.8.1]

9.3.8.1*

Plumes from medical procedures, including the use of lasers, shall be captured by one of the following methods:

(1) * Dedicated exhaust system that discharges in accordance with 9.3.8.2

(2) ~~Connection and return or exhaust duct after air cleaning through HEPA and gas phase filtration~~

~~Point of use smoke evacuator for air cleaning~~

(3) Collection, filtration and return to the space . Filtration shall be as necessary to acheive the cleanliness the facility elects following risk analysis.

Statement of Problem and Substantiation for Public Input

The exact degree of filtration and air cleaning needed for these systems is not universally agreed. Some use HEPA or ULPA filters alone, some HEPA or ULPA filters with prefiltration, some proprietary filters. ULPA is likely to be the standard set by the new ISO standard. Flowrates and vacuum levels influence this choice. The decision should be left to the facility in consultation with their supplier.

Submitter Information Verification

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Submittal Date: Tue May 18 13:18:10 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: The committee respects the Public Input. We don't want to eliminate this option of having filtration before returning air. It's our understanding that the current language represents the substantiation provided. The intent is to provide facilities with alternatives that accomplish the same result.

Public Input No. 190-NFPA 99-2021 [Section No. 9.3.8.2]

9.3.8.2

~~The~~ For centrally exausted systems that vent to outside, the exhaust shall be located as follows:

(1) Outdoors

(2) At least 7.5 m (25 ft) from any door, window, air intake, or other openings in buildings or places of public assembly

(3) At an elevation different from air intakes

(4) Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust

Statement of Problem and Substantiation for Public Input

The current wording does not make it clear that this provision is only for centrally piped systems. Systems which return the air to the room after filtration would not be subject to this provision.

Submitter Information Verification

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Submittal Date: Tue May 18 13:16:02 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: FR-903-NFPA 99-2021
Statement: The committee agrees with the submitter's intent to provide clarity in this item.

Public Input No. 192-NFPA 99-2021 [Section No. 9.3.8.2]

9.3.8.2

The exhaust shall be located as follows:

(1) Outdoors

(2) At least 7.5 m (25 ft) from any door, window, air intake, or other openings in buildings or places of public assembly

(3) At an elevation different from air intakes

(4) Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust

(5) Plume evacuation exhausts may be shared with medical vacuum or WAGD exhausts, provided the exhaust is sized for the sum of flow from all producers.

Statement of Problem and Substantiation for Public Input

The rules set here are exactly those for vacuum and WAGD in Chapter 5. Therefore it seems sensible to allow the facility to save the cost of two separate lines if that is convenient.

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Submittal Date: Tue May 18 13:21:54 EDT 2021
Committee: HEA-MEC

Committee Statement

Resolution: FR-904-NFPA 99-2021
Statement: The committee agrees that the exhaust plumes can be combined, however we are leaving piping to Chapter 5.