

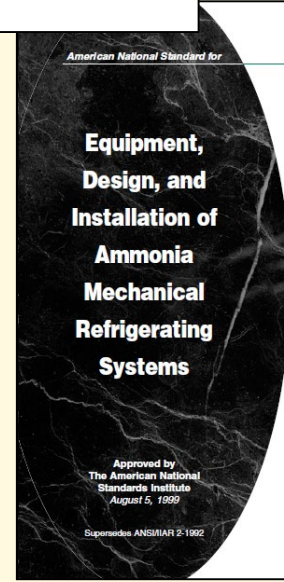
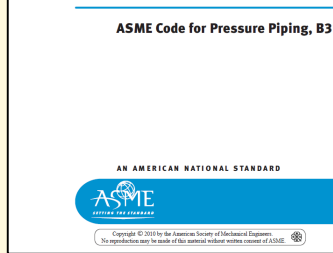


RESOURCE COMPLIANCE

IIAR Standards

Peter Thomas, P.E., CSP – Resource Compliance, Inc.

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

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:

07/29/2016

Proposed Penalty:

\$7000.00

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).

On or about _____, the employer did not document that is complied with recognized and generally accepted good engineering practices (RAGAGEP) exposing employees to the hazards of inhalation of toxic ammonia and/or fire/explosion in the following instances, see A through E:

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:

1. Engine Room 5, Evaporating Condenser, tower EC-1
2. Engine Room 6, Evaporating Condenser, tower EC-2
3. Engine Room 7, Evaporating Condenser, towers EC-1 and EC-2
4. Engine Room 8, Evaporating Condenser, towers EC-1, EC-2 and EC-3
5. Engine Room 11, Evaporating Condenser, tower EC-1, EC-2 and EC-3

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, including:

1. Engine Room 6, Heat Exchangers 1, 2 and 3. These are dual relief systems using Hansen Valves.

Ammonia Refrigeration Code Organizations



IIAR Literature

- IIAR Bulletin No. 107 *Guidelines for: Suggested Safety and Operating Procedures When Making Ammonia Refrigeration Plant Tie-ins*
- IIAR Bulletin No. 108 *Guidelines for: Water Contamination in Ammonia Refrigeration Systems*
- IIAR Bulletin No. 109 *Guidelines for: IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System*
- IIAR Bulletin No. 110 *Guidelines for: Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems*
- IIAR Bulletin No. 111 *Guidelines for: Ammonia Machinery Room Ventilation*
- IIAR Bulletin No. 112 *Guidelines for: Ammonia Machinery Room Design*
- IIAR Bulletin No. 114 *Guidelines for: Identification of Ammonia Refrigeration Piping and System Components*
- IIAR Bulletin No. 116 *Guidelines for: Avoiding Component Failure in Industrial Refrigeration Systems Caked by Abnormal Pressure or Shock*
- IIAR Bulletin No. R1 *A Guide to: Good Practices for the Operation of an Ammonia Refrigeration System*

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.

IIAR Suite of Standards

- **ANSI/IIAR 1** Definitions and Terminology Used in IIAR Standards
- **ANSI/IIAR 2** Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems
- **ANSI/IIAR 3** Ammonia Refrigeration Valves
- **ANSI/IIAR 4** Installation of Closed-Circuit Ammonia Mechanical Refrigeration Systems
- **ANSI/IIAR 5** Start-up and Commissioning of Closed-Circuit Ammonia Refrigeration Systems
- **IIAR 6 Standard for Inspection, Testing, and Maintenance of Safe Closed-Circuit Ammonia Refrigeration Systems**
- **ANSI/IIAR 7** Developing Operating Procedures for Closed-Circuit Ammonia Mechanical Refrigerating Systems
- **ANSI/IIAR 8** Decommissioning of Closed-Circuit Ammonia Mechanical Refrigeration Systems
- **IIAR 9 RAGAGEP Standard**

IIAR 1



ANSI/IIAR 1-2017

American National
Standard

Standard for
Definitions and Terminology
Used in IIAR Standards

IIAR

1



Approved by the American National Standards Institute June 30, 2017
Supersedes ANSI/IIAR 1-2012

Definitions – IIAR 1

- **pipng:** The interconnecting parts of a closed-circuit refrigeration system that contain and convey the refrigerant. Piping includes pipe; flanges; bolting; gaskets; valves; fittings; the pressure-containing parts of other components such as heat transfer components; expansion joints; strainers; filters; and devices that serve such purposes as mixing, separating, snubbing, distributing, metering or controlling flow; pipe hangers; supporting fixtures; and structural attachments.

