IIAR Publications as RAGAGEP for Ammonia Refrigeration Systems

Session Code TU-A3

March 25, 2024

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27th California Unified Program
Annual Training Conference
March 24-27, 2025

Introduction

PSM RAGAGEP References

- **Title 29 §1910.119(d)(3)(ii) Process Safety Information**
  - The employer shall document that equipment complies with recognized and generally accepted good engineering practices.
- **Title 29 §1910.119(j)(4)(ii) Mechanical Integrity**
  - Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
- **Title 29 §1910.119(j)(4)(iii) Mechanical Integrity**
  - The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

RAGAGEP Citations

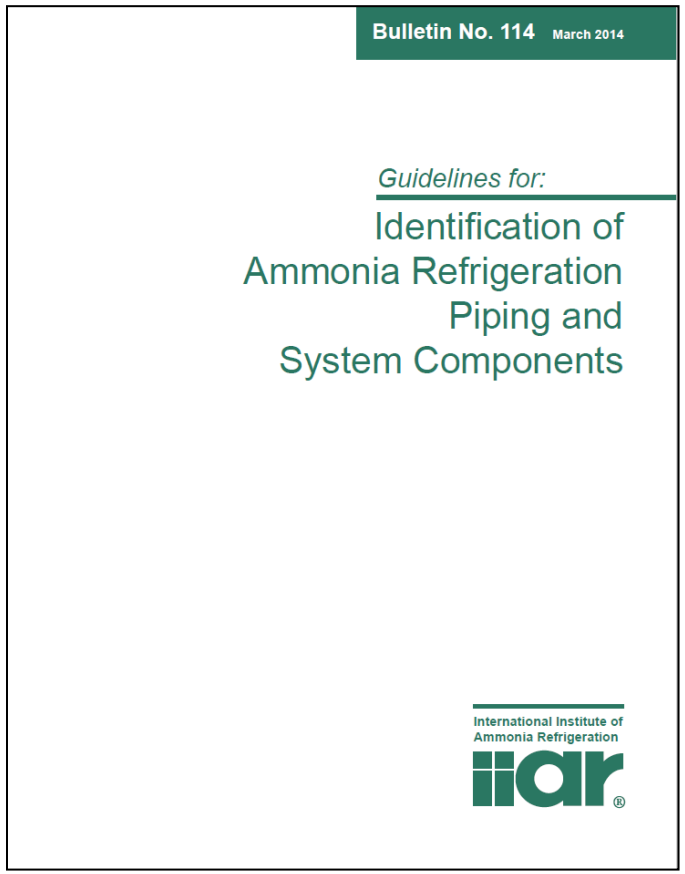
Citation 1 Item 2 Type of Violation: **Serious**

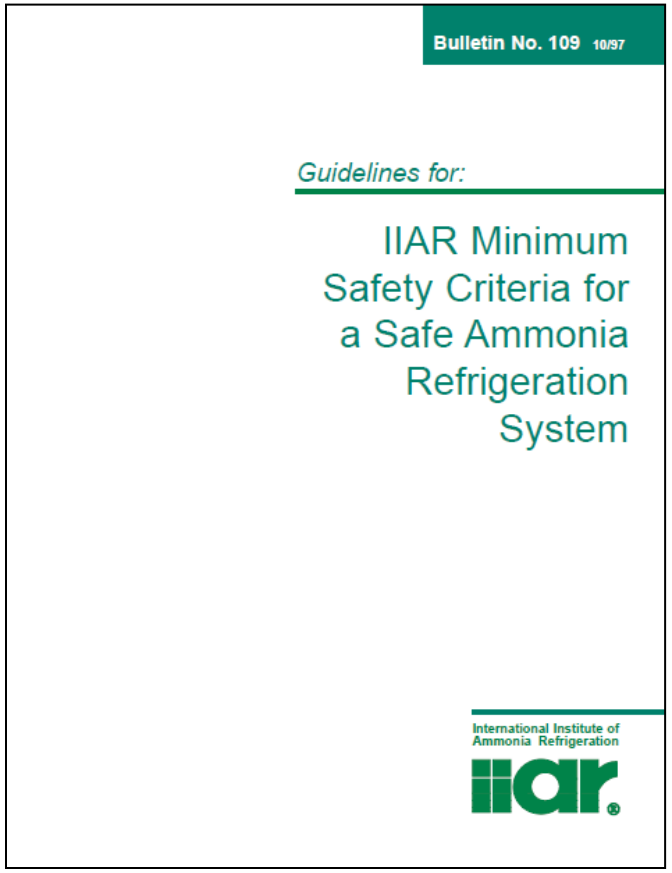
29 CFR 1910.119(d)(3)(ii): The employer did not document that equipment complies with recognized and generally accepted good engineering practices (RAGAGEP's).

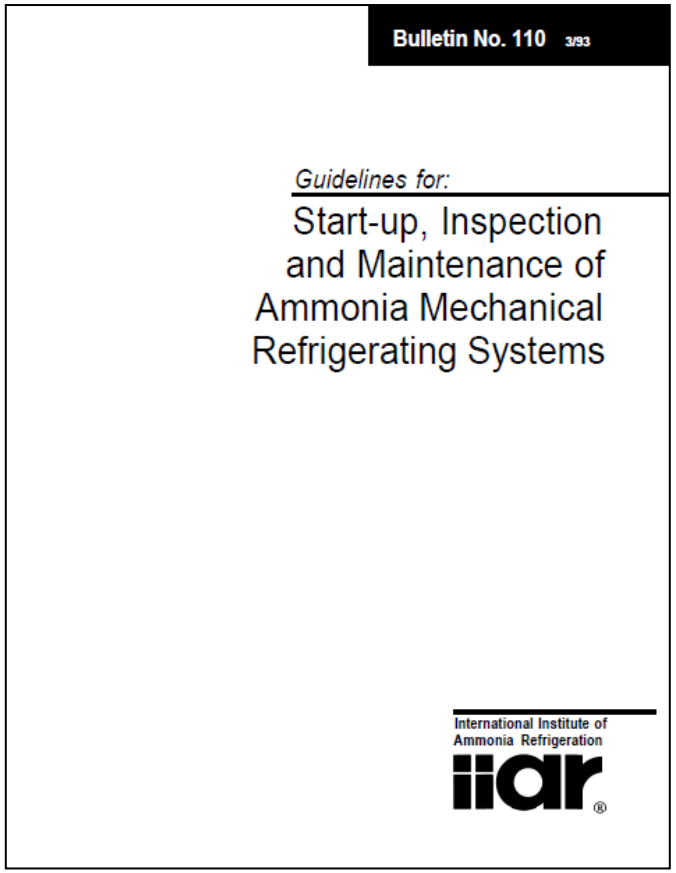
A. The employer failed to document compliance with RAGAGEP, such as IIAR Bulletin 114 "Identification of Ammonia Refrigeration Piping and System Components" Section 4.1 "Piping Markers" and Section 5.0 (a-d) "Marker Location", March 2014, as the employer failed to mark and/or label ammonia refrigeration equipment, including:

B. Failure to document compliance with RAGAGEP, such as IIAR Bulletin 110 "Guidelines for: Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems" Section 6.6 Valves and Sensing Devices Subsection 6.6.1 Shut-off Valves, as the employer failed to change out ammonia refrigeration system safety relief valves prior to their 5 year due dates from the date of installation,

IIAR Bulletins – Historical RAGAGEP







IIAR Literature - Bulletins

- IIAR Bulletin No. 110 §6.4.2 [emphasis mine]:
- *The system should be checked regularly for the presence of non-condensable gases which should be purged as necessary from the receiver(s) and/or condenser(s), preferably into a noncondensable gas remover or purger but alternatively into water. Where an automatic purger is fitted, its correct operation should be monitored. If there is a large accumulation of noncondensable gases the reason should be investigated and the cause should be corrected.*

Ammonia Refrigeration Code Organizations

IIAR and Model Codes

- **2018 IFC §605.1.2 Ammonia refrigeration.** Refrigeration systems using ammonia refrigerant and the buildings in which such systems are installed shall comply with **IIAR-2** for system design and installation and **IIAR-7** for operating procedures. Decommissioning of ammonia refrigeration systems shall comply with **IIAR-8**.
- **2018 NFPA 1 §53.1.3 Reference Codes and Standards.** Refrigeration systems shall be in accordance with ASHRAE 15 and the mechanical code. Refrigeration systems using ammonia as a refrigerant shall also comply with **ANSI/IIAR 2**, Standard for Equipment, Design and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems.

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International Institute of Ammonia Refrigeration

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IIAR and Model Codes

- **2018 UMC §1102.2 Ammonia Refrigeration Systems.** Refrigeration systems using ammonia as the refrigerant shall comply with **IIAR 2**, **IIAR 3**, **IIAR 4** and **IIAR 5**. and shall not be required to comply with this chapter.
- **2021 IMC §1101.1.2 Ammonia refrigerant.** Refrigeration systems using ammonia as the refrigerant shall comply with **IIAR 2**, **IIAR 3**, **IIAR 4** and **IIAR 5**. and shall not be required to comply with this chapter.

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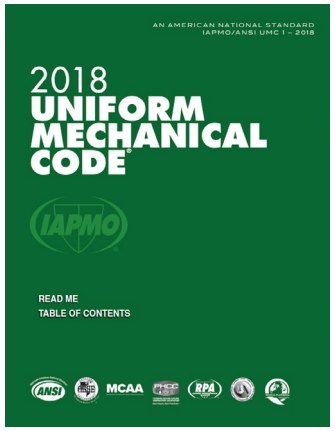

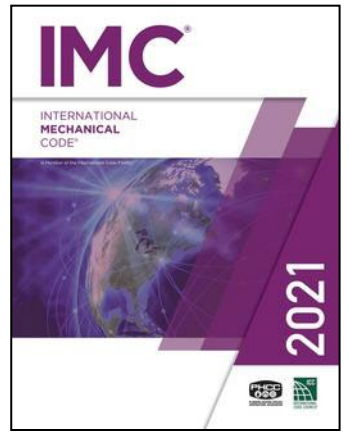

IIAR and Model Codes

- **ANSI/ASHRAE 15-2019 §2.3** This standard shall not apply to refrigeration systems using ammonia (R-717) as the refrigerant.
  - ***Informative Note:*** See **ANSI/IIAR 2** for systems using ammonia (R-717).

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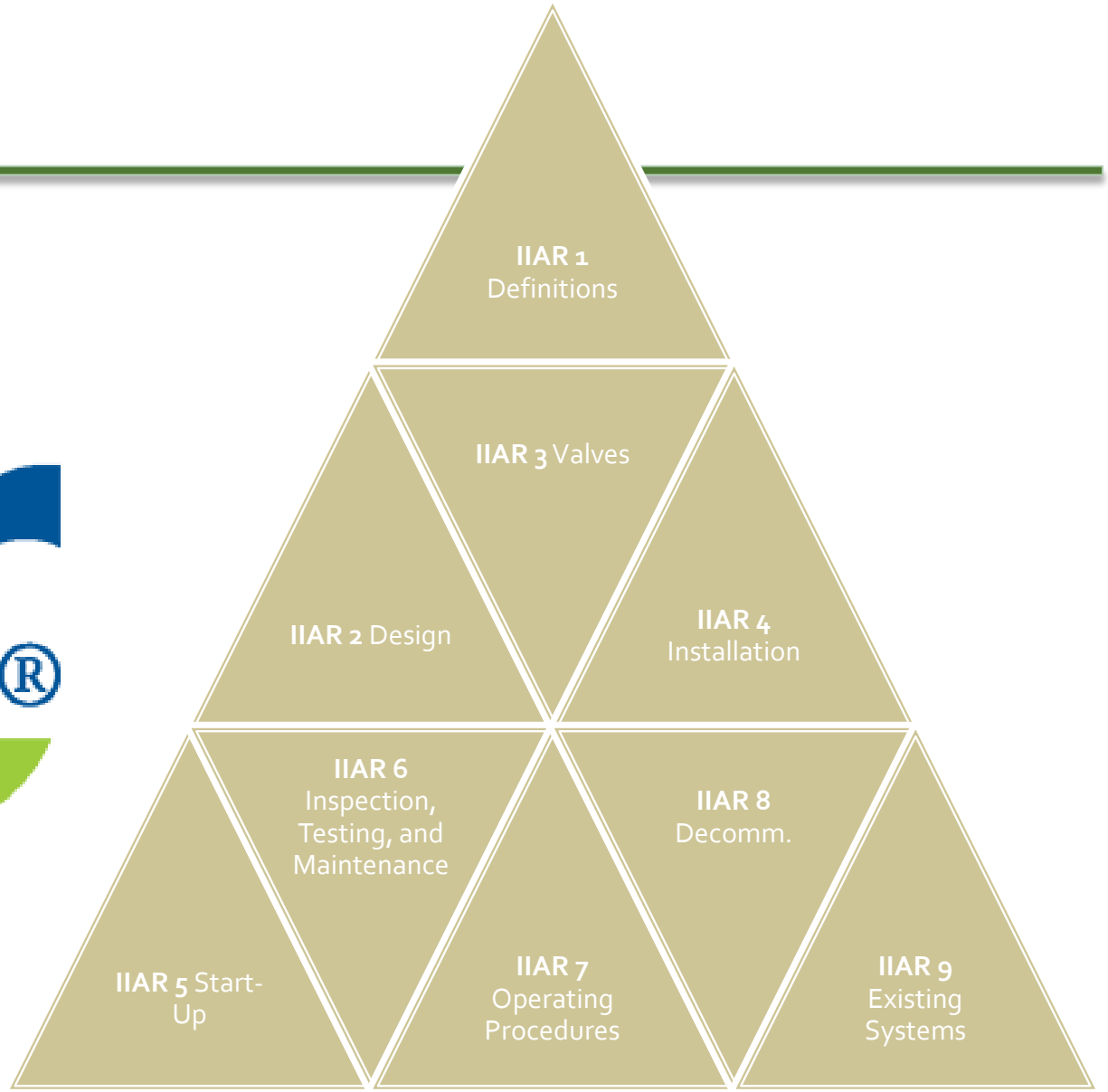
CALIFORNIA CUPA FORUM


IIAR 1
Definitions
IIAR 3 Valves
IIAR 2 Design
IIAR 4
Installation
IIAR 6
Inspection,
Testing, and
Maintenance
IIAR 8
Decomm.
IIAR 5 Start-
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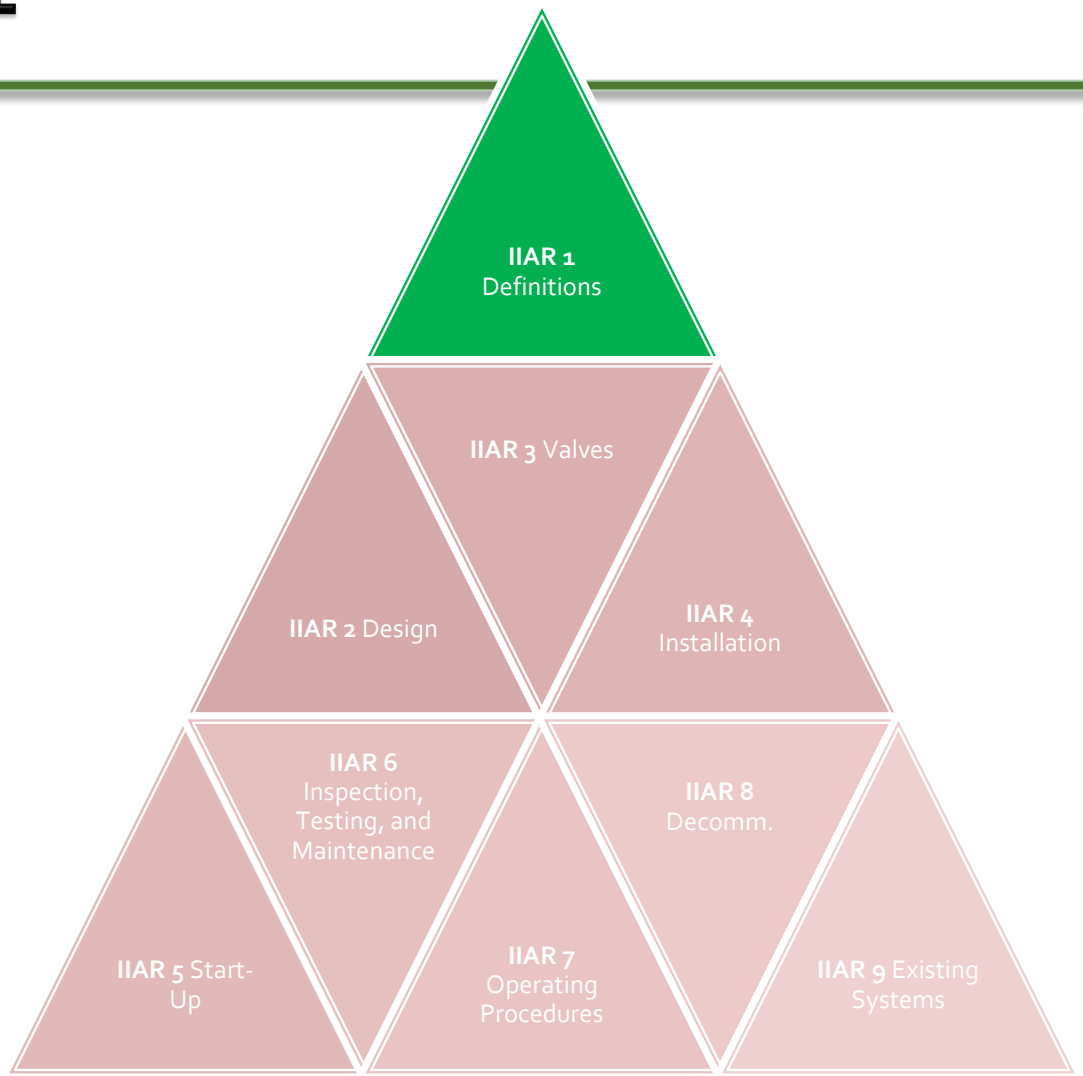
IIAR 7
Operating
Procedures
IIAR 9
Existing
Systems

IIAR 1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Systems


iiar
ANSI/IIAR 1-2017
American National
Standard
Standard for
Definitions and Terminology
Used in IIAR Standards
IIAR
ANSI
Approved by the American National Standards Institute June 30, 2017
Supersedes ANSI/IIAR 1-2012

IIAR 2


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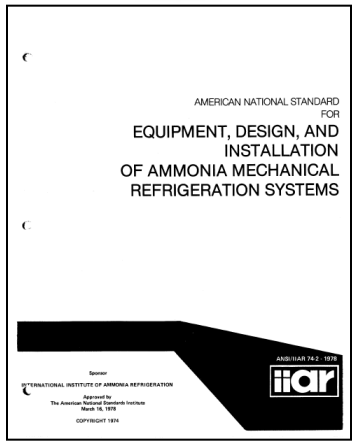
ANSI/IIAR 2-2014
American National
Standard
Standard for Safe Design
of Closed-Circuit
Ammonia Refrigeration Systems
IIAR
2
ANSI

