2021 Changes NFPA 99 Study Guide

Key Symbols:
A = Addition
D = Deletion
N = New
R = Revision
E = Error

All paragraphs listed are from the 2021 NFPA 99 Edition, unless specifically noted otherwise.

Key symbols are listed with each paragraph explaining the difference in the 2021 NFPA 99 Edition.

NOTES:

1) All changes are not noted in this guide. Only those changes that impact activities, systems or equipment are noted (in the opinion of the author). Minor wording changes are not noted.
2) This document is not intended to be a standalone document. A copy of the 2021 edition of NFPA 99 must be used in conjunction with this document.
3) The second number in a paragraph reference in Chapters 5 and 15 indicate the category of medical gas system that the paragraph is referring to. (i.e., Paragraph 5.*1*.1.2 applies to Category *1* medical gas systems.)
4) Please have a highlighter for use during study.

Chapter 1

2021 paragraph reference and changes noted:

1. (N) Para. 1.3.1.1: **Hyperbaric chambers** for veterinary care are now required to comply with chapter 14 of NFPA 99. – Pg. 15

2. (N) Para. 1.3.2.4: **Reducing safety features** in existing systems shall not be permitted if required for new construction or equipment. – Pg. 15

Chapter 3

3. (D) Para. 3.3.19.3 and 3.3.32.3 (2018 edition of NFPA 99): Definitions for **micro bulk cryogenic systems** has been deleted. An extensive new section has been added in 5.1.3.10 to cover all cryogenic fluid central supply systems. – Pg. 15

4. (R) Para. 3.3.37: **CO2 (Carbon Dioxide)** can no longer be used as a source for dental air to drive dental devices. – Pg. 21

5. (N) Para. 3.3.58: **FGI (Facility Guidelines Institute)** documents for "guidelines for design and constructions of hospitals", "….outpatient facilities" and "….residential health, care and support facilities." – Pg. 22

6. (N) Para. 3.3.75 and 3.3.76: **Health care microgrids and control systems** are now defined, as power backup systems become more technologically advanced (i.e., solar, energy storage, combined heath and power, etc.). – Pg. 22

Chapter 4

7. (N) Para. 4.1.5: **Higher risk categories** may be assigned which supersede the chapter 4 designations when stipulated. – Pg. 27

Chapter 5

8. (D) Para. 5.1.1.2: The previous wording in this paragraph "…piped gas or piped vacuum systems are intended for Category patient care space…" has been removed since **Category 1 source systems may serve Category 2 and 3 patient care spaces.** – Pg. 28

9. (R) Para. 5.1.1.4: The wording in this paragraph referring to the **Authority having Jurisdiction** (AHJ) has been changed from "**as long as**" to "**unless**" with regard to existing systems not in strict compliance with the provisions of this code as long as their use does not constitute a

distinct hazard to life. This means those existing systems may be continued in use “unless” the AHJ intervenes. – Pg. 28

10. (N) Para. 5.1.1.6: **Category 1 source systems** are permitted to serve Category 1, 2 and 3 spaces. But Category 1 spaces may only be supplied by Category 1 sources. – Pg. 28

11. (N) Para. 5.1.3.1.8.1 and 5.1.3.1.9.1: **Existing signage** that is not in strict compliance with the provisions of this code are permitted to be used as long as the AHJ (Authority Having Jurisdiction) approves. – Pg. 29

12. (D) Para. 5.1.3.2.11 (2018 edition): **Containers** shall not be stored in a tightly closed space. The other requirements listed in 5.1.3.3 would prevent this from happening. – Pg. 29

13. (R) Para. 5.1.3.3.2.1(3) and (4): **Design and construction for central supply systems located outdoors** shall be well drained, and outdoor cylinders and containers must be protected from prolonged contact with the soil. – Pg. 30

14. (D) Para. 5.1.3.3.2(4): **The requirement for two gates** in an outdoor enclosure greater than 200 sq. ft. in size has been deleted. This appears to be a mistake. – Pg. 30