Definitions – IIAR 1

- **pressure vessel:** Any *refrigerant* containing receptacle in a *closed circuit mechanical refrigerating system* designed and manufactured under the rules of ASME Section VIII, Division 1, Boiler and Pressure Vessel Code. See also *receiver: receiver* and *controlled-pressure receiver*.
EXCEPTIONS per ASME Section VIII, Division 1, Boiler and Pressure Vessel Code:
 - a. *Compressors*
 - b. *Pumps*
 - c. *Controls*

Definitions – IIAR 1

- **Machinery Room:** An enclosed space that, where required by this standard to contain *equipment*, must comply with the requirements set forth in Chapter 6.
- **Trained Operator:** An individual having training and experience that qualify that individual to operate and perform basic system inspections on a closed-circuit refrigeration system with which he or she has become familiar.

IIAR 2



ANSI/IIAR 2-2014

American National
Standard

Standard for Safe Design
of Closed-Circuit
Ammonia Refrigeration Systems

IIAR

2



IIAR Standard 2

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

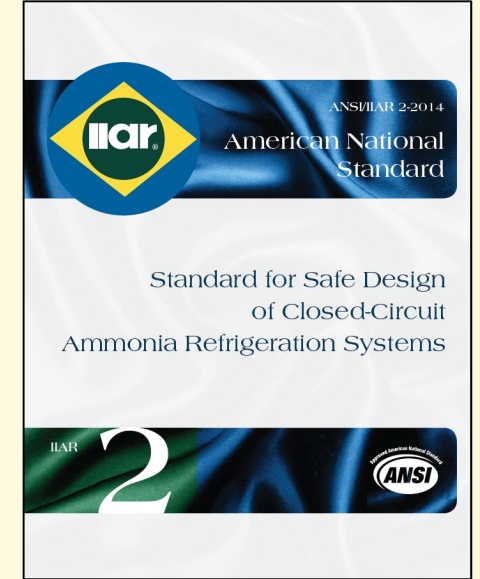
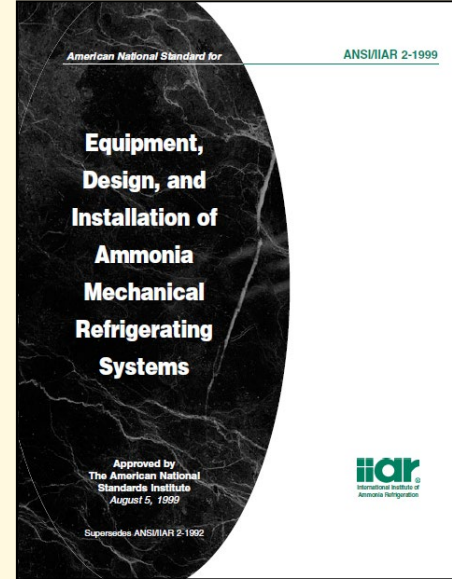
1974-78

1984

1999

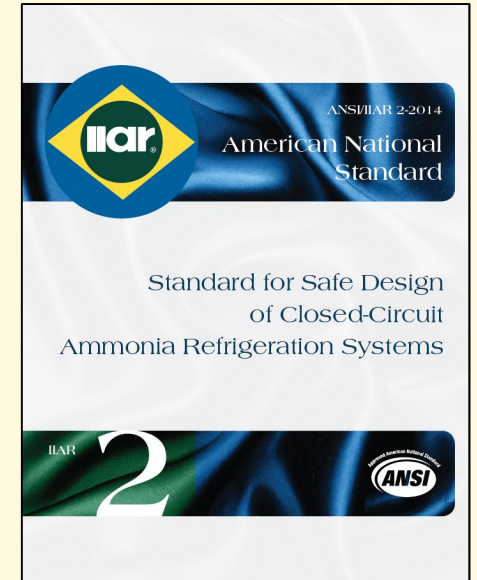
2008

2014



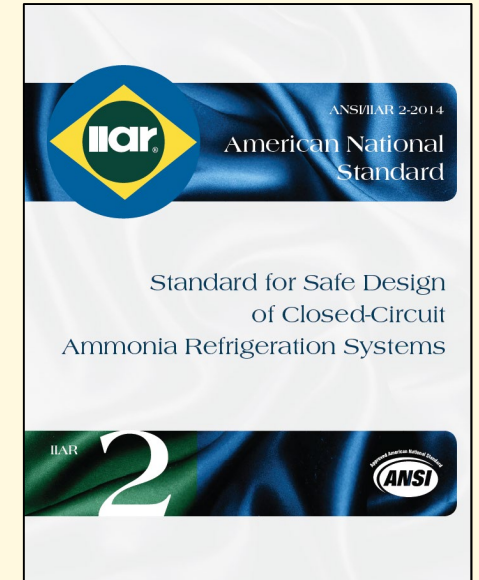
Overview

- **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)