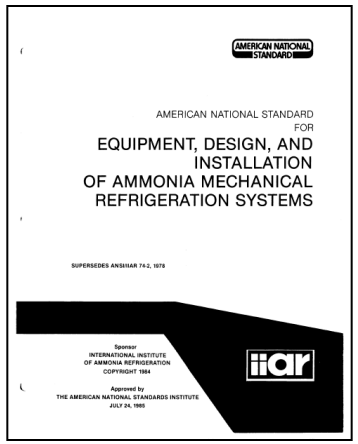
IIAR Standard 2

- ANSI/IIAR 2 Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems

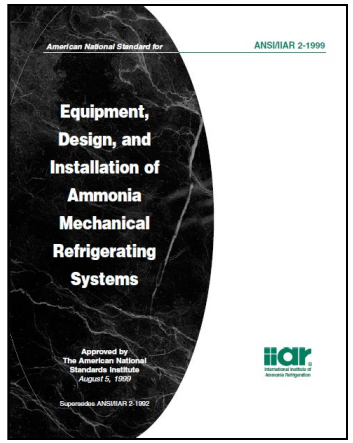
1974-78



1984



1999



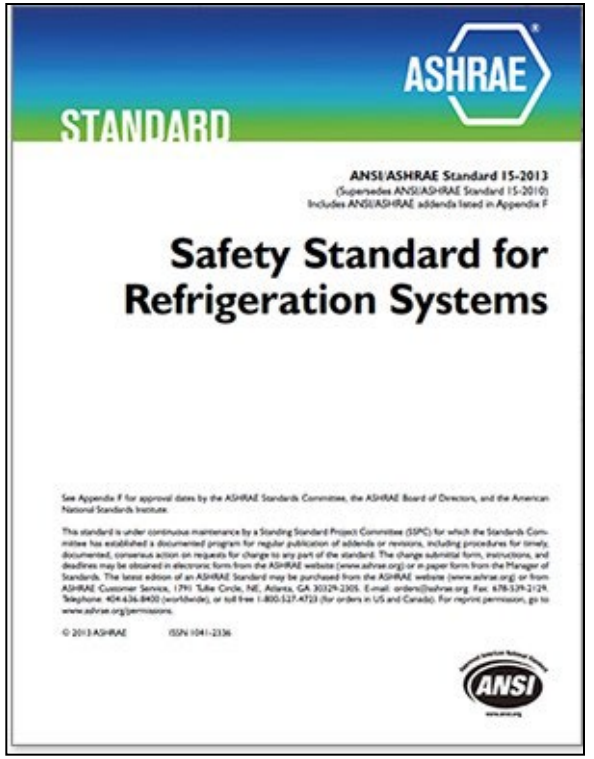
2008

2014

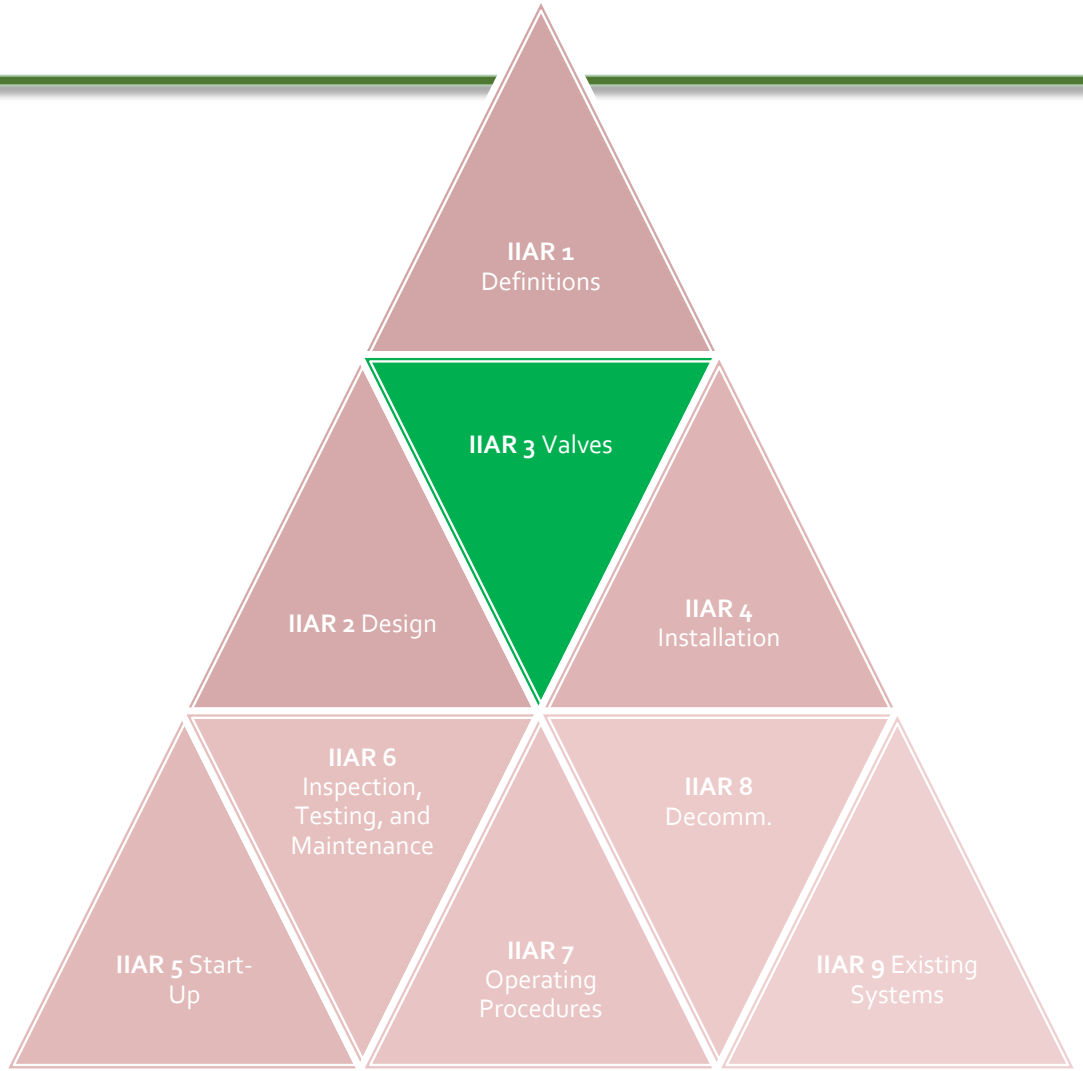
Overview

- **Part 1** – General (Chapters 1-3)
- **Part 2** – Design and Installation Considerations (Chapters 4-7)
- **Part 3** – Equipment (Chapters 8-17)
- **Part 4** – Appendices (Appendix A – Appendix N)

IIAR 2 vs. ASHRAE 15



IIAR 3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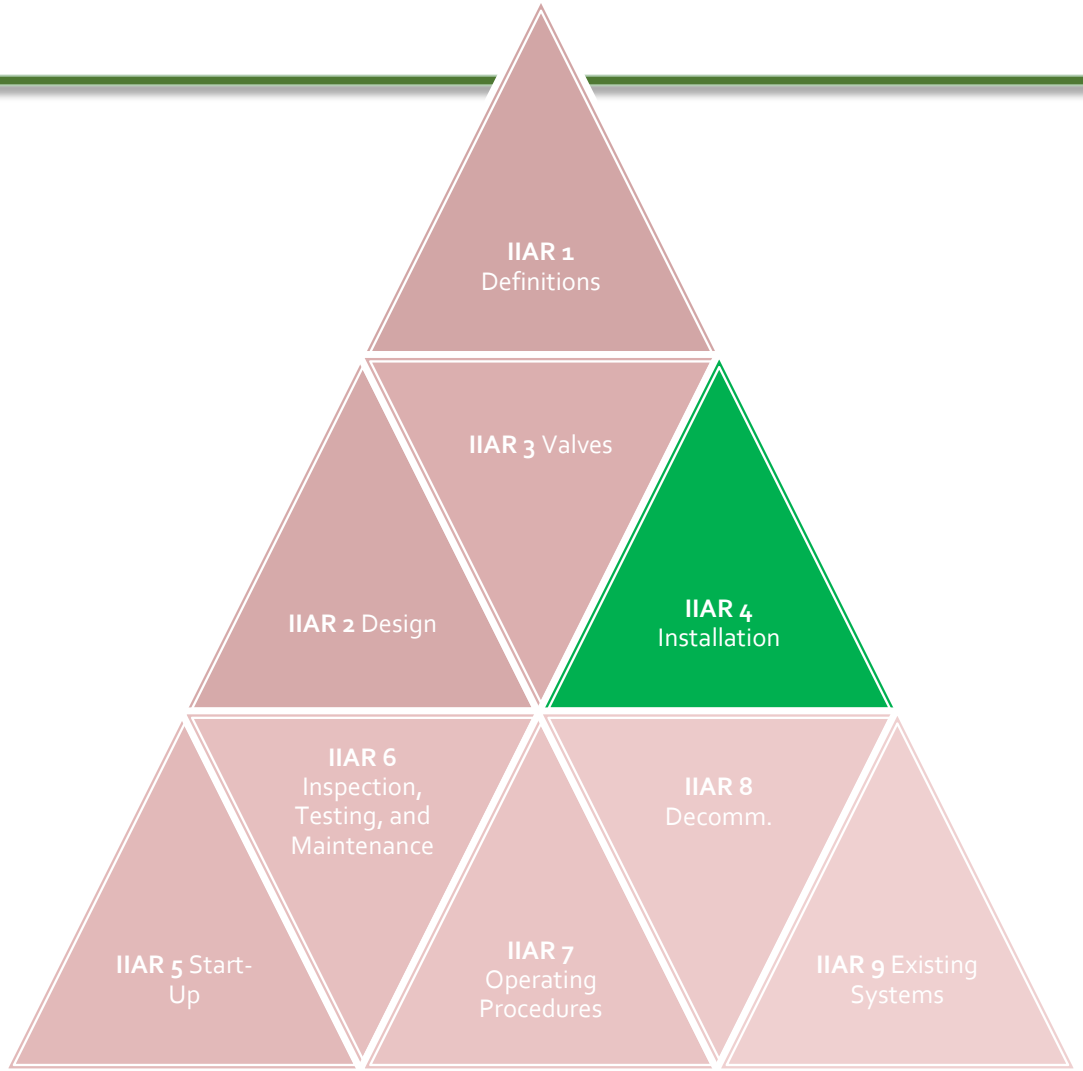
ANSI/IIAR 3-2017
American National Standard
Standard for
Ammonia Refrigeration
Valves
IIAR
3
ANSI
Approved by the American National Standards Institute June 30, 2017
Supersedes ANSI/IIAR 3-2012


R/S

IIAR 4


IIAR 1 Definitions
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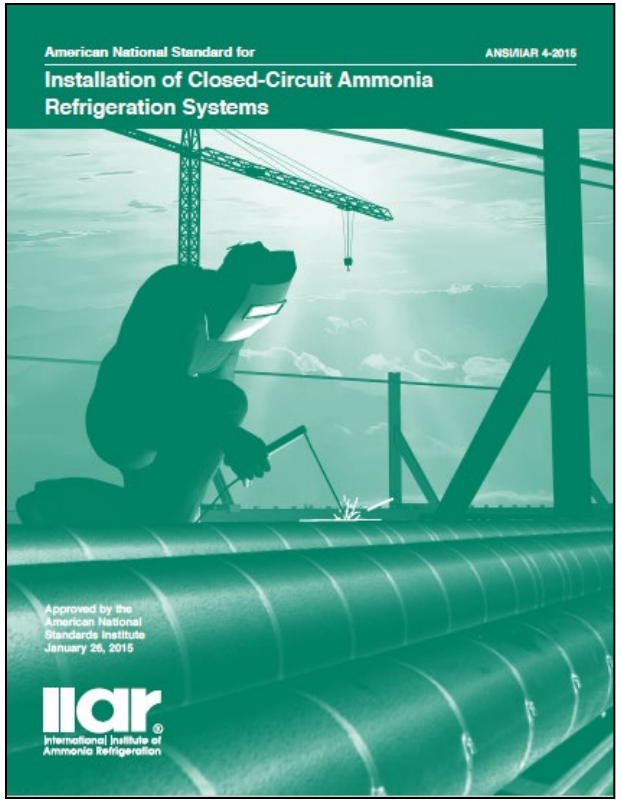
American National Standard for
ANSI/IIAR 4-2015
Installation of Closed-Circuit Ammonia Refrigeration Systems
Approved by the American National Standards Institute January 26, 2015
IIAR
International Institute of Ammonia Refrigeration

	Compressors		***LP Side Components Including Vessels, Heat Exchangers, Evaporators, Pumps & Piping***	***Hot Gas Defrost Evaporators & Piping***	***HP Side Components Including Valves, Sensing Devices, Heat Exchangers, Condensers, Pumps & Piping***	
	LP Side & Boosters	*HP Side*			*Water-cooled Systems*	*Air-cooled Systems*
Psig	250	300	**250**	250	**250**	300
kPa gauge	1724	2069	1724	1724	1724	2069

IIAR 5


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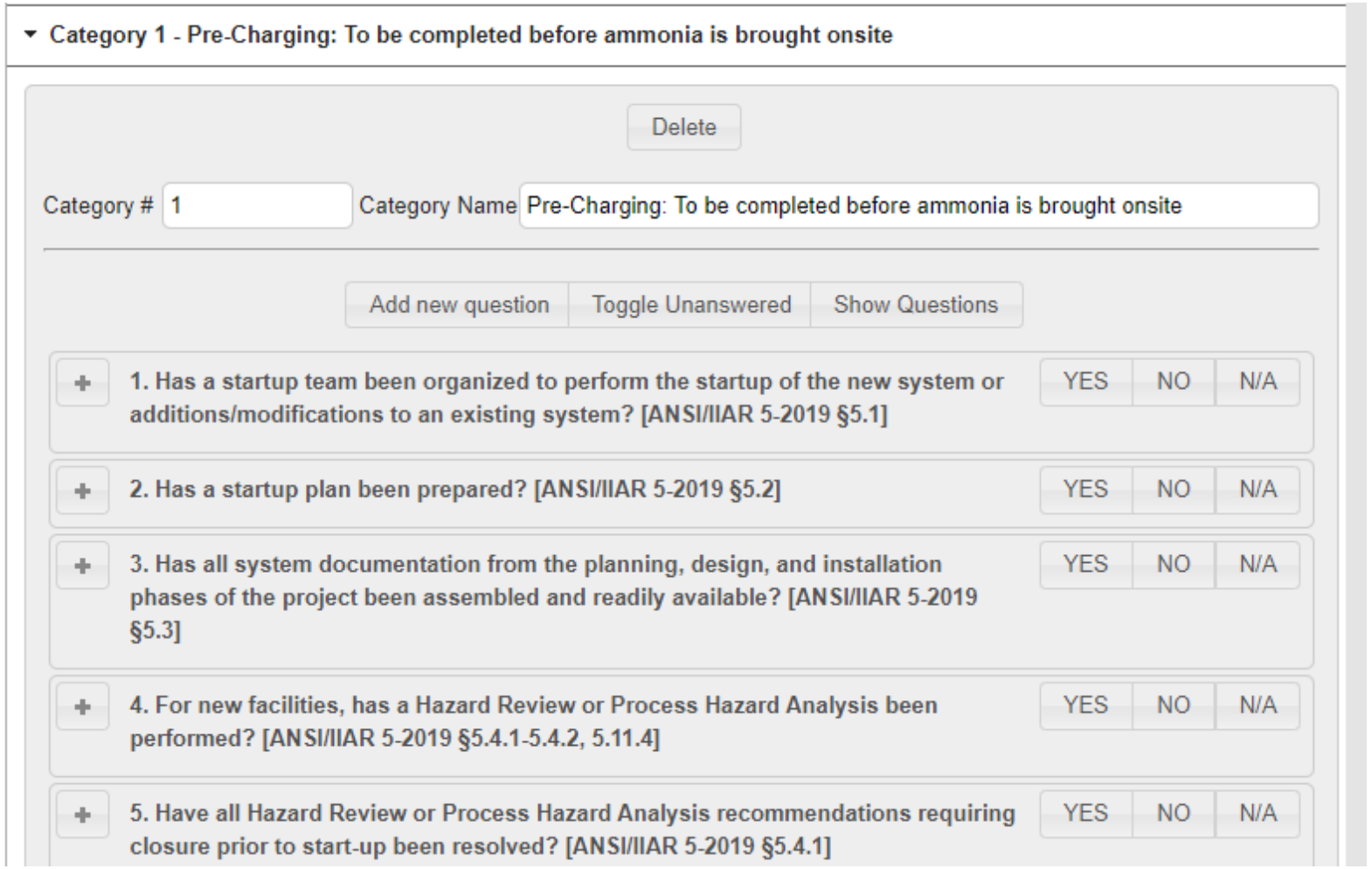
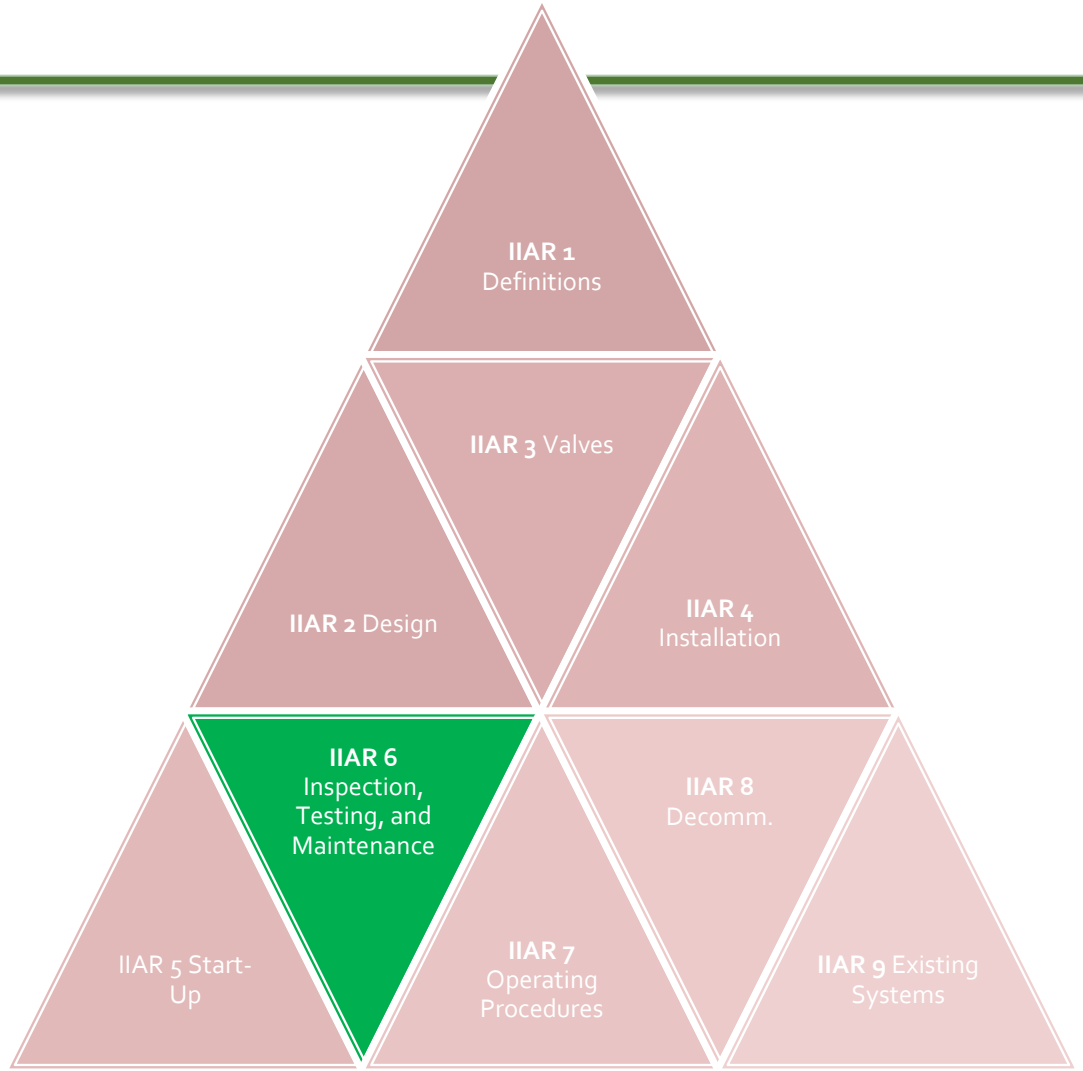
ANSI/IIAR 5-2013
American National Standard
Standard for
Start-up and Commissioning
of Closed-Circuit Ammonia
Refrigeration Systems
IIAR 5
ANSI
Approved by the American National Standards Institute July 31, 2013


Category 1 - Pre-Charging: To be completed before ammonia is brought onsite
Delete
Category # 1
Category Name Pre-Charging: To be completed before ammonia is brought onsite
Add new question
Toggle Unanswered
Show Questions
1. Has a startup team been organized to perform the startup of the new system or additions/modifications to an existing system? [ANSI/IIAR 5-2019 §5.1]
YES NO N/A
2. Has a startup plan been prepared? [ANSI/IIAR 5-2019 §5.2]
YES NO N/A
3. Has all system documentation from the planning, design, and installation phases of the project been assembled and readily available? [ANSI/IIAR 5-2019 §5.3]
YES NO N/A
4. For new facilities, has a Hazard Review or Process Hazard Analysis been performed? [ANSI/IIAR 5-2019 §5.4.1-5.4.2, 5.11.4]
YES NO N/A
5. Have all Hazard Review or Process Hazard Analysis recommendations requiring closure prior to start-up been resolved? [ANSI/IIAR 5-2019 §5.4.1]
YES NO N/A