15. (R) Para. 5.1.3.3.2.1(6): **Design and construction for central supply systems located indoors** and containing oxygen, nitrous oxide, or other oxidizers shall have walls and floors with a 1-hour fire rating and doors with a 3/4-hour fire rating. (Non-oxidizing gases do not require this.) – Pg. 30

16. (N) Para. 5.1.3.3.2.2: **Cryogenic fluid central supply system location** design shall comply with 5.1.3.5.12 which then refers to 5.1.3.10 (Pg. 44). This incorporates NFPA 55 into the location design. – Pg. 30

17. (R) Para. 5.1.3.5.6.1(5): **Relief valve vent discharge lines** shall not be smaller than the size of the relief valve or ¾” NPS, whichever is larger. – Pg. 31

18. (N) Para. 5.1.3.5.6.2: **Pressure relief devices (valves) for cryogenic fluid central supply systems** shall comply with 5.1.3.10.10 (Pg. 46) which stipulates some additional requirements. – Pg. 32

19. (R) Para. 5.1.3.5.7: **Multiple pressures piped from a single central supply source** now have the same requirements for pressure controls, relief valves, source valves and master alarms for all central supply sources. – Pg. 32

20. (R) Para. 5.1.3.5.11.4(4): **Manifolds for cryogenic liquid containers** which are a hybrid arrangement - one liquid container header (primary), one gas cylinder header (secondary) and a reserve gas cylinder header - both the primary and secondary supplies shall have equal capacity

peak flow rates and the reserve shall be sufficient for one average days' supply but not less than three cylinders. – Pg. 33

21. (R) Para. 5.1.3.5.13.2(8): **EOSC's (Emergency Oxygen Supply Connections)** when used for a temporary source of supply, shall have four alarm connection points (from the temporary source) installed to both master alarm panels for monitoring when in use. – Pg. 34

22. (N) Para. 5.1.3.6.3.11(I): **Medical air compressor intake** shall be labeled in accordance with 5.1.11.1 with any method that would distinguish it as a medical air intake. – Pg. 37

23. (R) Para. 5.1.3.7.4: **Vacuum filtration** is required for all vacuum central supply systems **except** liquid ring pump systems. – Pg. 39

24. (N) Para. 5.1.3.7.7.4: **Vacuum exhaust** shall be labeled in accordance with 5.1.11.1 with any method that would distinguish is as a vacuum exhaust. – Pg. 40

25. (R) Para. 5.1.3.8.1.2(2): **WAGD produced by the medical vacuum source** requires that the total concentration of **oxygen** be maintained below 23.6 percent instead of both oxygen and nitrous oxide. It is more difficult to monitor nitrous oxide on a continuous basis. However, it can still increase the hazard. – Pg. 40

26. (N) Para. 5.1.3.10: **Cryogenic fluid central supply systems** is an entirely new paragraph section which details the requirements for:

Applicability – 5.1.3.10.1.2
Installation – 5.1.3.10.2
Operation – 5.1.3.10.3
Main Supply System – 5.1.3.10.4
Reserve Supply System – 5.1.3.10.5
Fill System – 5.1.3.10.6
Vaporizers – 5.1.3.10.7
High Pressure Manifolds – 5.1.3.10.8
Pressure Control Devices – 5.1.3.10.9
Pressure Relief Devices – 5.1.3.10.10
Tubing and Valves – 5.1.3.10.11
Alarms – 5.1.3.10.12
– Pg. 44

27. (R) Para. 5.1.4.1.6(8)(9): **Valve types** now include two additional paragraphs requiring threaded purge ports on each side of the valve and a minimum working pressure equal to or greater than the system relief valve on all positive pressure systems. – Pg. 47

28. (N) Para. 5.1.4.9(6): **In-line check valves must be sized** to have a maximum velocity that does not exceed the manufacturer's recommendations. This will prevent "chatter" of the actual check disk in the valve. – Pg. 48

29. (R) Para. 5.1.6.2: **Manufactured assemblies** shall be leak tested by the **manufacturer** prior to the arrival on site per the following criteria:

Positive pressure system = 0.00037 in^3/sec @ 20% above operating pressure

Negative pressure systems = 0.00012 in ^{3}/sec @ 25" HgV

– Pg. 49

30. (R) Para. 5.1.9.1(15): **Category 1 warning systems** (alarms) shall be accessible for service and testing. – Pg. 50

31. (R) Para. 5.1.9.2.3.2(B): **Wireless alarms** are required to not utilize common devices that could disable the signal from another initiating device (sensor). (i.e., failure of one device will not disable sensing at multiple devices.) – Pg. 51

32. (N) Para. 5.1.10.2.3.2: **WAGD and vacuum systems piping** when connected together shall be labeled separately for each required service per paragraph 5.1.11. – Pg. 54

33. (R) Para. 5.1.10.4.2.3: **Deburring** is listed as a process that "shall be" performed rather than "shall be permitted" to be performed and is thus mandatory. – Pg. 54

34. (R) Para. 5.1.10.11.1.2: **Main and branch piping systems** shall be not less than 1/2" NPS (5/8" O.D.) size for all pressure and **WAGD** systems. WAGD systems were not listed previously. – Pg. 57

35. (N) Para. 5.1.11.1.2: **Labeling for positive pressure systems** operating at pressures other than the standard gauge pressure listed in table 5.1.11 shall include the operating pressure in addition to the name of the gas on the label. – Pg. 59

36. (R) Para. 5.1.11: (Table) The **labeling color and operating pressure table** has been modified to add dental air and dental vacuum to the nonmedical designations for both. Also, nitrogen has a standard gauge pressure of 55-185 PSI and instrument air a standard gauge pressure of 50-185 PSI. – Pg. 60

37. (N) Para. 5.1.11.1.3: **Labeling for vacuum systems used to serve WAGD systems** shall have piping in the immediate area of the WAGD system labeled to indicate both systems. – Pg. 59

38. (N) Para. 5.1.11.1.6: **Labeling for compressor intakes, vacuum exhausts and relief valve vent lines** shall be labeled for service type and function to distinguish them from the supply systems. – Pg. 59

39. (R) Para. 5.1.11.2.1(2): **Labeling for shutoff valves** shall indicate the correct system color code per table 5.1.11. – Pg. 59

40. (N) Para. 5.1.11.2.3: **Source shutoff valves that serve both vacuum and WAGD systems** shall be labeled to indicate both systems. – Pg. 60

41. (R) Para. 5.1.11.3.1(2): **Station outlets and inlets** shall indicate the gas or vacuum system color code in accordance with table 5.1.11. – Pg. 60 & 61

42. (R) Para. 5.1.11.4.2(2): **Alarm panels** shall indicate the gas or vacuum system color code in accordance with table 5.1.11. – Pg. 61

43. (N) Para. 5.1.11.4.3: **Area alarm panels** shall include identification of nonstandard operating pressures when they are different from those listed in table 5.1.11. – Pg. 61

44. (N) Para. 5.1.11.4.4: **An area alarm panel** monitoring the area in which the vacuum system is used to serve the WAGD system shall be labeled to indicate both systems. – Pg. 61

45. (N) Para. 5.1.11.5.2: **Vacuum system source equipment labeling** shall include indications that it serves both vacuum and WAGD systems when it serves both systems. – Pg. 61

46. (R) Para. 5.1.12.2.7.5: **Installer standing vacuum test** now has a specified leakage rate of 0.5 percent of the starting pressure over a 24-hour period starting at 25" HgV. – Pg. 63

47. (N) Para. 5.1.13.3 through 5.1.13.3.6.11: **Medical support gas central supply systems** is an entirely new paragraph section which details the requirements for:

Design and construction – 5.1.13.3.2
Ventilation – 5.1.13.3.3
Storage – 5.1.13.3.4
Control Equipment – 5.1.13.3.5
Nitrogen NF Central Supply Systems – 5.1.13.3.6
Including: (1) Manifolds for gas cylinders – 5.1.3.5.11
(2) Manifolds for cryogenic liquid containers – 5.1.3.5.12
(3) Cryogenic fluid central supply systems – 5.1.3.10

Para. 5.1.13.3.6.1 through 5.1.13.3.6.11 cover the following general topics with regard to Nitrogen NF central supply systems.