IIAR 6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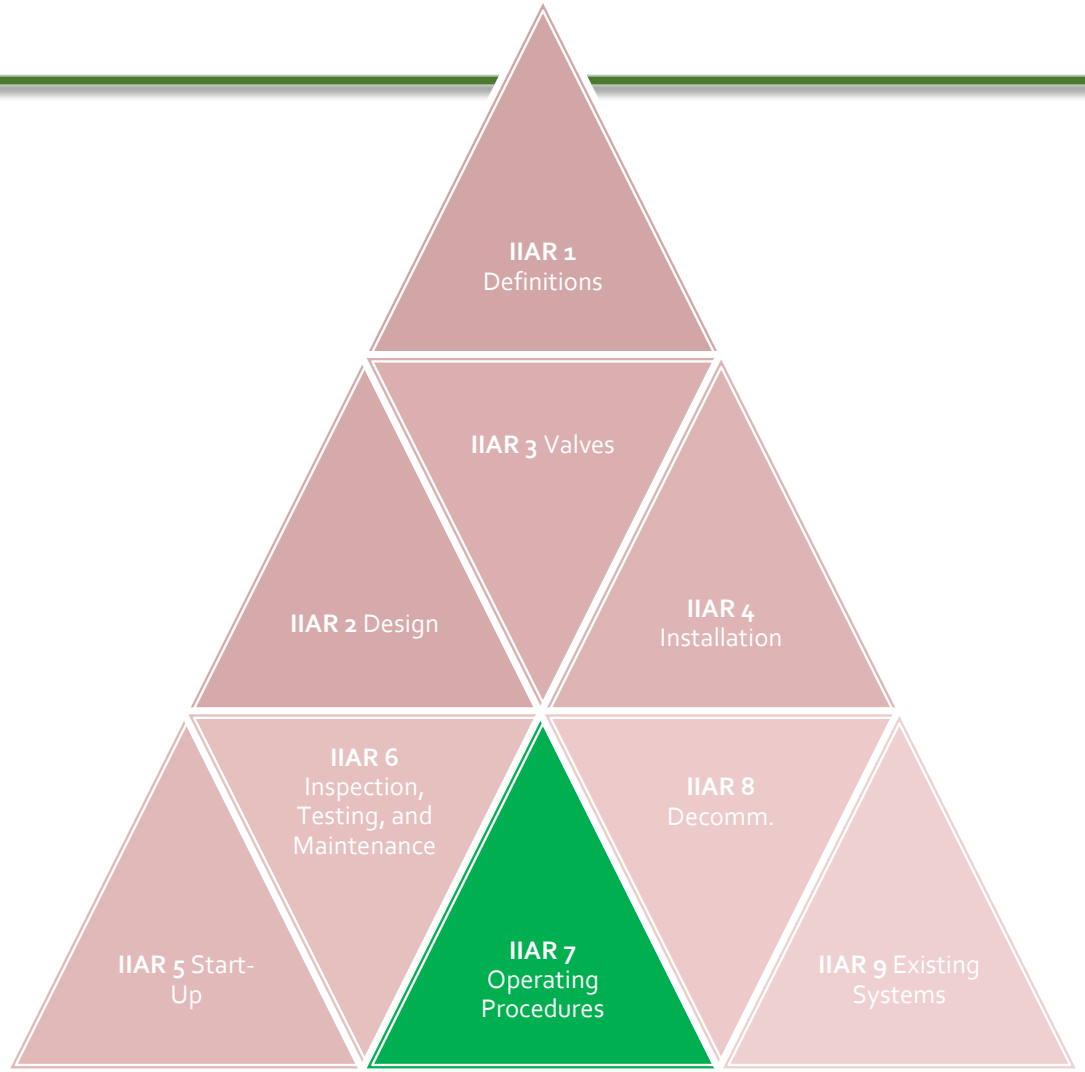
Frequencies

- D – Daily
- W – Weekly
- M – Monthly
- Q – Quarterly
- S – Semiannual
- A – Annual
- B - Biennial,
- 3 - Three Years
- 5 - Five Years
- 10 - Ten Years
- WA - Where Applicable
- NA - Not Applicable
- NR - Not Required

IIAR 7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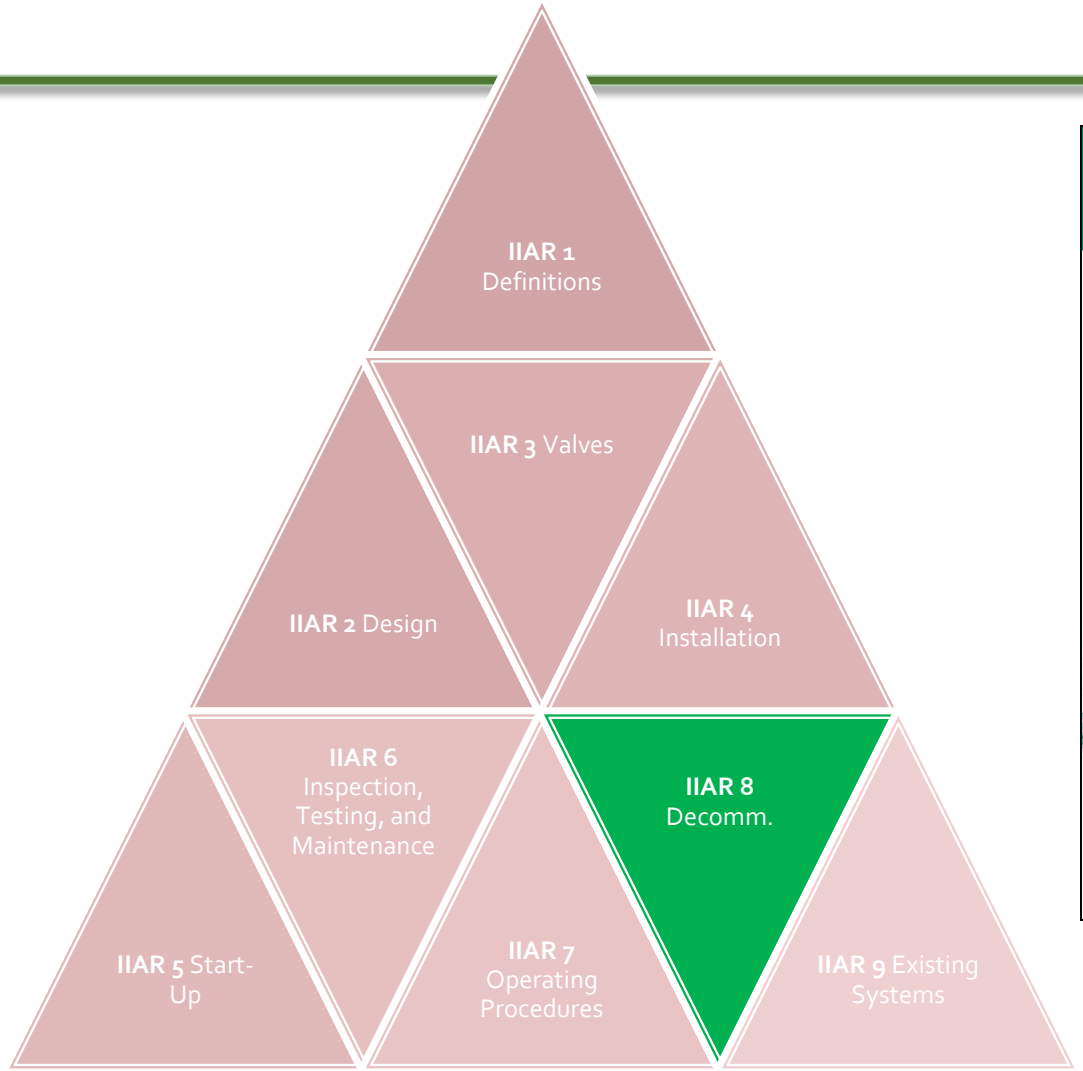
iiar
ANSI/IIAR 7-2013
American National
Standard
Standard for Developing
Operating Procedures
for Closed-Circuit
Ammonia Mechanical
Refrigerating Systems
IIAR
7
ANSI
Approved by the American National Standards Institute August 21, 2013


+26RP

IIAR 8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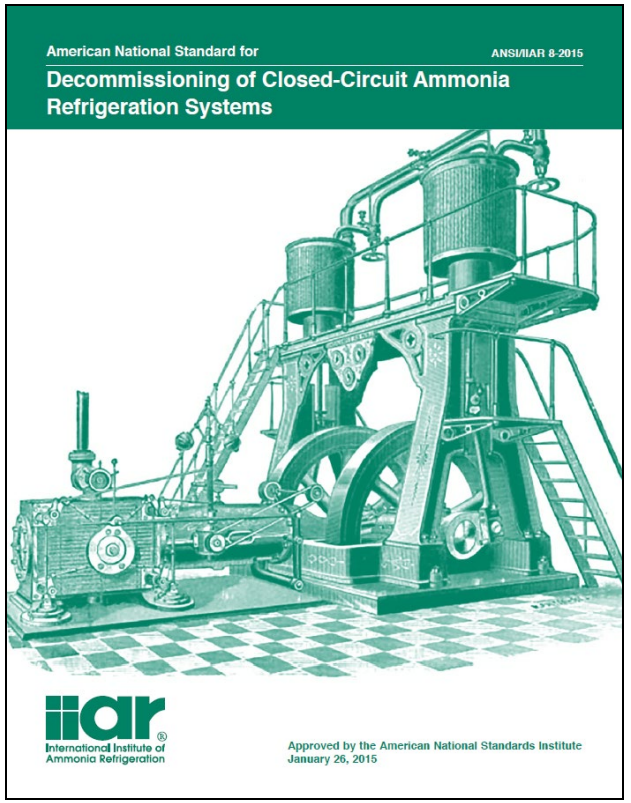
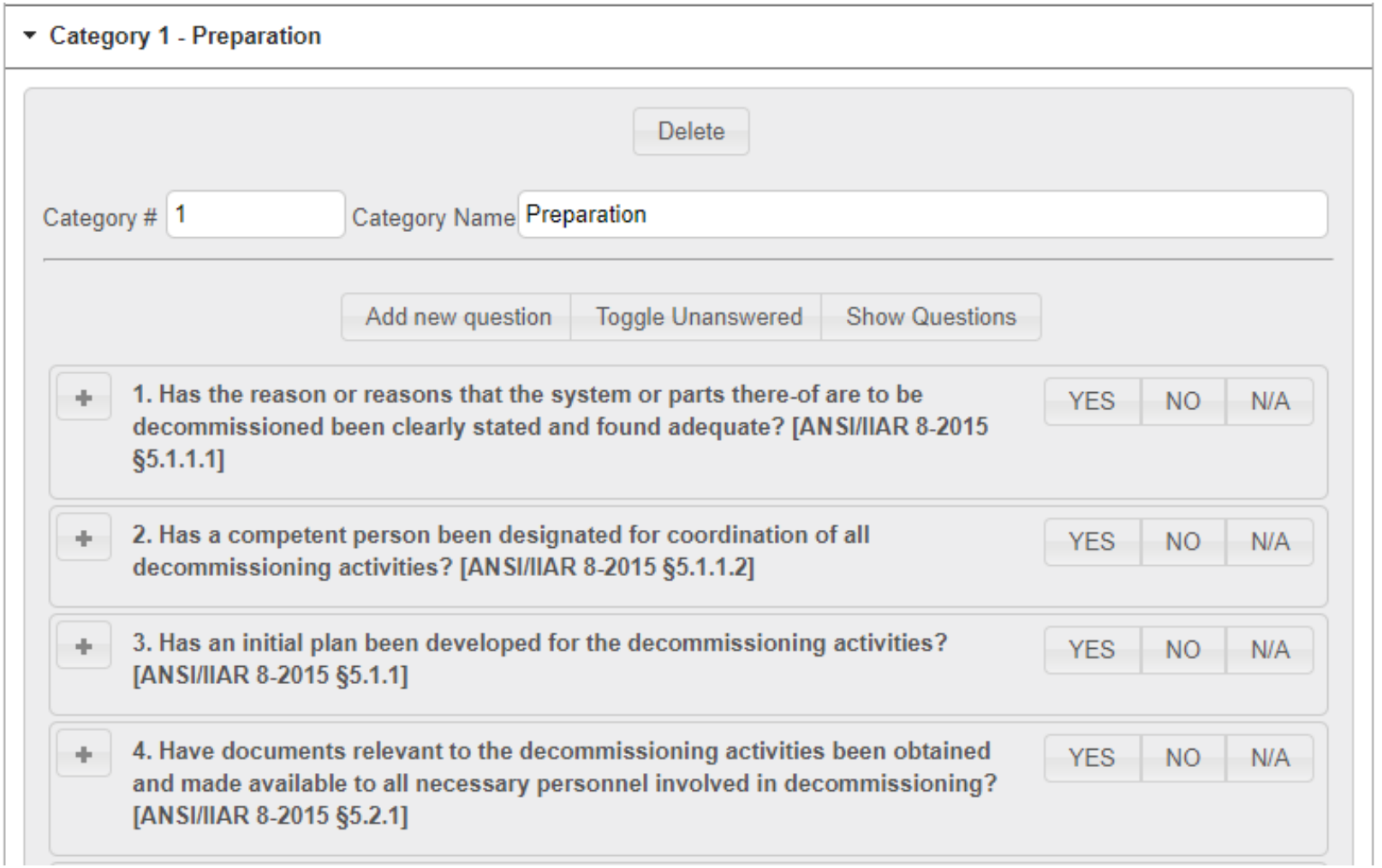
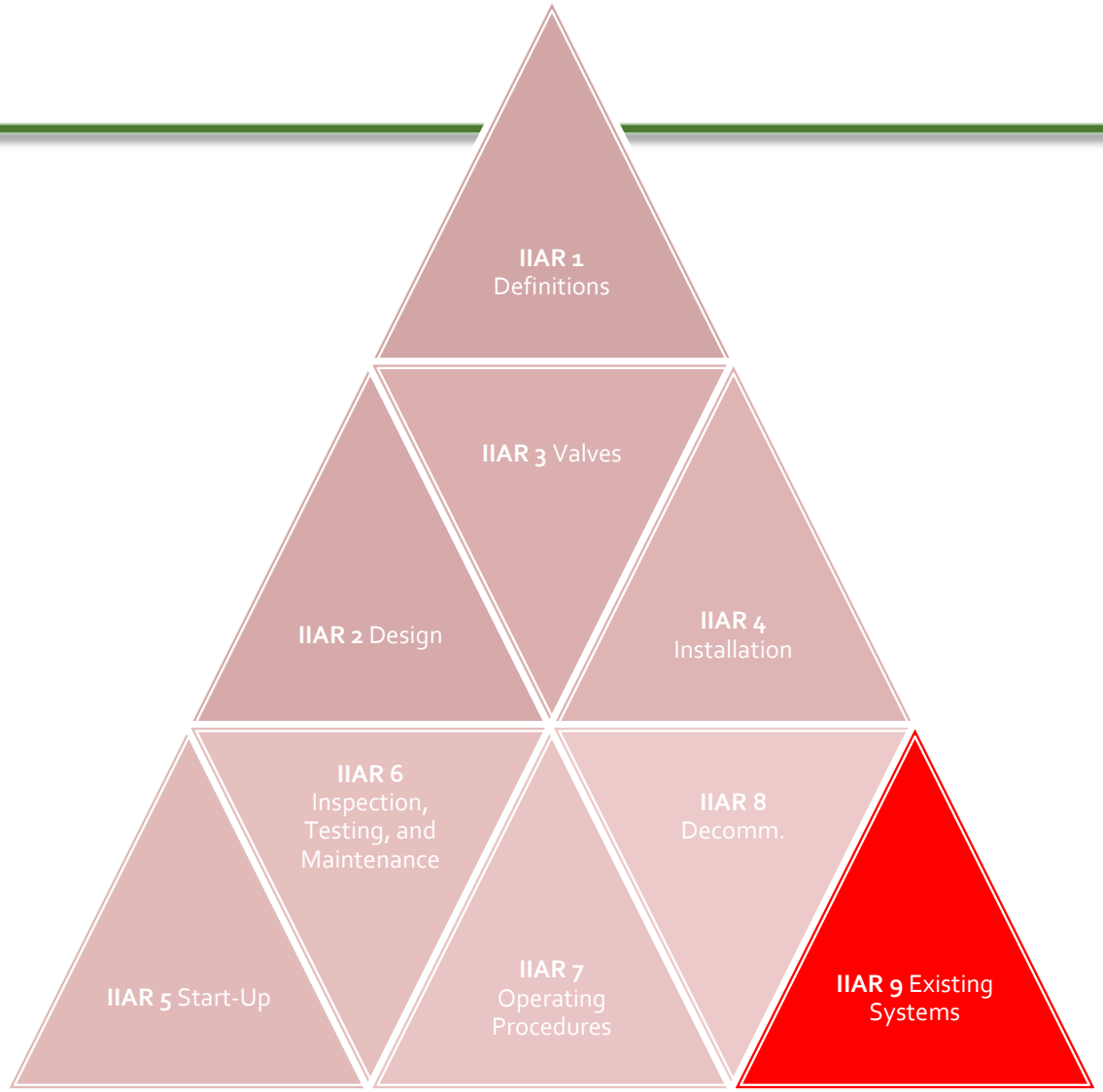

American National Standard for
ANSI/IIAR 8-2015
Decommissioning of Closed-Circuit Ammonia Refrigeration Systems
iiar
International Institute of Ammonia Refrigeration
Approved by the American National Standards Institute
January 26, 2015


Category 1 - Preparation
Delete
Category # 1
Category Name Preparation
Add new question
Toggle Unanswered
Show Questions
1. Has the reason or reasons that the system or parts there-of are to be decommissioned been clearly stated and found adequate? [ANSI/IIAR 8-2015 §5.1.1.1]
YES
NO
N/A
2. Has a competent person been designated for coordination of all decommissioning activities? [ANSI/IIAR 8-2015 §5.1.1.2]
YES
NO
N/A
3. Has an initial plan been developed for the decommissioning activities? [ANSI/IIAR 8-2015 §5.1.1]
YES
NO
N/A
4. Have documents relevant to the decommissioning activities been obtained and made available to all necessary personnel involved in decommissioning? [ANSI/IIAR 8-2015 §5.2.1]
YES
NO
N/A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Grandfathering

Scenario:

- Cold Storage Facility was built in 1969 in accordance with the 1967 UMC.

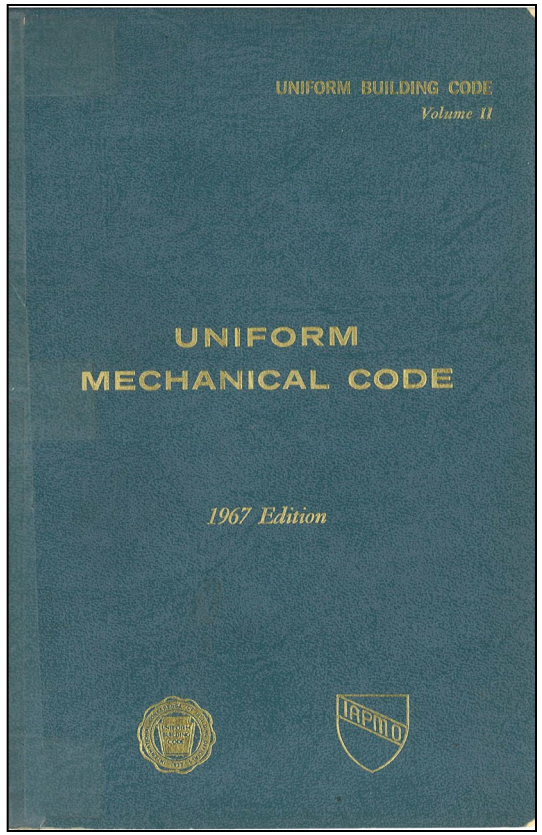
U.M.C. STANDARD 15-1-67 UNIFORM MECHANICAL CODE

UNIFORM MECHANICAL CODE STANDARD NO. 15-1-67

MECHANICAL REFRIGERATION

Based on Standard B9.1-1964 of the United States of America Standards Institute

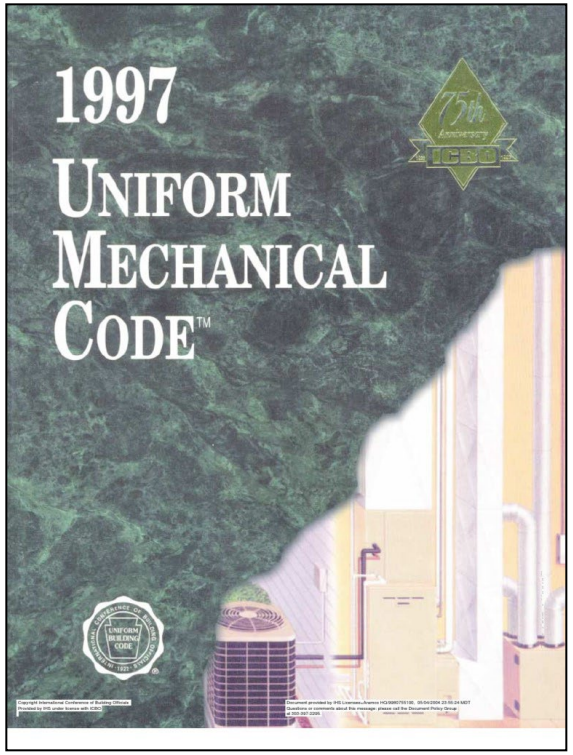
See Section 1501, Uniform Mechanical Code



Grandfathering

Scenario:

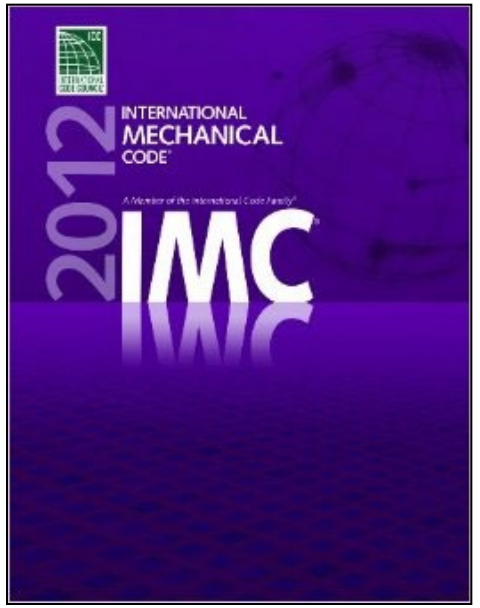
- In 1998, modifications were made to the machinery room
  - New compressor installed
  - AHJ required ventilation and detection to be upgraded
  - All changes performed in accordance with 1997 UMC

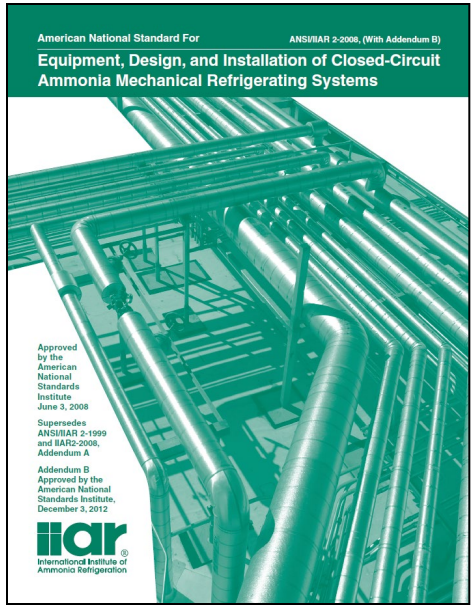


Grandfathering

Scenario:

- In 2014, facility hired a contractor to construct a new cold storage room
  - No machinery room modifications required
  - New room must comply with 2012 IMC and ANSI/IIAR 2-2008 Addendum B
  - Facility elected to upgrade detection for entire facility to comply with 2012 IMC



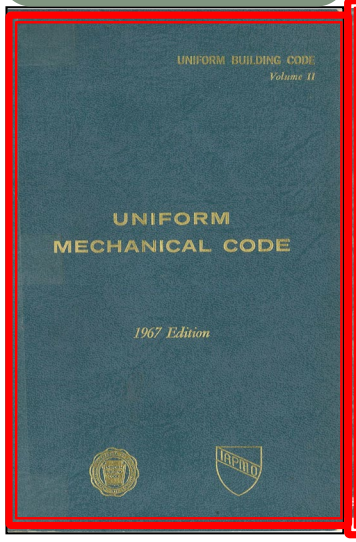
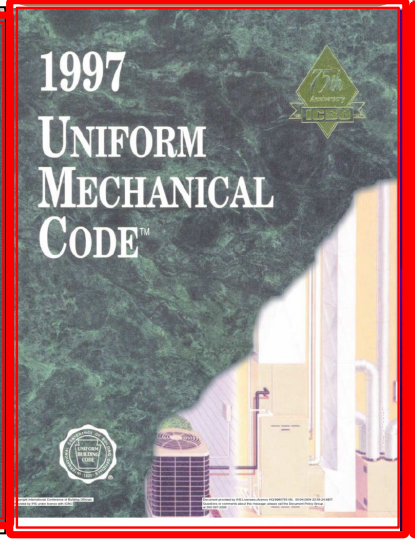
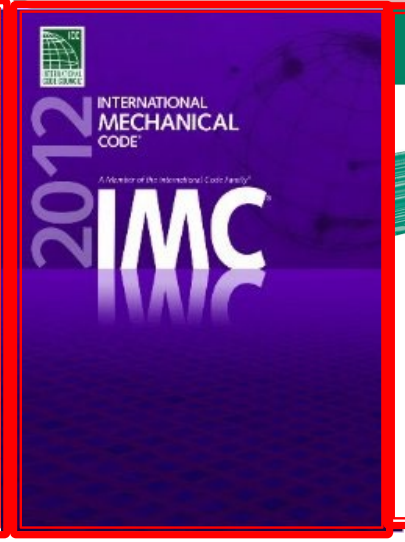


Poll Question 2

- In the example given, which RAGAGEP is applicable at the facility?
  - 1967 UMC
  - 1997 UMC
  - 2012 IMC and ANSI/IIAR 2-2008 Addendum B
  - All of the above

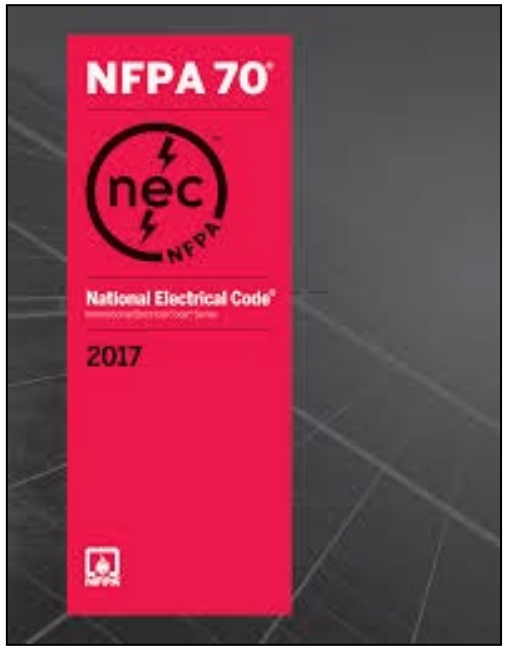
Grandfathering

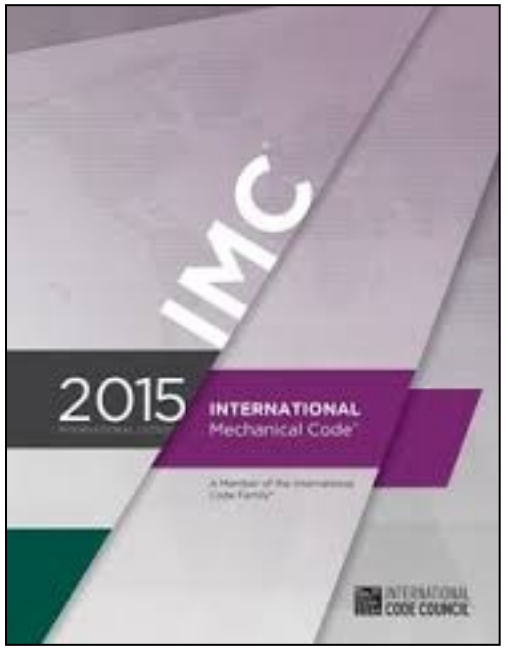
- **What RAGAGEP is applicable at the facility?**

Originally Installed System	New Compressor and Ventilation System	New Room and Detection System	
			

Consideration of New RAGAGEPs

When a new code/standard is released, what do I do?

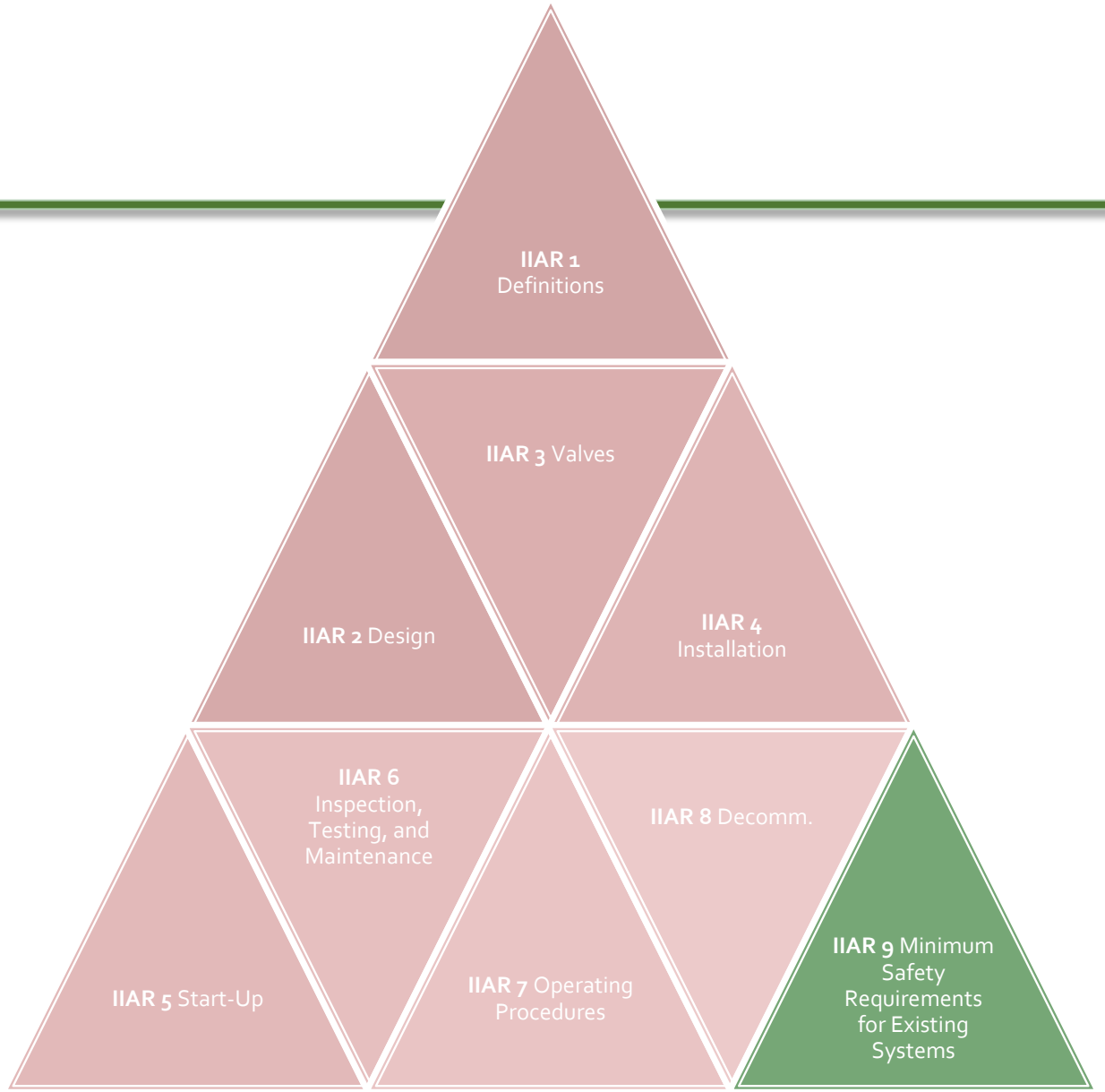




ANSI/IIAR 9-2020

Standard for Minimum System Safety Requirements for Existing Closed-Circuit Ammonia Refrigeration Systems

Standard 9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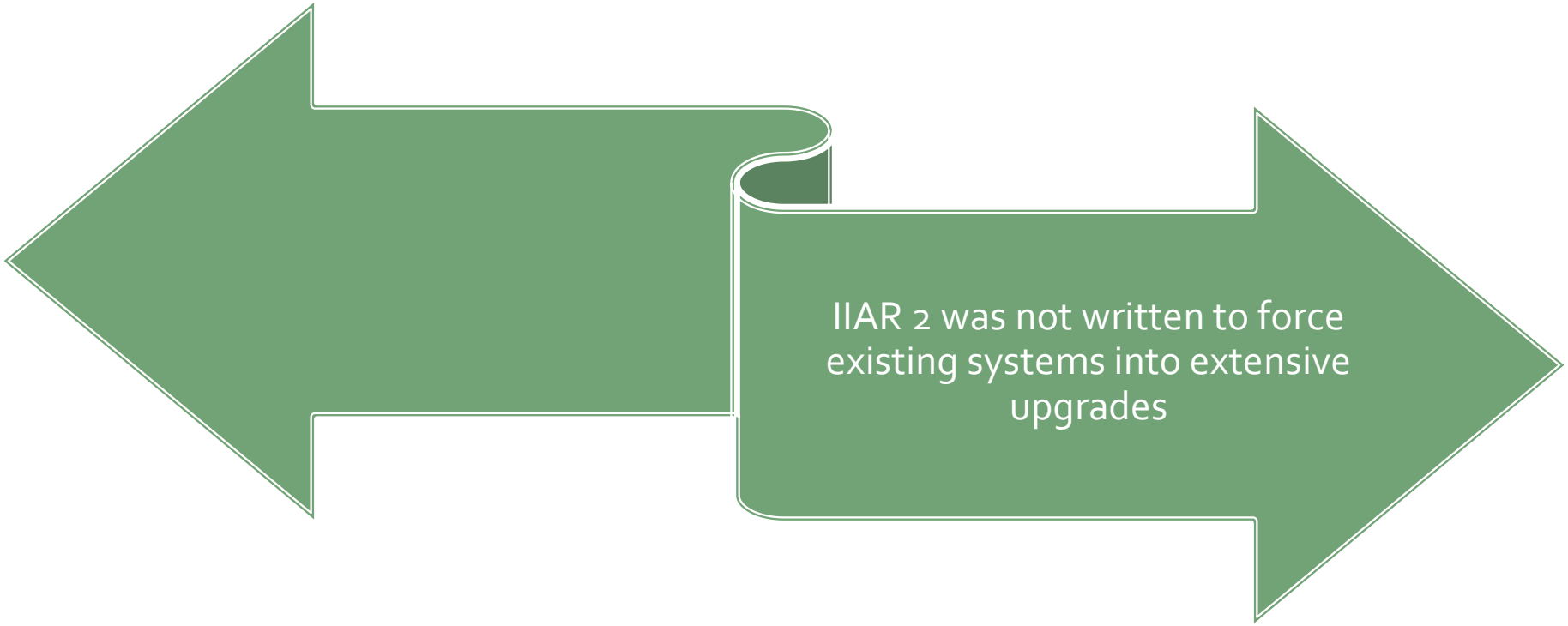
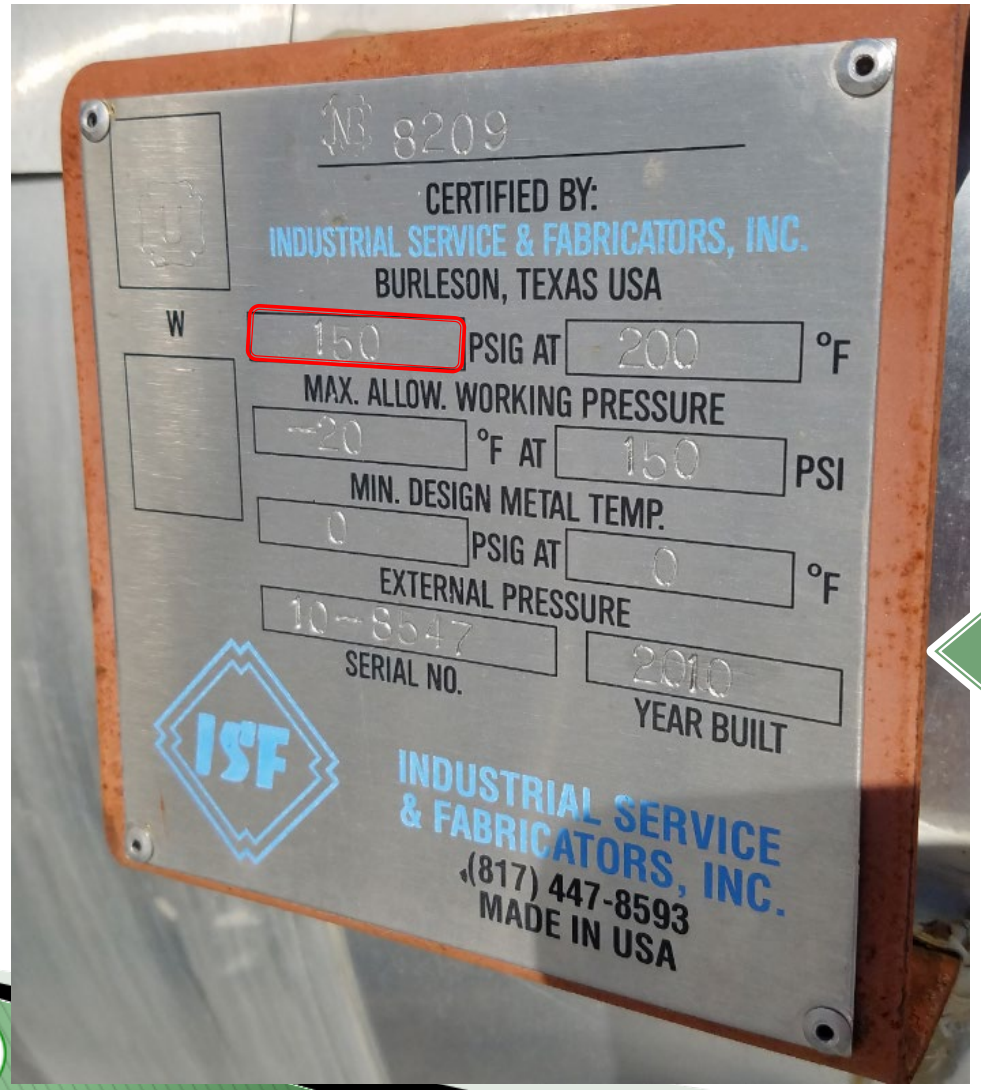
IIAR 9 Minimum Safety Requirements for Existing Systems

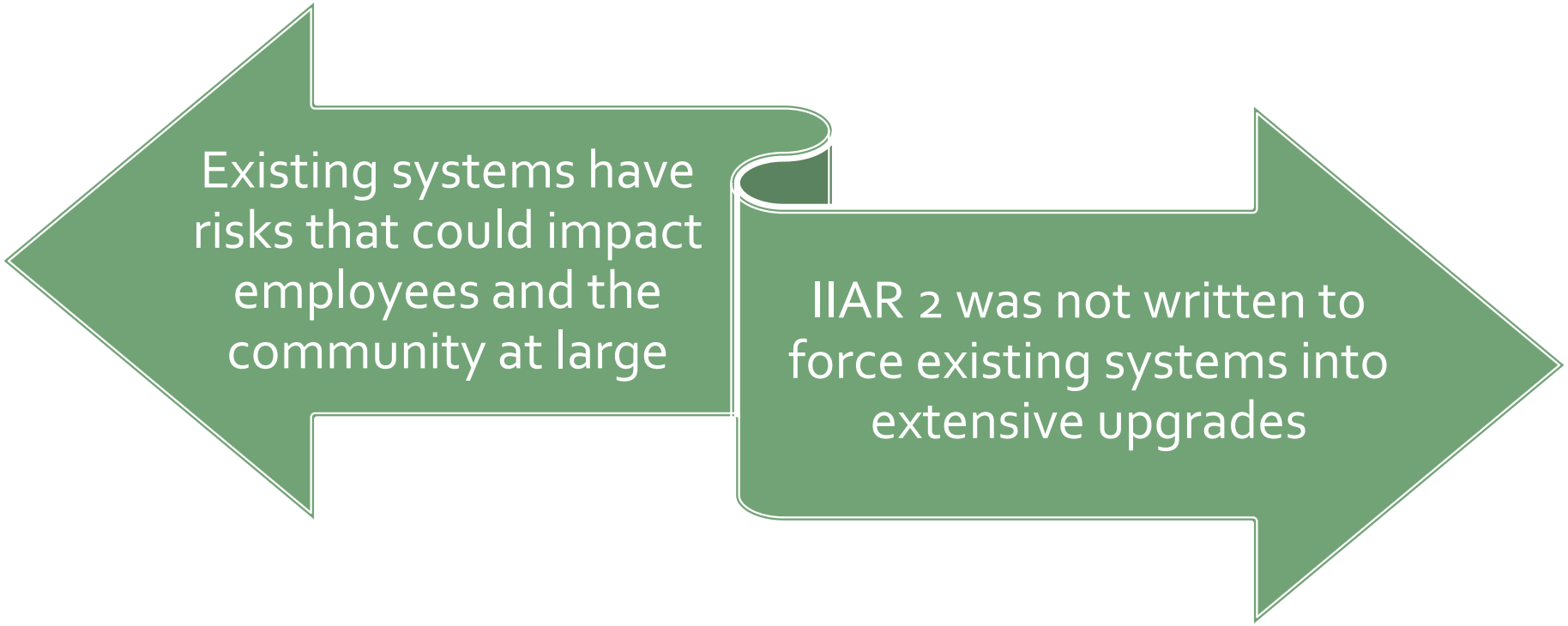

IIAR 2 was not written to force existing systems into extensive upgrades

ANSI/IIAR 2-2014 Addendum A §5.5.3(1)