(1) General
(2) Medical Support Gases
(3) Materials
(4) Controls for Line Pressure
(5) Relief Valves
(6) Multiple Pressures
(7) Local Signals
(8) Headers
(9) Nitrogen NF Manifolds for Gas Cylinders
(10) Nitrogen NF Manifolds for Cryogenic Liquid Containers

(11) Nitrogen NF Cryogenic Fluid Central Supply Systems
– Pg. 67 - 69

48. (N) Para. 5.1.14.1: **Responsible Facility Authority (RFA)** is a new term/requirement for each health care facility for responsibility of the medical gas systems. One or more individuals must be designated by the facility to meet this requirement. – Pg. 69

49. (N) Para. 5.1.14.2: **Responsibilities of the RFA** shall include primary responsibility for the implementation of piped medical gas and vacuum system requirements of the NFPA 99 code. – Pg. 69

50. (N) Para. 5.1.14.1.2.2: **Specific responsibilities of the RFA** shall include:

(1) Advising on section 1.3 "Application" and section 4.2 "Risk Assessment" as applied to piped medical gas and vacuum systems. Also, interpretations of sections 5.1 through 5.3 as they apply to the facility.
(2) Writing and upkeep of the facilities emergency plan as applied to piped medical gas and vacuum systems.
(3) Ensuring that the facility's emergency plan addresses unusual or exceptional requirements for patient and staff safety.
(4) Developing and enforcing permit-to-work rules pertaining to the piped medical gas and vacuum systems with regard to repair, modification or construction, including safety requirements.
(5) Evaluation and acceptance of installer, inspector and verifier test reports per 5.1.12.
(6) Maintenance of the facility's records on piped medical gas and vacuum systems installations and operations.
– Pg. 69 & 70

51. (N) Para. 5.1.14.1.3.1 and 5.1.14.1.3.2: **Qualifications of the RFA** shall be in accordance with any one of the following credentials:

(1) Completion of an educational program acceptable to the facility's governing body and equal to or superior to the ASSE 6010 or ASSE 6020 requirements.
(2) ASSE 6010 medical gas installer credential
(3) ASSE 6020 medical gas inspector credential
(4) ASSE 6030 medical gas verifier credential
(5) ASSE 6040 medical gas maintenance personnel credential
– Pg. 70

52. (N) Para. 5.1.14.2.1 and 5.1.14.2.2: **Permit-to-work system plan developed by the RFA** for the piped medical gas and vacuum systems shall also be maintained and managed by the RFA. This plan shall be applicable to all maintenance repair or construction work and shall assure the following:

(1) The affected medical staff and facility administration is appropriately notified prior to any work performed.

(2) Alternative supply or adjustments in patient care arrangements are in place prior to system interruption, including monitoring.
(3) All work on the piped medical gas and vacuum systems is performed by competent individuals with appropriate qualifications (documentation) for the work.
(4) Procedures for shutdown and restoration of medical gases are described, communicated and observed by all persons working on the systems.
(5) Safety procedures are in place and are observed for all persons involved in working on the systems.
(6) This code is observed in the execution of maintenance, repair or construction procedures.
(7) The affected portions of the systems are correctly tested in accordance with 5.1.12 and 5.1.13 and demonstrated to be acceptable for patient use.
– Pg. 70

53. (N) Para. 5.1.14.3.5: **Clinical spaces converted to non-clinical spaces** require that medical gas outlets and inlets not accessible for maintenance and testing be removed or decommissioned. This may be accomplished by one of the following means:
(1) Devices removed and tubing capped
(2) Devices plugged and provided with a blank-off plate
(3) Other means deemed appropriate by the AHJ
– Pg. 70

54. (N) Para. 5.1.14.7.11: **Access to valves and alarms** shall be part of the facility standard operating procedure and shall include the following:
(1) No items are to be placed in front of or affixed to any alarm panel that would restrict the view of or diminish the sound of the alarm.
(2) Valves in secured areas are to be as follows:
(a) Visible from the intended operator's position.
(b) Operable with no more than ordinary aids, such as a ladder.
(c) If provided with security hardware, such hardware is visible and readily removable when needed.
– Pg. 72