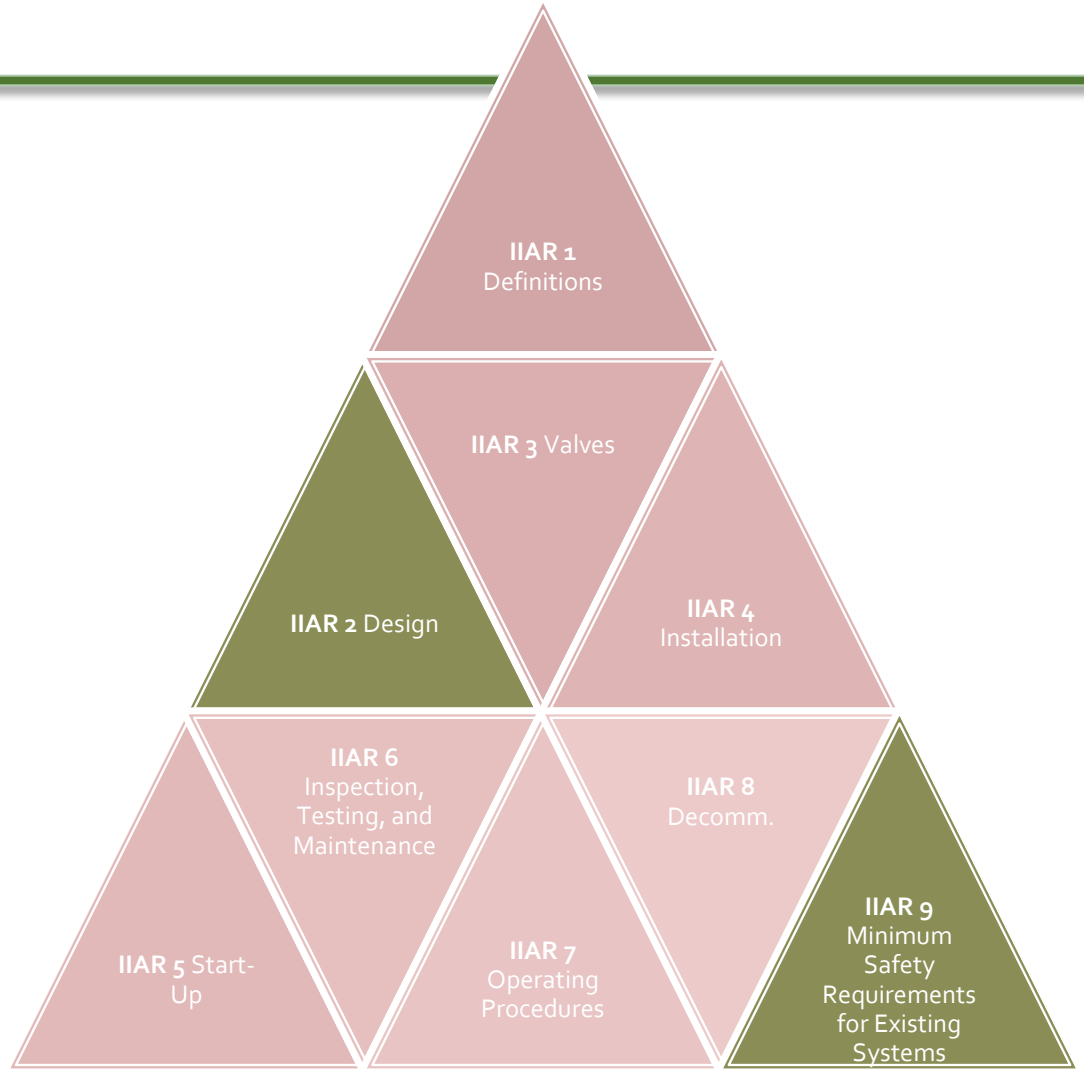


- **1. Low-pressure side:** 10°F (5.6°C) higher than the 1% ambient dry-bulb temperature for the installation location or 114.6°F (45.9°C), whichever is greater. **The minimum design pressure shall be 250 psig** (1,724 kPa).

IIAR 2 was not written to force existing systems into extensive upgrades


Existing systems have risks that could impact employees and the community at large
IIAR 2 was not written to force existing systems into extensive upgrades

Standard 9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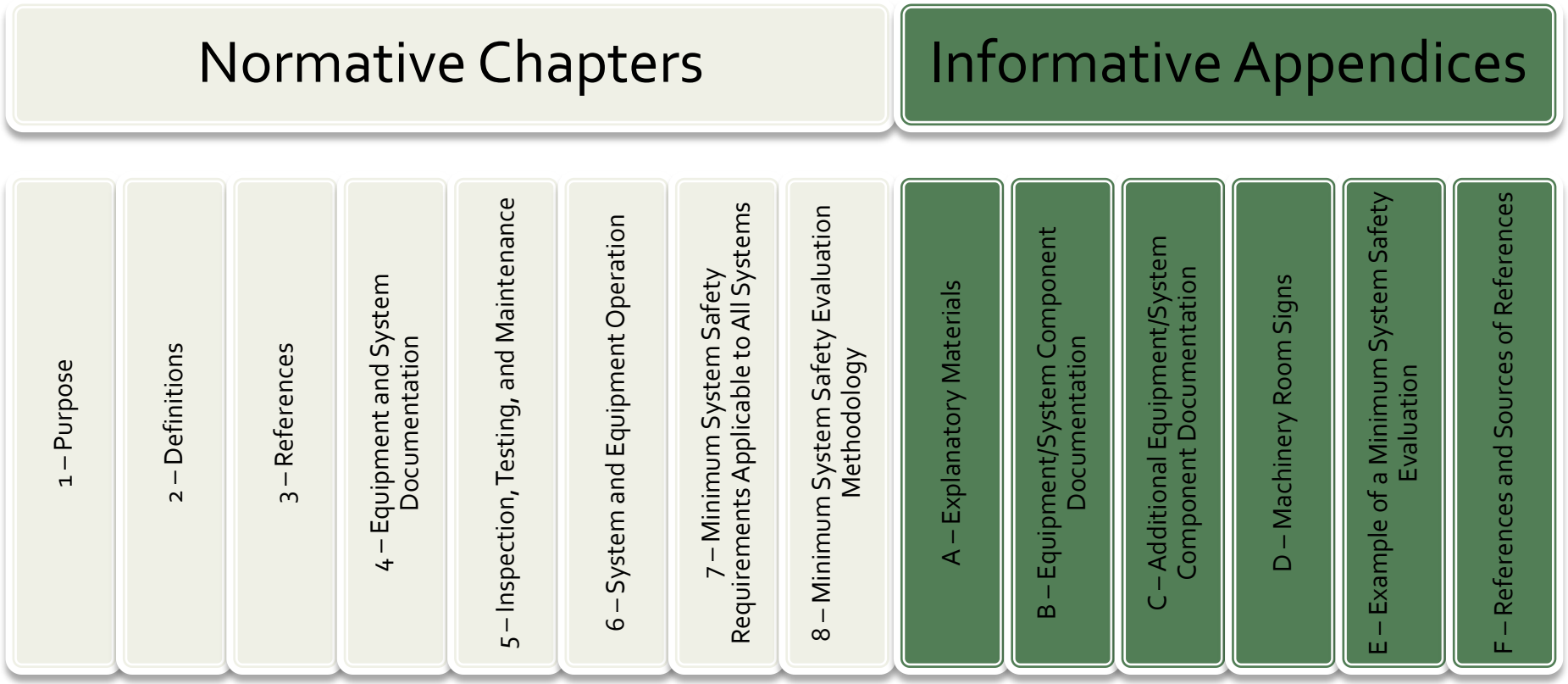
IIAR 3 Valves
IIAR 2 Design
IIAR 4
Installation
IIAR 6
Inspection, Testing, and Maintenance
IIAR 8
Decomm.
IIAR 5 Start-Up
IIAR 7
Operating Procedures
IIAR 9
Minimum Safety Requirements for Existing Systems

IIAR 9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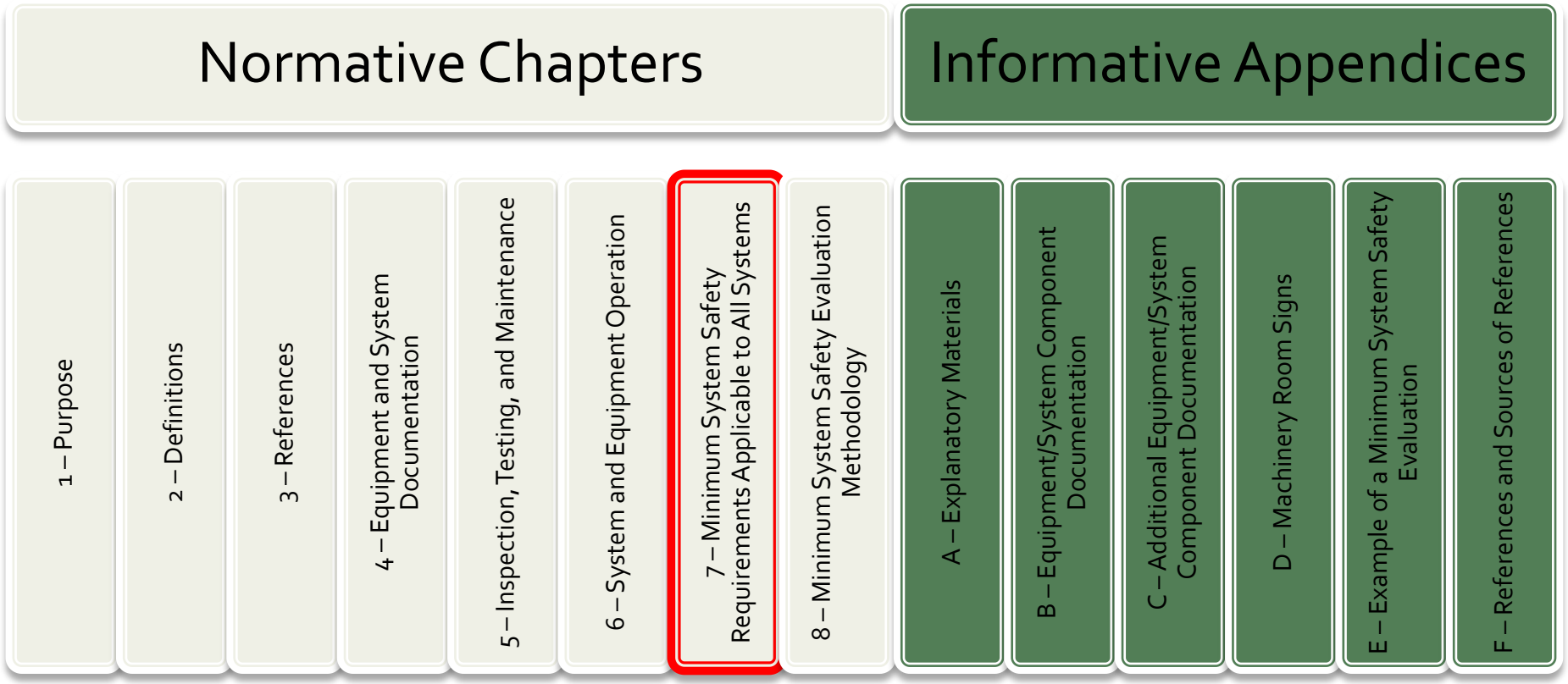
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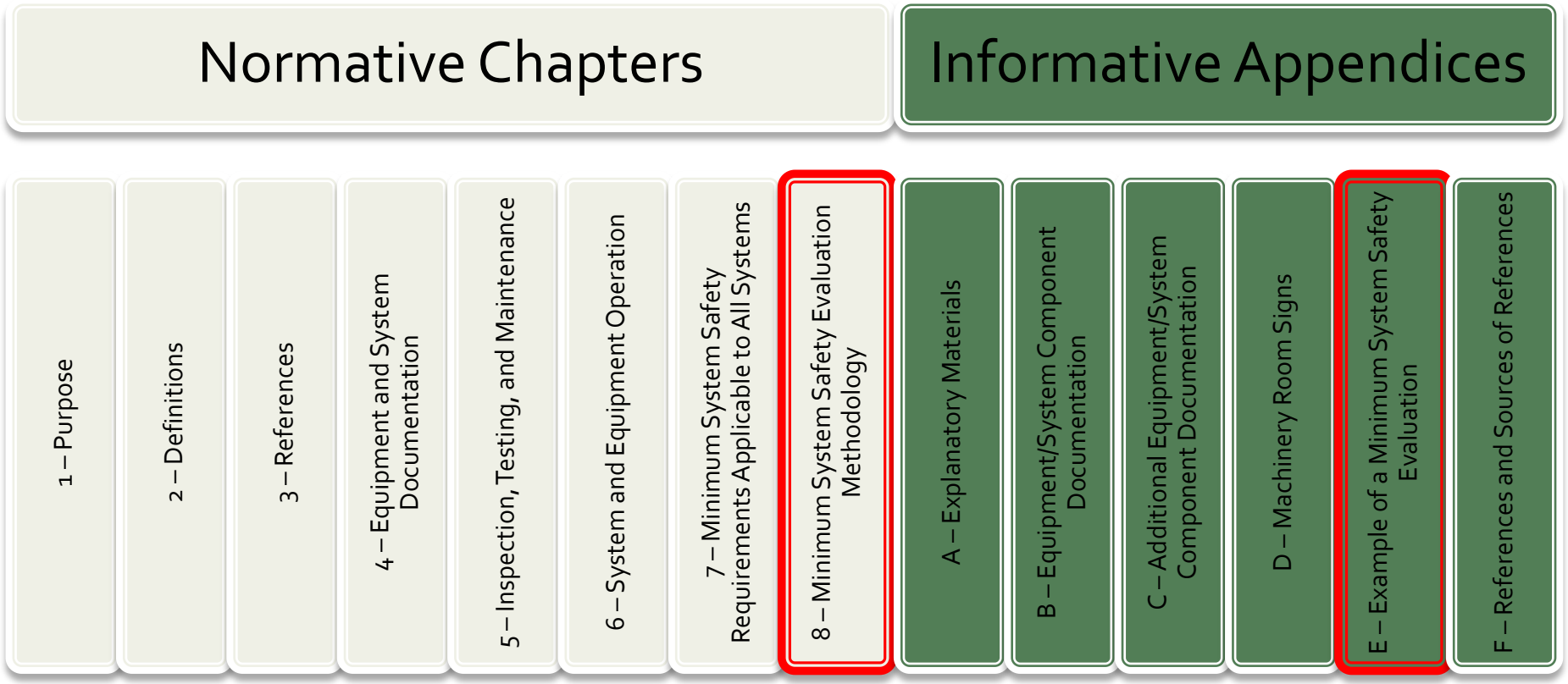
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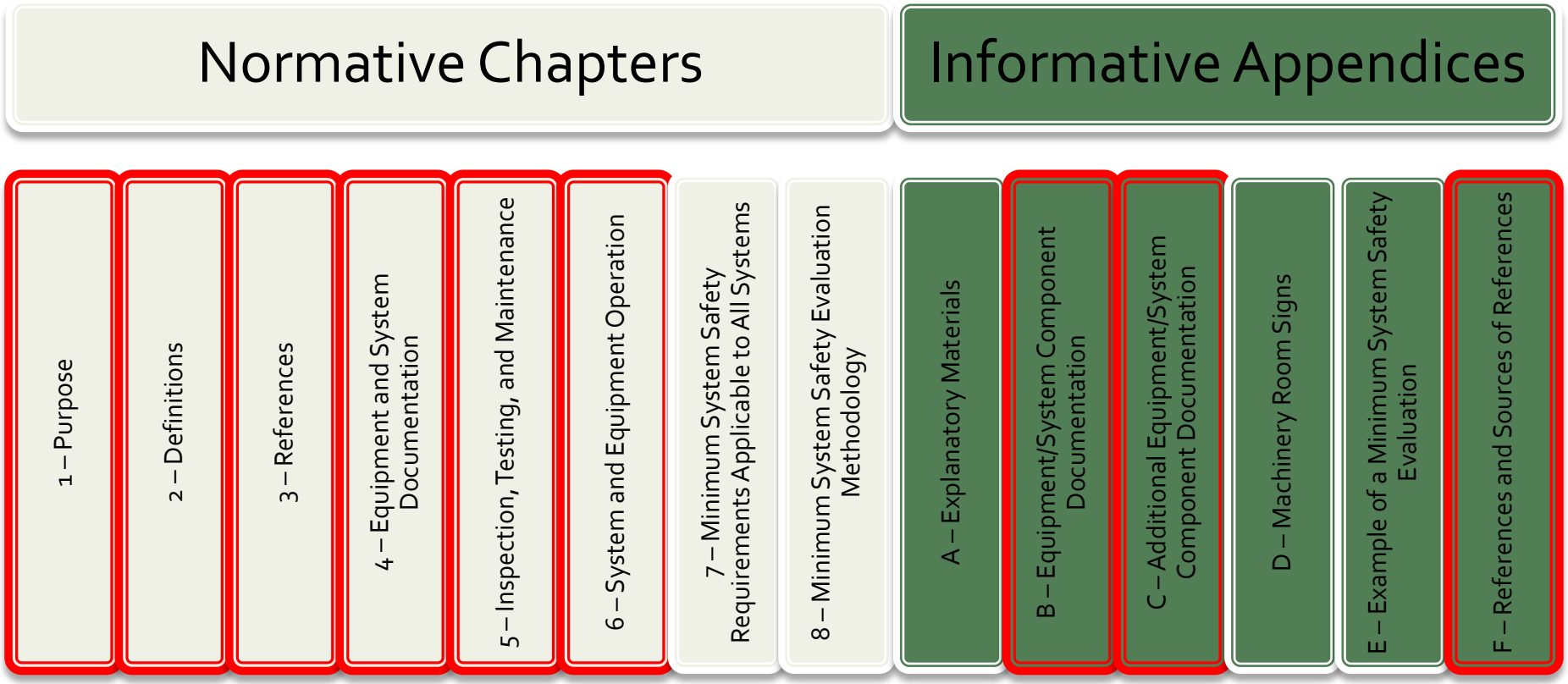
Chapters 1-6

IIAR 9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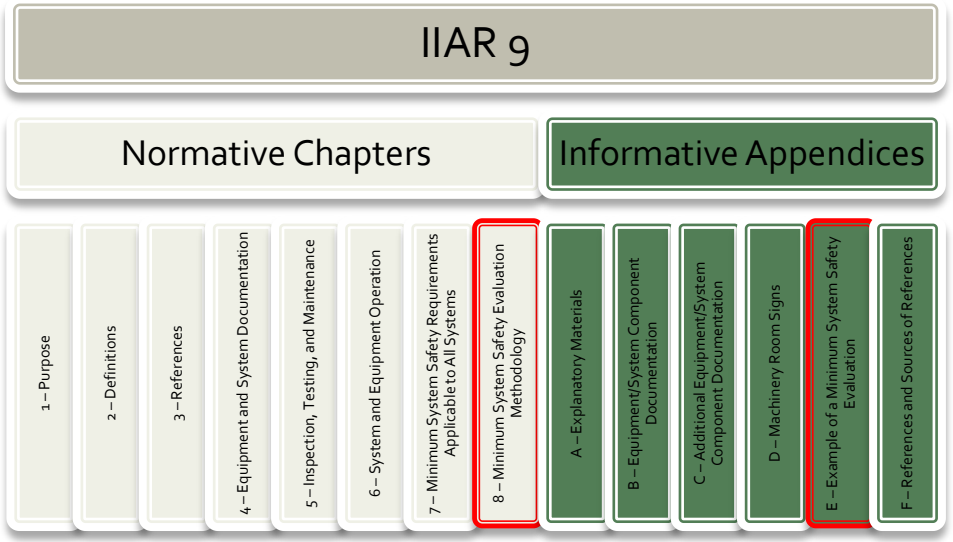
Chapter 1: Purpose

- §1.1 Purpose
  - §1.1.1 This standard provides the minimum safety requirements for existing closed-circuit ammonia refrigeration systems.

Chapter 1: Scope

- §1.2 Scope
  - §1.2.1 This standard provides a method to determine if existing stationary closed-circuit refrigeration systems using ammonia as a refrigerant comply with minimum system safety requirements.



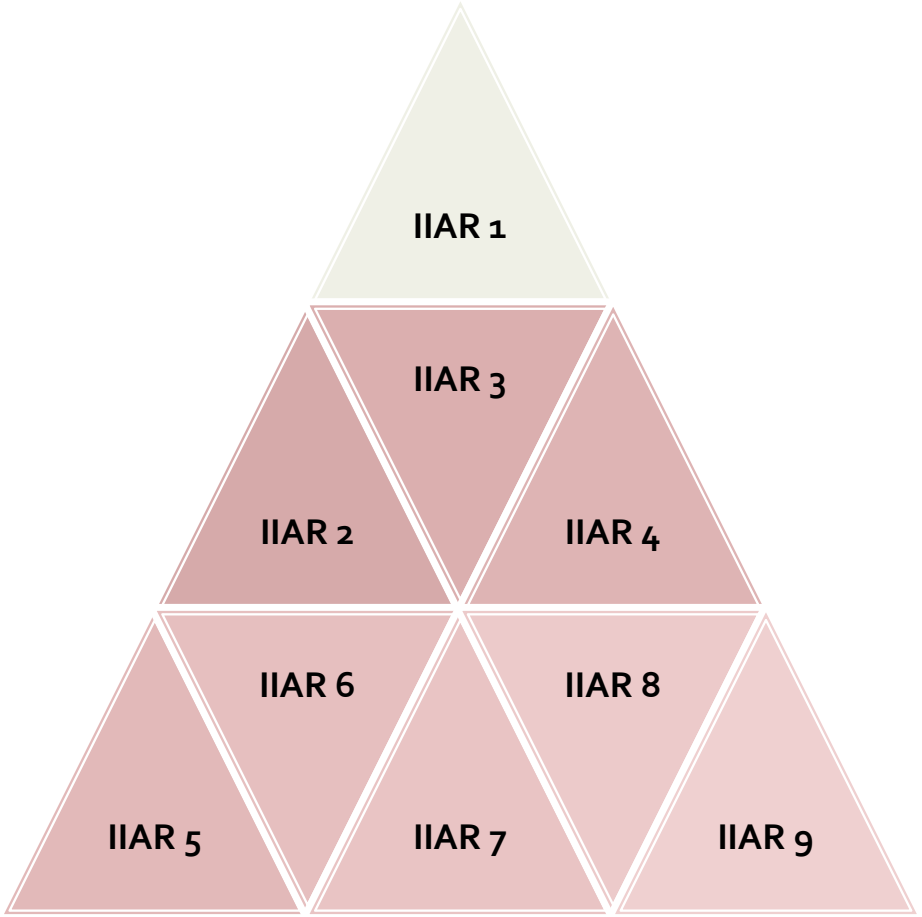
Chapter 1: Scope

- §1.2 Scope
  - §1.2.2 This standard provides a method for existing stationary closed-circuit refrigeration systems using ammonia as a refrigerant to determine and document that existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use is inspected, tested, maintained, and operating in a safe manner.
  - ***1910.119(d)(3)(iii) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.***

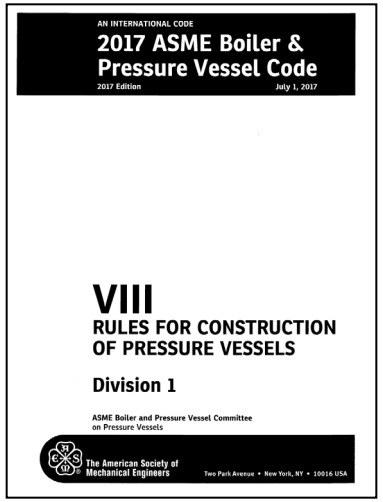
Chapter 1: Scope

- §1.2 Scope
  - §1.2.3 This standard does not apply to non-industrial occupancies and ammonia absorption systems.

Chapter 2: Definitions



Chapter 3: Normative References



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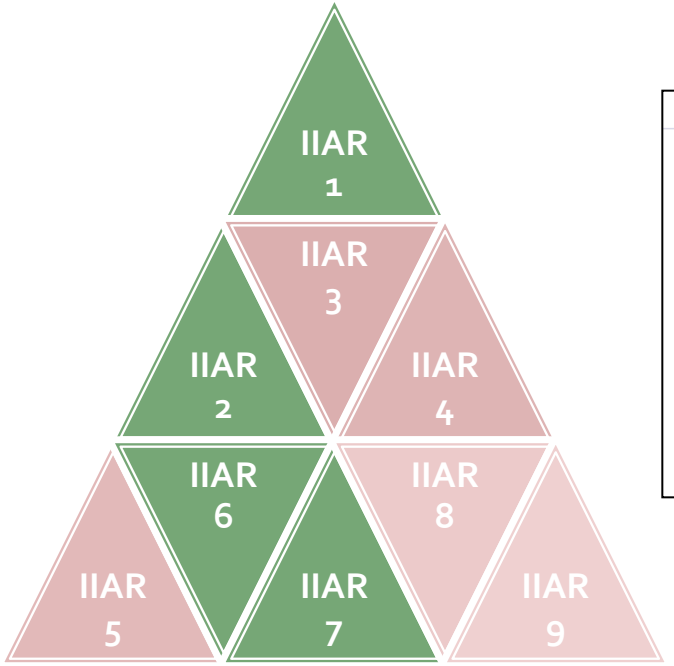

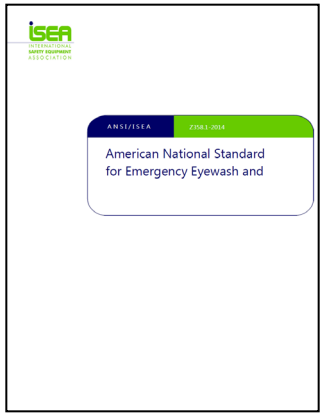

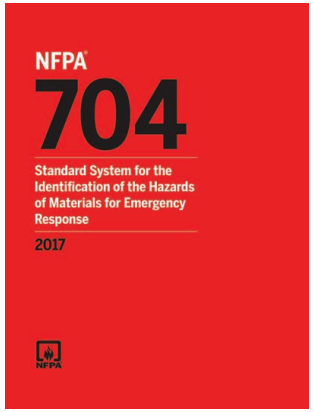

CALIFORNIA CUPA FORUM

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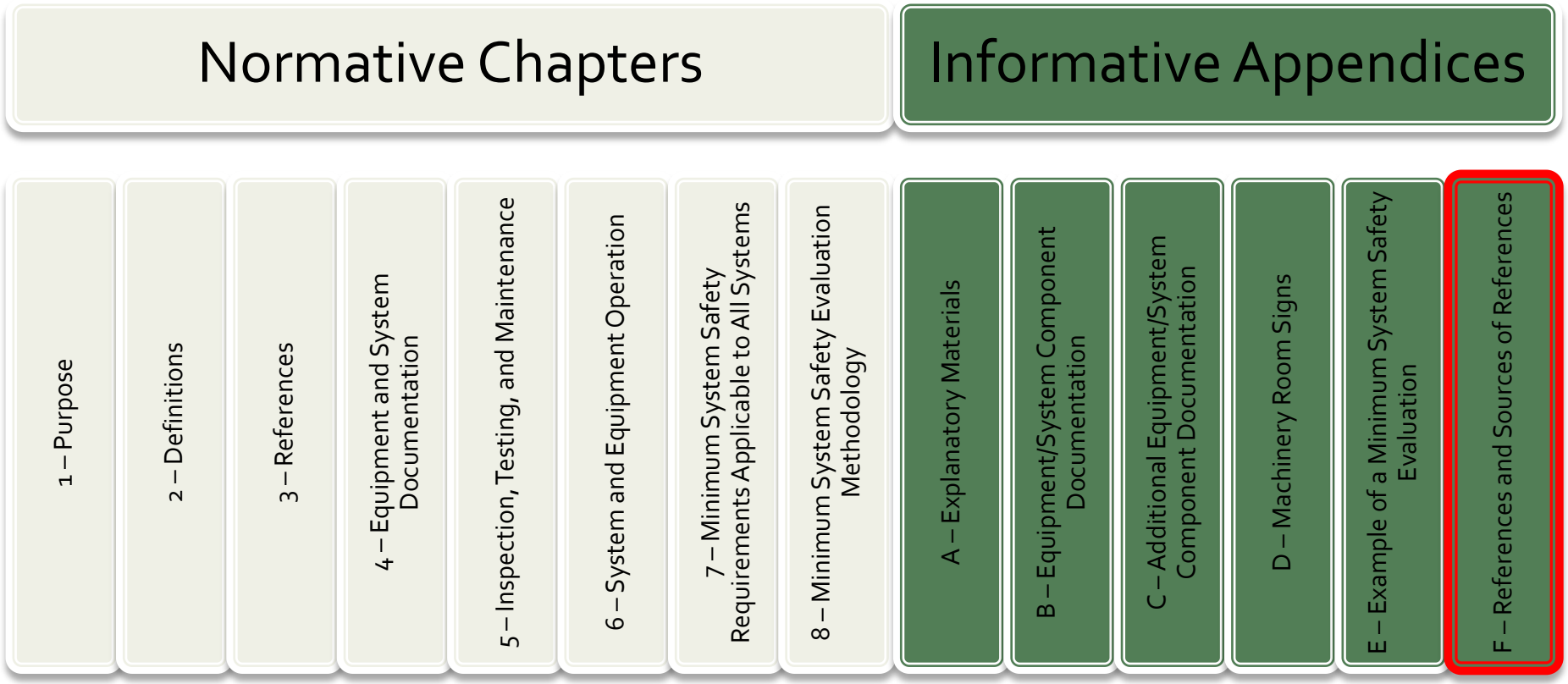
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Appendix F: References and Sources of References

- F.1 Informative References
  - F.1.1 Environmental Protection Agency (EPA): EPA Alert 550-F-1999, August 2001.
  - F.1.2 American National Standards Institute: ANSI Z535.2 (2011), American National Standard for Environmental and Facility Safety Signs.
- F.2 Sources of References
  - F.2.1 American National Standards Institute (ANSI)
    11 West 42nd Street
    New York, NY 10036, USA
    www.ansi.org
  - F.2.2 International Institute of Ammonia Refrigeration (IIAR)
    1001 North Fairfax Street
    Suite 503
    Alexandria, VA 22314, USA
    www.iiar.org
  - F,2,3 Occupational Safety and Health Administration (OSHA)
    United States Department of Labor
    Washington, DC 20210, USA
    www.osha.gov
    www.dol.gov
    www.osha.gov/tdc
  - F.2.4 United States Environmental Protection Agency (EPA)
    Ariel Rios Building
    1200 Pennsylvania Avenue, NW
    Washington, DC 20460, USA
    www.epa.gov

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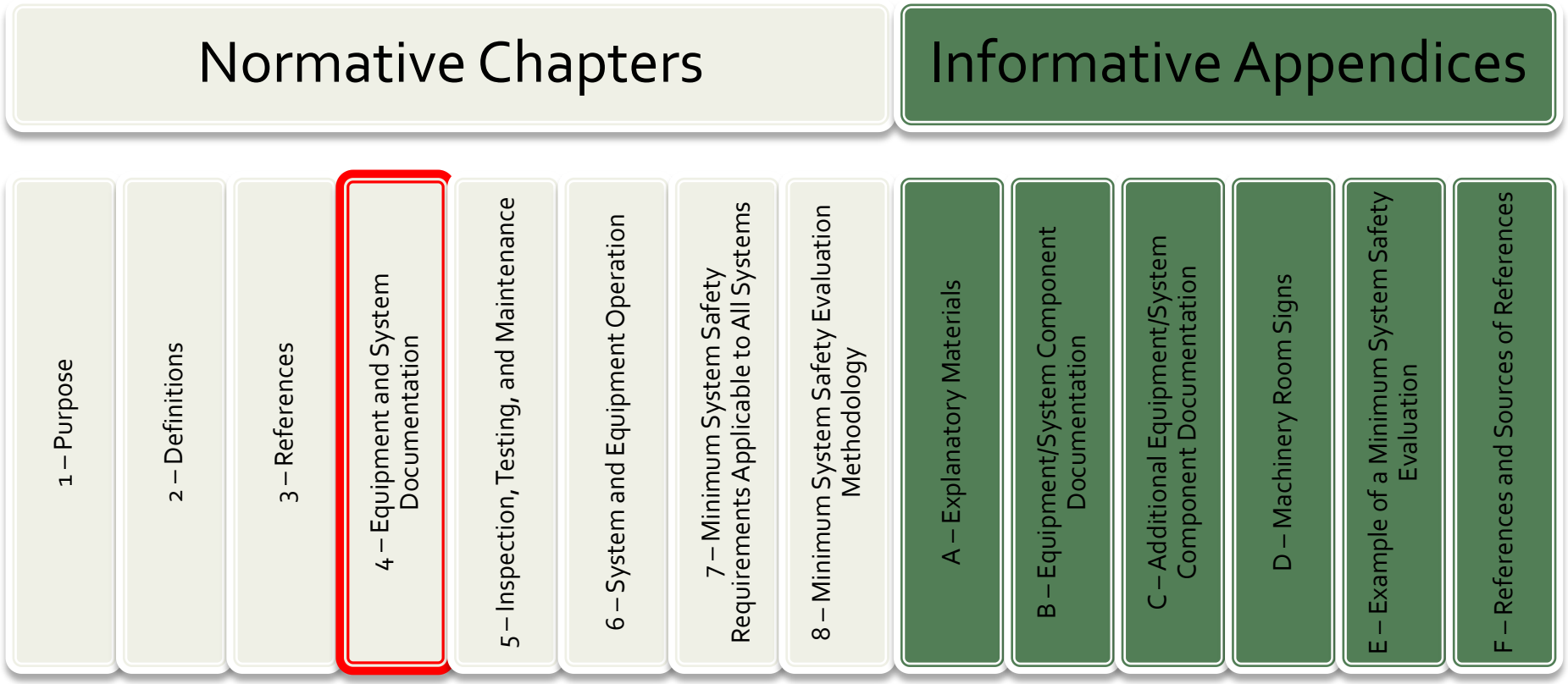
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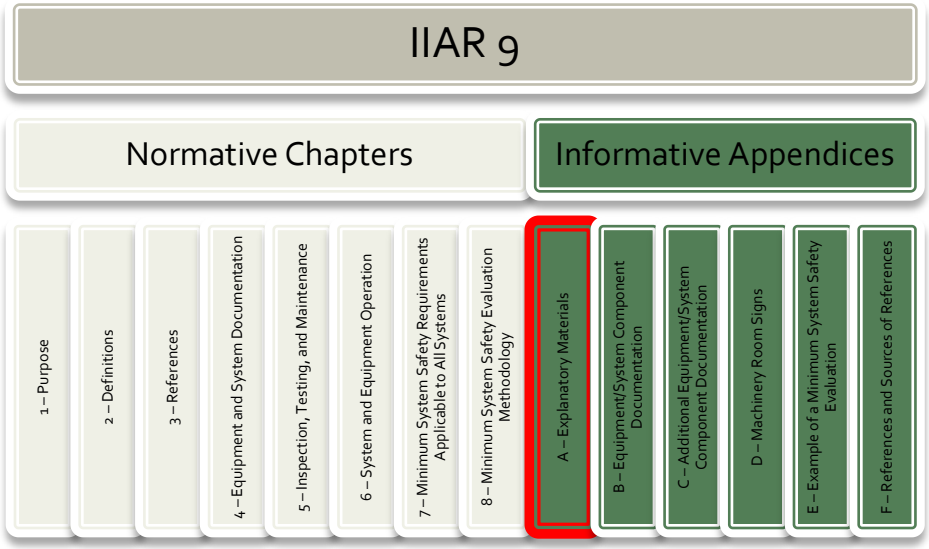
Chapter 4: Equipment and System Components Documentation

§4.1 The following equipment documentation and system component documentation shall be obtained and on-file at the facility.

- §4.1.1 *Manufacturer Data Report(s)
- §4.1.2 *Materials of Construction
- §4.1.3 *Manufacturer Documentation for System Components



Appendix A: Explanatory Material

- A.4.1.2 Materials of construction refers specifically to the documentation showing that the equipment and materials used in the construction of an ammonia refrigeration system are suitable for ammonia refrigerant at the corresponding temperature and pressure that the components will be subjected to. The materials of construction for equipment in the ammonia refrigeration system could be documented utilizing the following items:
  - equipment specifications;
  - design specifications;
  - equipment,
  - valve and instrument tables;
  - equipment drawings;
  - manufacturer manuals; etc.

Appendix C provides a listing of additional equipment/system component documentation that is not required by this standard to be obtained to demonstrate compliance; however, this information could be beneficial in the development of the Preventative Maintenance program and/or the Standard Operating Procedures.

Appendix A: Explanatory Material

- A.4.1.2 Materials of construction refers specifically to the documentation showing that the equipment and materials used in the construction of an ammonia refrigeration system are suitable for ammonia refrigerant at the corresponding temperature and pressure that the components will be subjected to. The materials of construction for equipment in the ammonia refrigeration system could be documented utilizing the following items:
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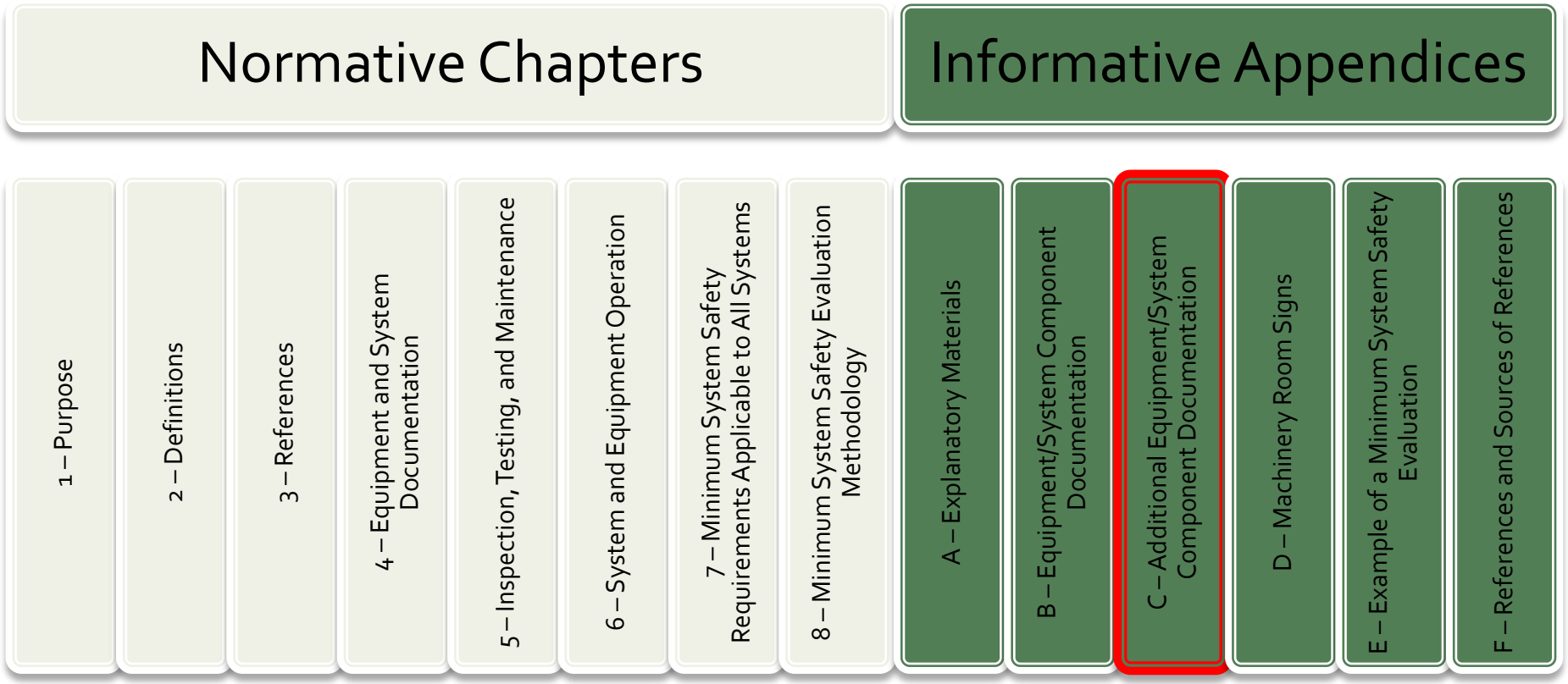
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Appendix C: Additional Equipment/System Component Documentation

This appendix is not part of this standard. It is merely informative and does not contain requirement necessary for conformance to the standard. It has not been processed according to the ANSI requirements for the standard and may contain material that has not been subject to public review or a consensus process.

The purpose of this informative appendix is to provide a listing of additional equipment system component documentation that is not required by this standard to be obtained to demonstrate compliance with minimum system safety requirements. The documentation listed within this informative appendix could be beneficial in the development of the Preventative Maintenance Program and Standard Operating Procedures. There may be situations where the information below is not available (i.e. natural disaster; manufacturer out of business, etc.) for these situations, it is recommended that the steps taken to obtain this information be documented.