55. (N) Para. 5.2.1.4: **Category 2 systems** shall be permitted to serve spaces identified as Category 2 or 3. – Pg. 72

56. (R) Para. 5.2.3.9: **Category 2 instrument air supply systems** do not require a redundant source of supply which technically was required in the previous code edition. – Pg. 72

57. (R) Para. 5.3.1.2: Only **minimal sedation** is allowed in Category 3 spaces. Previously moderate sedation was also allowed. – Pg. 73

58. (N) Para. 5.3.1.4: **Category 3 systems can only serve Category 3 spaces**. If Category 1 and/or Category 2 spaces are in the same facility, they cannot be served by Category 3 systems. – Pg. 73

59. (R) Para. 5.3.3.2.1: **Category 3 systems** shall comply with the requirements of 5.1.3.2 except for the **requirement of emergency electrical** service. – Pg. 73

60. (N) Para. 5.3.3.3 through 5.3.3.9: **Category 3 central supply systems** have a new set of paragraph requirements, the majority of which refer back to compliance with Category 1 requirements with exceptions as follows:

(1) Oxygen central supply systems using concentrators are permitted to consist of (1) source. (Para. 5.3.3.5.11)

(2) Emergency electrical service (EES) for medical air, medical vacuum, WAGD and instrument air systems shall conform to the requirements of section 6.6 and NFPA 70. However, section 6.6 states that EES systems are not required for Category 3 or Category 4. – Pg. 73 & 74

61. (R) Para. 5.3.9: **Category 3 and Category 4 warning systems (alarms)** shall have electrical power in accordance with section 6.6 which states that EES systems are not required. – Pg. 74

62. (R) Para. 5.3.13: **Medical support gases for Category 3** comply with 5.1.13 except instrument air systems may be simplex with no standby header and the facility staff shall have an emergency plan to deal with the loss of instrument air. – Pg. 74

Chapter 15

63. (N) Para. 15.1.9: Where the term **Responsible Facility Authority** is used, that entity shall follow the requirements of 5.1.14.1. This term is also used in the following paragraphs:

(1) 15.4.7.1.1.2 and 15.4.7.1.1.4 testing and verification (accept & review reports)
(2) 15.4.8.1.1.2 and 15.4.8.1.1.4 dental air and vacuum systems testing (Category 2)
(3) 15.5.7.1.1.2 and 15.5.7.1.1.4 dental air and vacuum systems testing (Category 3)

NOTE: 15.3.2.10 is not changed, but requires compliance with 5.1.12 “Performance criteria and Testing” (Category 1)
– Pg. 133

64. (R) Para. 15.4.2.5.9: **Category 2 flexible connectors that are used in Category 2 gas manifolds** and are described as “nonmetallic hoses and flexible connectors” and shall not be concealed in walls, floors, ceilings or partitions. – Pg. 138

65. (N) Para. 15.4.2.5.9.1: **Category 2 medical gas source equipment** (oxygen and nitrous oxide) shall not be connected to the piping system through flexible connectors. – Pg. 138

66. (R) Para. 15.4.2.6.1: All **Category 2 medical gas systems** (oxygen and nitrous oxide) now require an **emergency shutoff valve** to be installed accessible from all use point locations in an emergency. – Pg. 138

67. (R) Para. 15.4.5.3(3): **Category 2 minimum pipe sizes** shall ensure that all oxygen piping is at least one size larger than piping for nitrous oxide. – Pg. 141

68. (R) Para. 15.4.7.1.1.2, 15.4.7.1.1.3 (oxygen & nitrous oxide), 15.4.8.1.12 and 15.4.8.1.1.4 (dental air & vacuum): The **Responsible Facility Authority** is responsible for reviewing all **performance criteria and testing reports**, and the facility acceptance prior to the use of all systems for oxygen, nitrous oxide, dental air and dental vacuum. – Pg. 144, 147