Appendix C: Additional Equipment/System Component Documentation

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- **C.1 Compressor**
  - C.1.1 Certified/Dimensional Drawing(s) for:
    - C.1.1.1 Oil separator, and
    - C.1.1.2 Oil cooler (if applicable).
  - C.1.2 General arrangement/dimensional drawing(s) for compressor packages.
  - C.1.3 Design pressure and temperature.
  - C.1.4 Equipment ratings.
  - C.1.5 Operating parameters.
  - C.1.6 Alarm parameters (default and cutout).
  - C.1.7 Installation, Operation, Service, and Maintenance Manual(s).
- **C.2 Condenser**
  - C.2.1 Design pressure and temperature
  - C.2.2 Equipment ratings.
  - C.2.3 Operating parameters.
  - C.2.4 Manufacturer dimensional drawing(s).
  - C.2.5 Installation, Operation, Service, and Maintenance Manual(s).
- **C.3 Evaporators**
  - C.3.1 Design pressure and temperature.
  - C.3.2 Equipment ratings.
  - C.3.3 Operating parameters.
  - C.3.4 Manufacturer dimensional drawing(s).
  - C.3.5 Installation, Operation, Service, and Maintenance Manual(s).
- **C.4 Auto Purger**
  - C.4.1 Design pressure and temperature.
  - C.4.2 Equipment ratings.
  - C.4.3 Operating parameters.
  - C.4.4 Manufacturer dimensional drawing(s).
  - C.4.5 Installation, Operation, Service, and Maintenance Manual(s).
- **C.5 Pump**
  - C.5.1 Design pressure and temperature.
  - C.5.2 Equipment ratings.
  - C.5.3 Operating parameters.
  - C.5.4 Manufacturer dimensional drawing(s).
  - C.5.5 Pump curve(s).
  - C.5.6 Installation, Operation, Service, and Maintenance Manual(s).
- **C.6 Pressure Vessel**
  - C.6.1 Certified/Dimensional Drawing(s).
- **C.7 Heat Exchanger**
  - C.7.1 Manufacturer performance and design basis.
  - C.7.2 Manufacturer dimensional drawing(s).
  - C.7.3 Installation, Operation, Service, and Maintenance Manual(s).
- **C.8 Piping**
  - C.8.1 Mill Test Report(s) – piping manufacturer's test certificate.
  - C.8.2 Pressure testing report(s).
- **C.9 Instrumentation and Controls**
  - C.9.1 Controls description(s).
- **C.10 Ammonia Detection**
  - C.10.1 Controller Installation, Operation, Service, and Maintenance Manual.
  - C.10.2 Sensor Installation, Operation, Service, and Maintenance Manual.
  - C.10.3 Portable Gas Detection Operation, Service, and Maintenance Manual.
  - C.10.4 Electrical Drawings.
  - C.10.5 Layout Drawings
- **C.11 Machinery Room Ventilation**
  - C.11.1 Exhaust Ventilation Fan(s).
    - C.11.1.1 Fan curve(s).
    - C.11.1.2 Fan performance data.
    - C.11.1.3 Installation, Operation, Service, and Maintenance Manual(s).
  - C.11.2 Intake Ventilation Fan(s).
    - C.11.2.1 Fan curve(s).
    - C.11.2.2 Fan performance data.
    - C.11.2.3 Installation, Operation, Service, and Maintenance Manual(s).
  - C.11.3 Intake Louver(s).
    - C.11.3.1 Installation, Operation, Service, and Maintenance Manual(s).
  - C.11.4 Layout Drawings.
  - C.11.5 Electrical Drawings.
  - C.11.6 Ventilation Manual Control Switch – Installation, Operation, Service, and Maintenance Manual(s).
  - C.11.7 Ventilation System Failure Device – Installation, Operation, Service, and Maintenance Manual(s).
- **C.12 Emergency Alarms**
  - C.12.1 Emergency Shut-down Switch(s).
    - C.12.1.1 Installation, Operation, Service, and Maintenance Manual(s).
  - C.12.2 Audible Alarm(s).
    - C.12.2.1 Installation, Operation, Service, and Maintenance Manual(s).
  - C.12.3 Visual Alarm(s).
    - C.12.3.1 Installation, Operation, Service, and Maintenance Manual(s).

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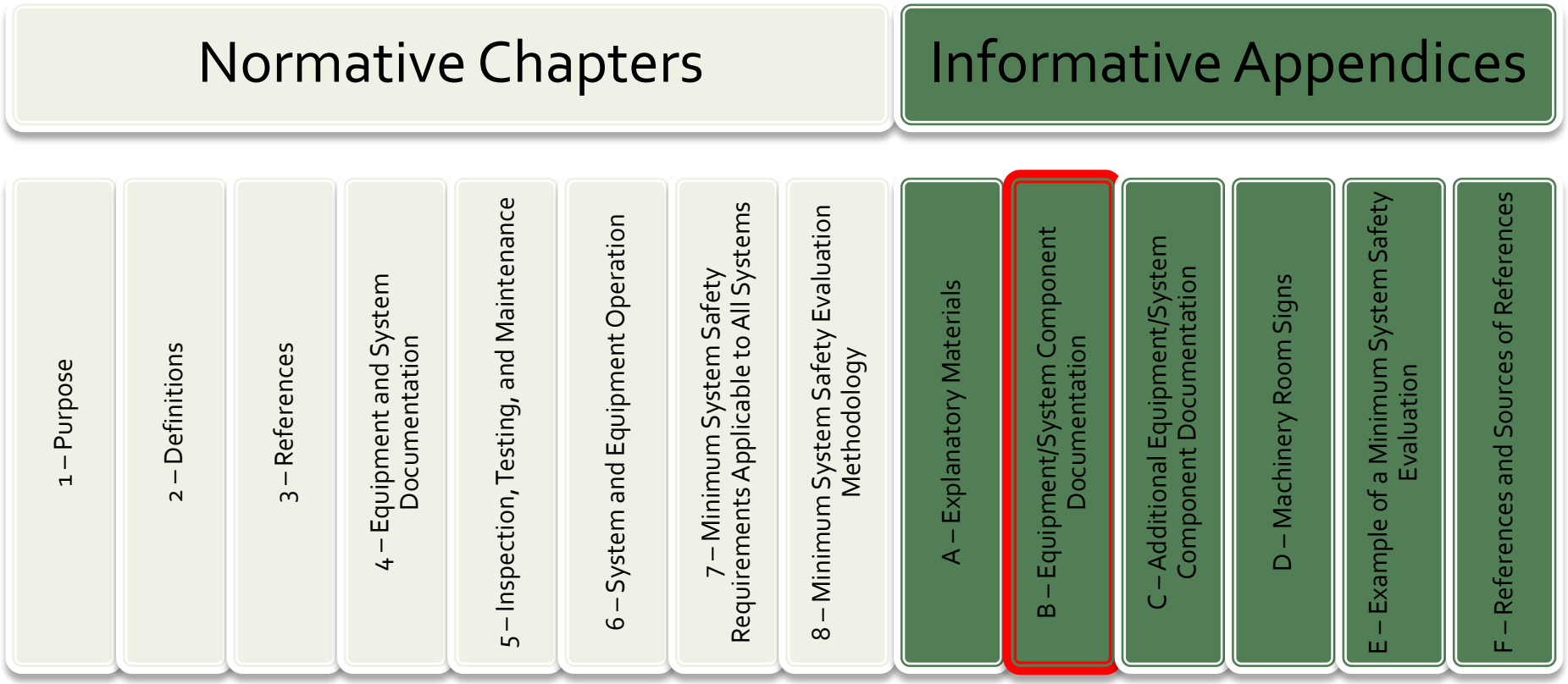
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Appendix B: Equipment/System Component Documentation

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Appendix B: Equipment/System Component Documentation

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Appendix B: Equipment/System Component Documentation

- 1. Piping and Instrumentation Drawing(s) (P&IDs)
- 2. Block Flow Diagram(s) or Simplified Process Flow Diagram(s)
- 3. Machinery Room Electrical Classification Documentation
- 4. Relief System Design and Design Basis
- 5. Machinery Room Ventilation Design Basis and Calculations
- 6. Material and Energy Balance
- 7. Maximum Intended Inventory
- 8. Safe upper and lower limits for such items as temperature, pressure, and level
- 9. Safety systems such as setpoints, interlocks, and detection
- 10. Safety Data Sheet for Anhydrous Ammonia

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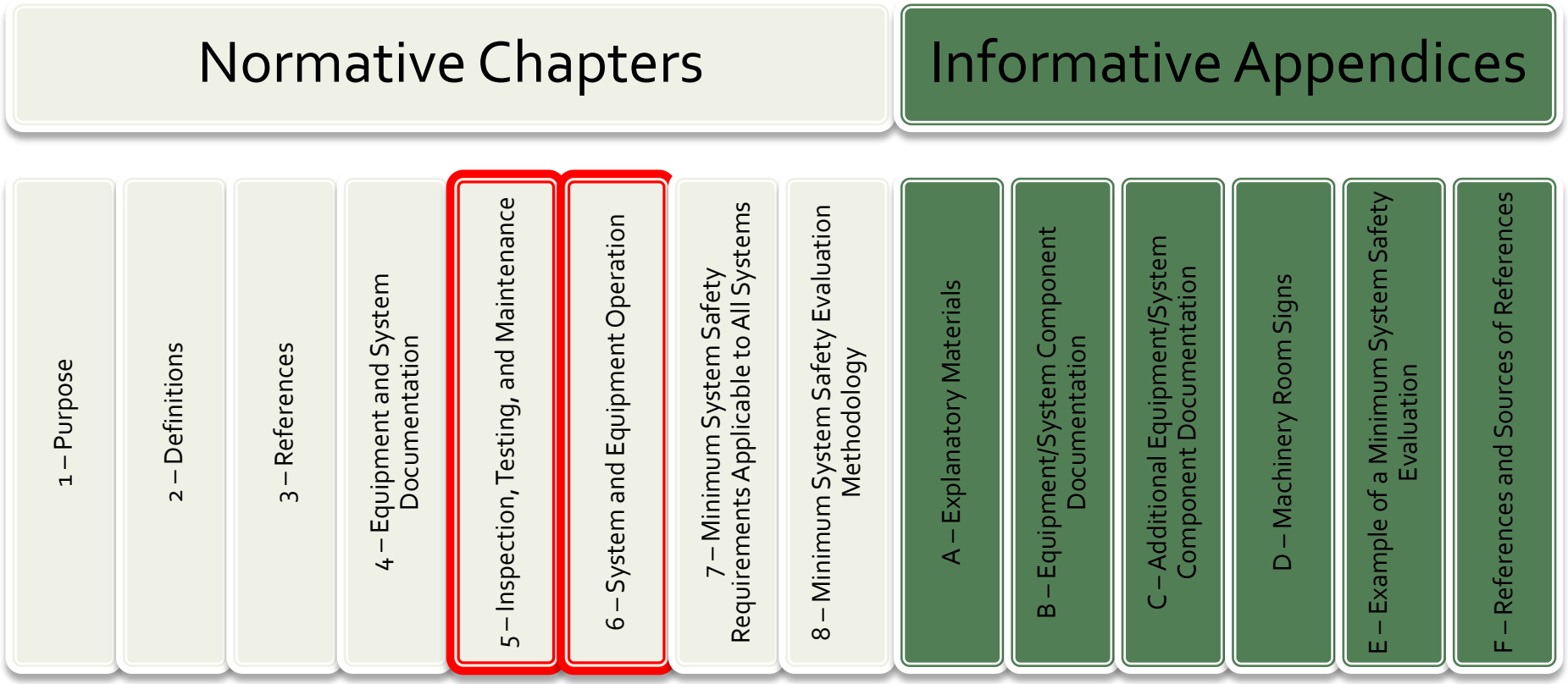
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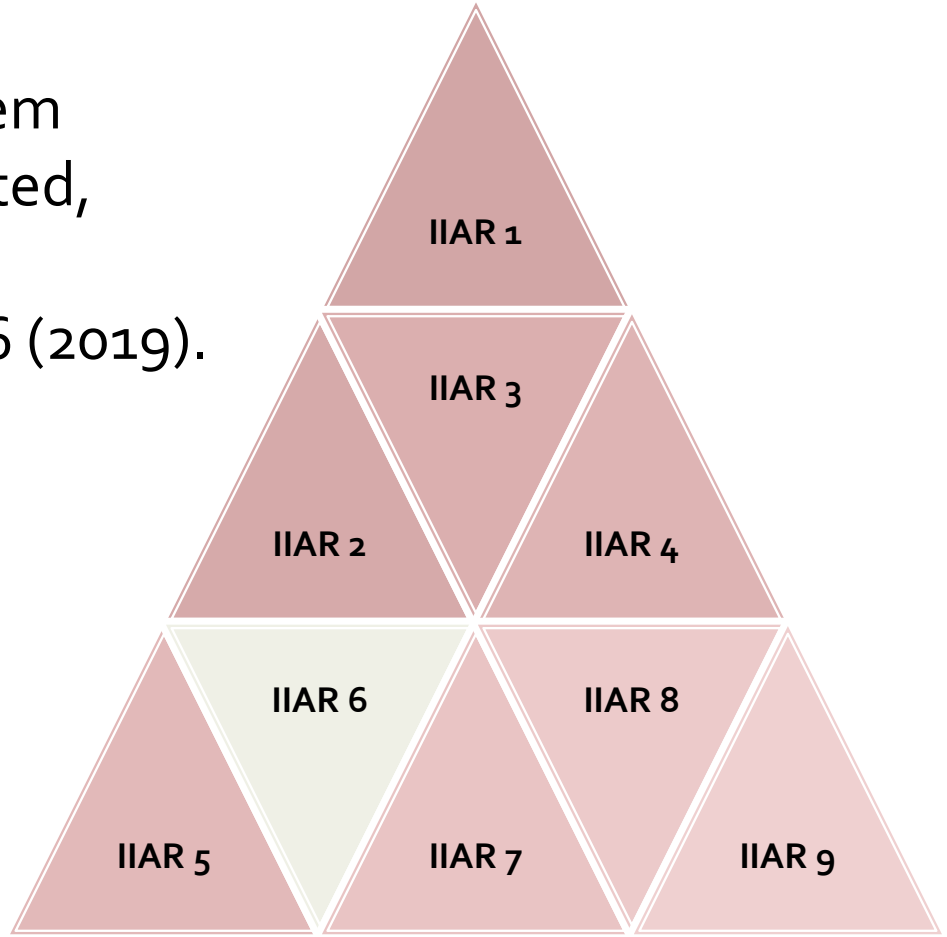
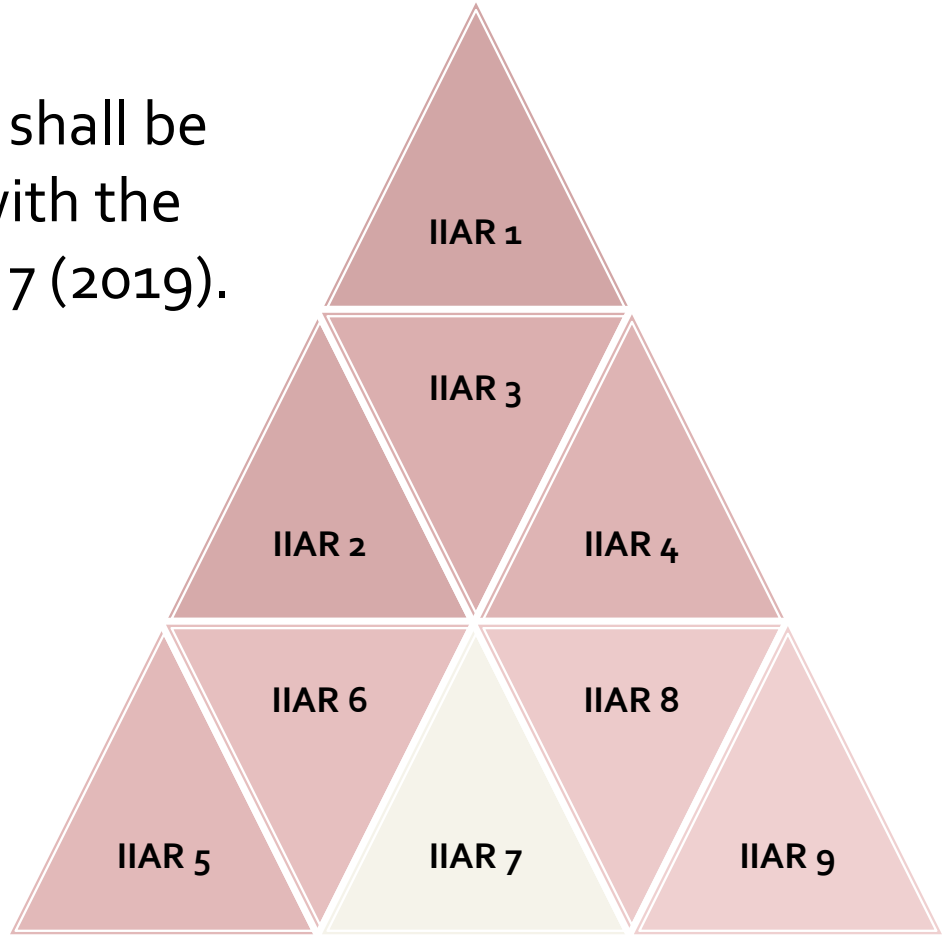
Chapter 5: Inspection, Testing, and Maintenance

- §5.1 All equipment and system components shall be inspected, tested, and maintained in accordance with ANSI/IIAR 6 (2019).



Chapter 6: System and Equipment Operation

- §6.1 Operating procedures shall be developed in accordance with the requirements of ANSI/IIAR 7 (2019).



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Chapter 8

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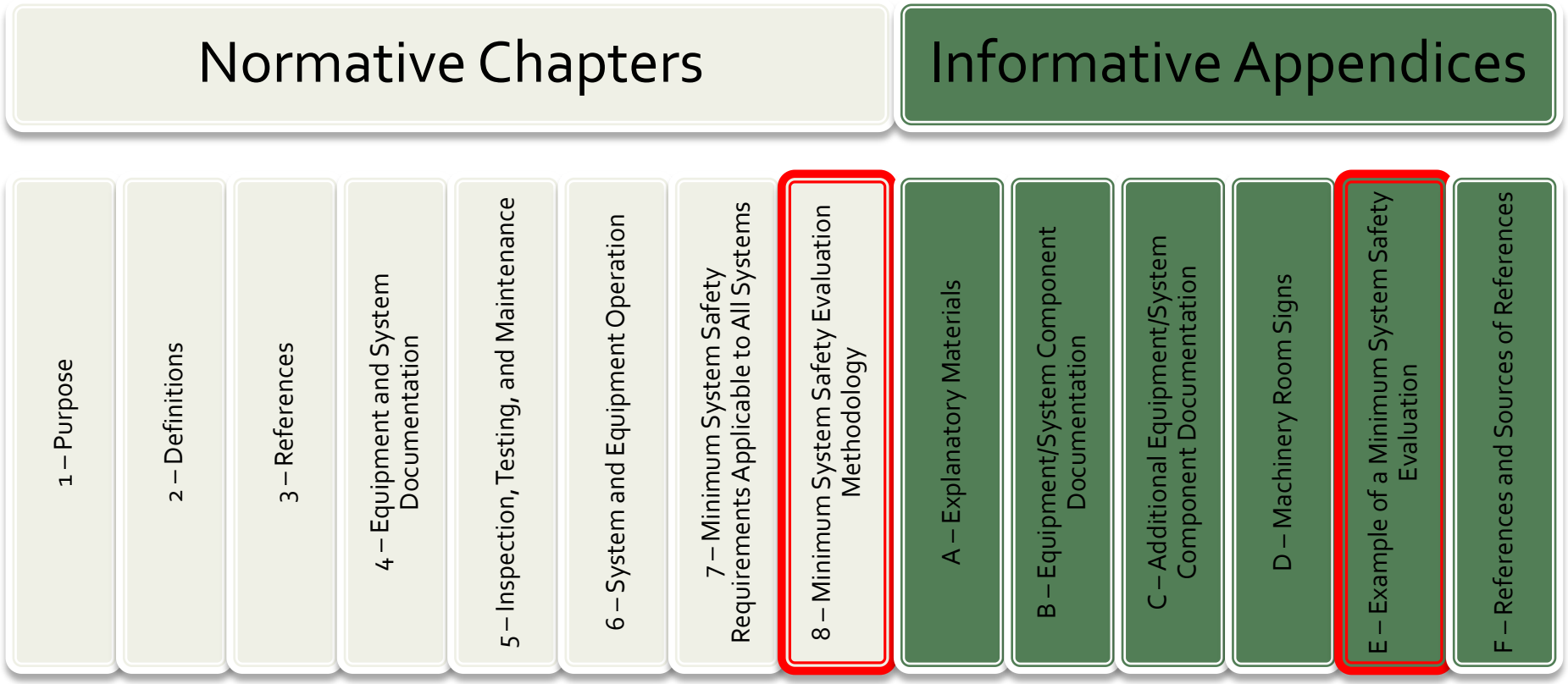
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Chapter 1: Scope

- §1.2 Scope
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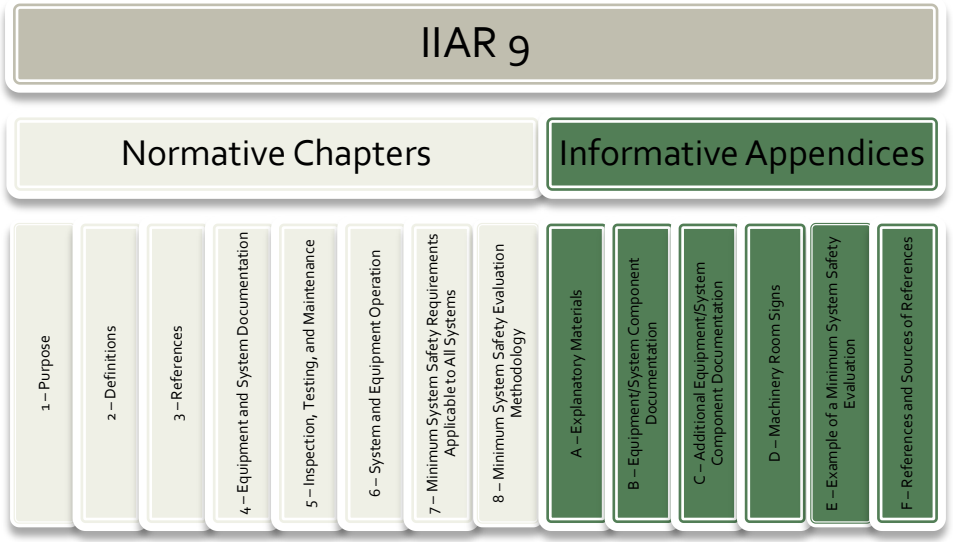
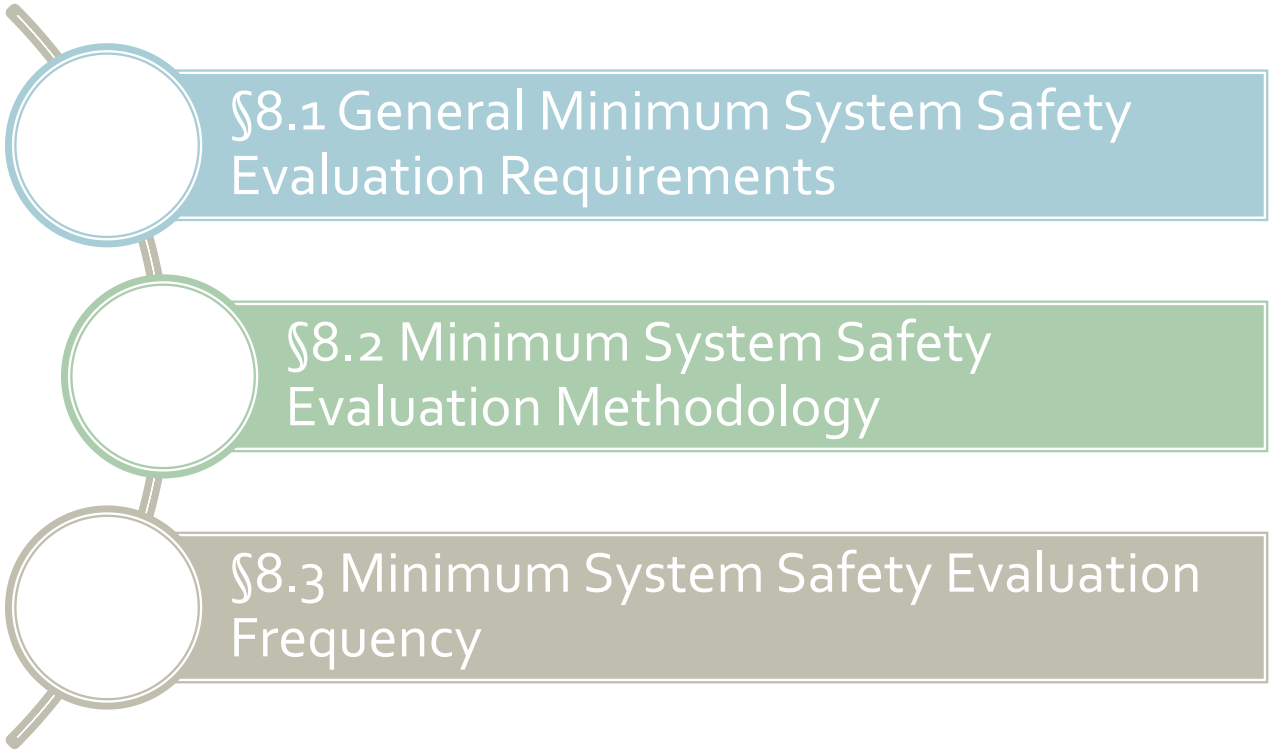
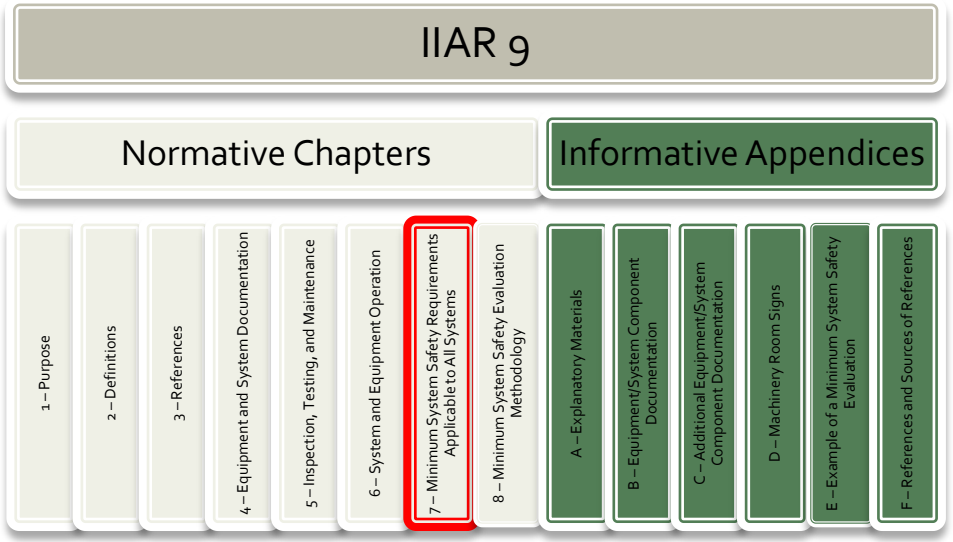


Chapter 8: Minimum System Safety Evaluation Methodology



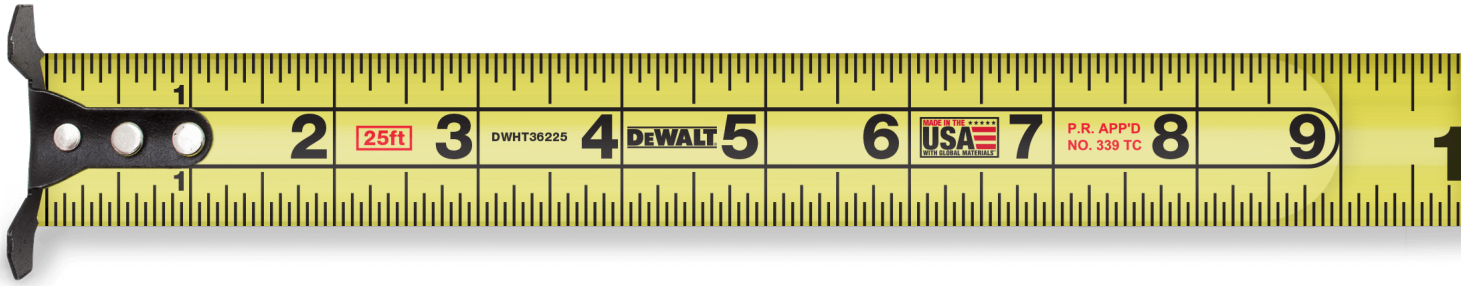
General MSSE Requirements

- §8.1.1 The owner or the owner's designated representative shall conduct regular evaluations to document that the ammonia refrigeration system complies with the minimum system safety requirements.

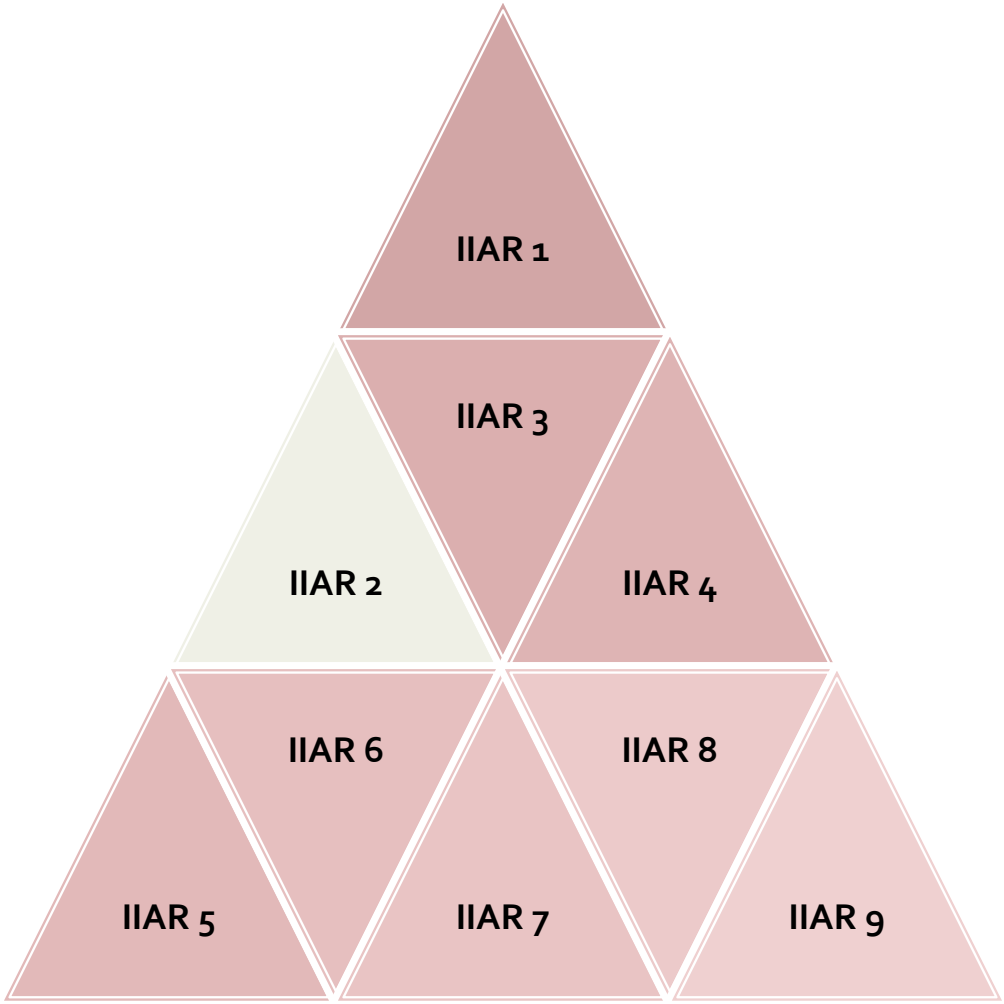


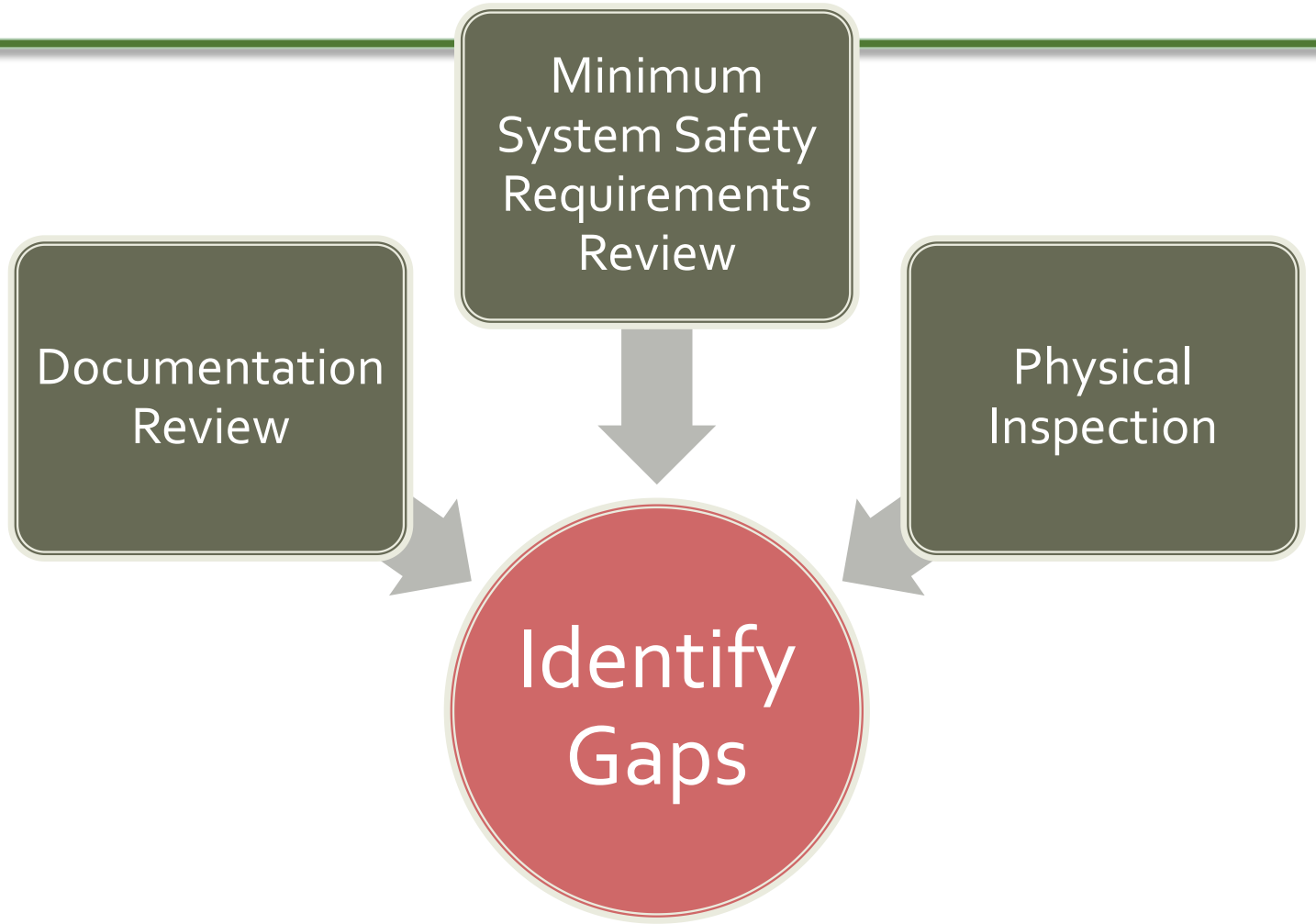
MSSE Methodology

- §8.2.1 Existing ammonia refrigeration system(s) shall be evaluated using the minimum system safety requirements contained within this ANSI/IIAR 9 standard.



MSSE Methodology




Minimum System Safety Requirements Review
Documentation Review
Physical Inspection
Identify Gaps

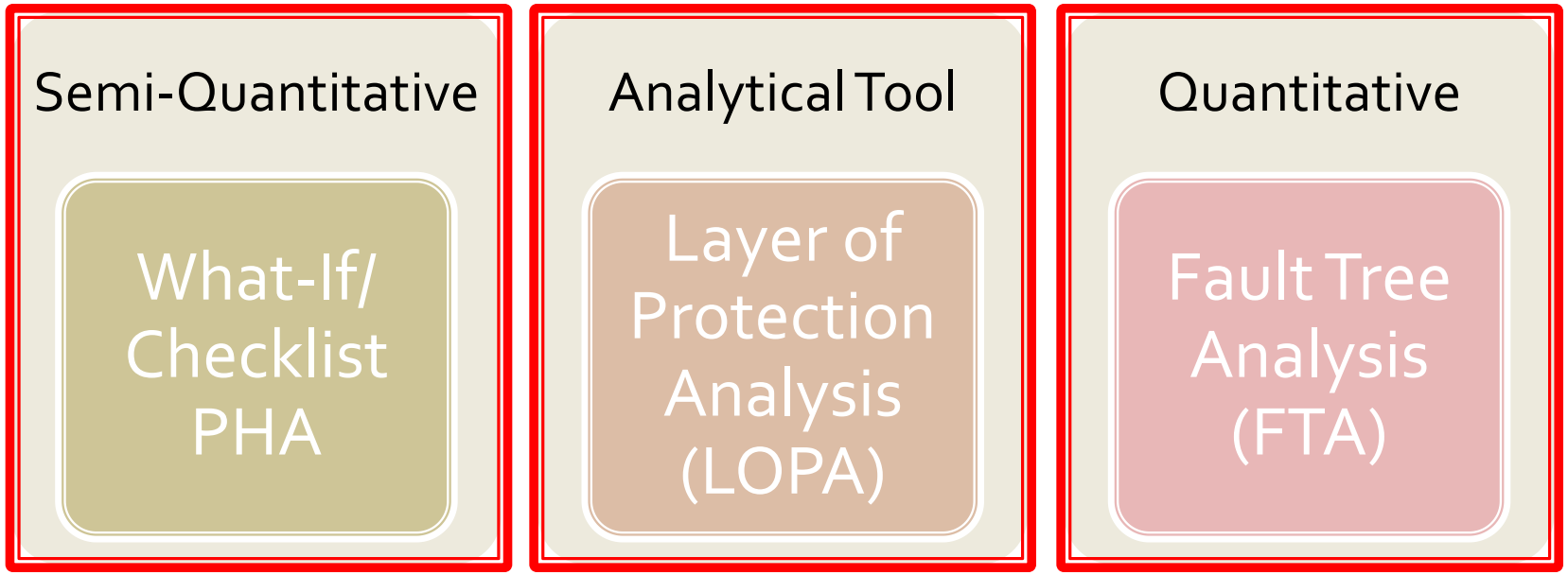
MSSE Methodology

- §8.2.4 The results of the minimum system safety evaluation and the procedures used to identify gaps shall be documented.
- §8.2.5 Documentation shall be provided specifying the action(s) taken to address each of the gap(s) identified during the minimum system safety evaluation using one of the following options:
  - Close the gap
  - Decline to close the gap

Declining to Close a Gap

- When declining to close a gap, justification must be provided using one of the following:
  - 1) A semi-quantitative technique for risk-based ranking.
  - 2) An analytical tool.
  - 3) A quantitative risk analysis.
  - 4) The owner or the owner's designated representative shall obtain a variance from the Authority Having Jurisdiction (AHJ).

Declining to Close a Gap



MSSE Frequency

- Initial evaluation is required within five years of the date of publication (~March 18, 2020)
- Evaluations must be revalidated at least every five years

Comparing Chapter 1 and Chapter 8

Requirement	Chapter 1	Chapter 8
Initial MSSE	§1.2.1.1 An initial safety evaluation shall be conducted for each ammonia refrigeration system to ensure that they comply with the safety requirements specified in IIAR 9 within five years from the date of publication of this standard.	§8.3.1 The initial minimum system safety evaluation shall be conducted within five years from the date of publication of this standard.
MSSE Revalidation Frequency	§1.2.1.2 The safety evaluations shall be revalidated at least every five (5) years.	§8.3.2 Minimum system safety evaluations shall be revalidated at least every five years.
MSSE Methodology	§1.2.1.3 Chapter 8 of this standard describes the methodology which shall be used to conduct the safety evaluations.	§8.2 Minimum System Safety Evaluation Methodology

Appendix E

Table E.1

BSR/IIAR 9-2019 Detection System Requirements	Existing Machinery Room Ammonia Detection System	Gaps Identified	Method Used to Address Gaps
7.3.12.1 (1): At least one ammonia detector shall be provided in the room or area.	The machinery room contains two ammonia detectors.	None	N/A
7.3.12.1 (2): The detector shall activate an alarm that reports to a monitored location so that corrective action can be taken.	The machinery room ammonia detectors activate alarms at 25 ppm on the facility call-down system.	None	N/A
7.3.12.1 (3) (Part 1): Audible and visual alarms shall be provided inside the room for alarm response.	Audible and visual alarms are provided inside the machinery room.	None	N/A
7.3.12.1 (3) (Part 2): Additional audible and visual alarms shall be located outside of each entrance to the machinery room for alarm response.	An audible and visual alarm has been provided outside the main entrance to the machinery room.	There is no audible and visual alarm outside the secondary entrance to the machinery room.	Install an audible and visual alarm outside the secondary entrance to the machinery room. This action item will be tracked in the facility's PSM on-line tracking system.

Any Questions?

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