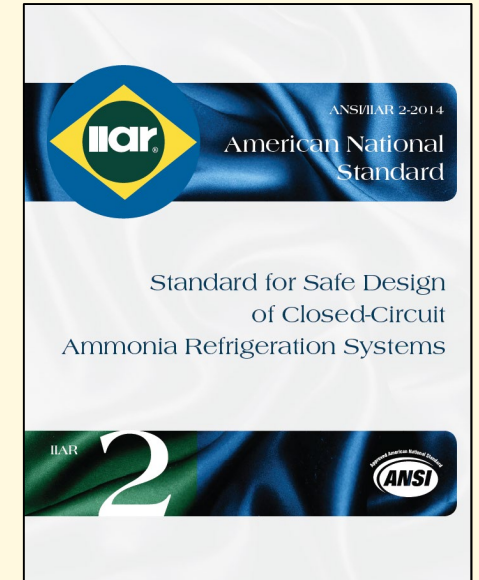
Outline

- **Part 1**
 - **Chapter 1** – Purpose, Scope, and Applicability
 - **Chapter 2** – Definitions
 - **Chapter 3** – Reference Standards
- **Part 2**
 - **Chapter 4** – Location of Ammonia Refrigeration Machinery
 - **Chapter 5** – General System Design Requirements
 - **Chapter 6** – Machinery Rooms
 - **Chapter 7** – Refrigeration Equipment in Areas Other Than Machinery Rooms



Outline

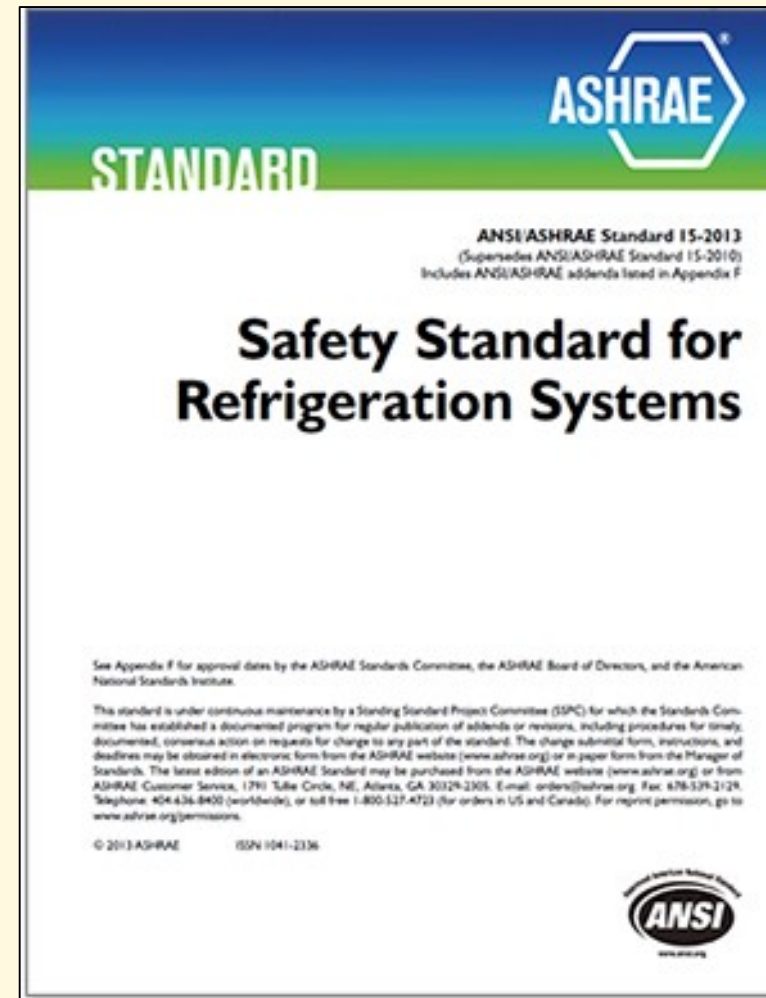
- **Part 3**
 - **Chapter 8** – Compressors
 - **Chapter 9** – Refrigerant Pumps
 - **Chapter 10** – Condensers
 - **Chapter 11** – Evaporators
 - **Chapter 12** – Pressure Vessels
 - **Chapter 13** – Piping
 - **Chapter 14** – Packaged Systems and Equipment
 - **Chapter 15** – Overpressure Protection Devices
 - **Chapter 16** – Instrumentation and Controls
 - **Chapter 17** – Ammonia Detection and Alarms
- **Part 4** (Informative Appendices)



Normative vs. Informative

| Normative | Informative |
|---------------------------|---------------------|
| Parts 1-3 (Chapters 1-17) | Part 4 (Appendices) |
| Prescriptive | Descriptive |
| Required | Supplemental |
| Shall | Should |
| Must | May |
| Will | Could/Can |

IIAR 2 vs. ASHRAE 15



IIAR 3



ANSI/IIAR 3-2017

American National
Standard

Standard for
Ammonia Refrigeration
Valves

IIAR

3



Approved by the American National Standards Institute June 30, 2017
Supersedes ANSI/IIAR 3-2012

American National Standard for

ANSI/MAR 4-2015

Installation of Closed-Circuit Ammonia Refrigeration Systems

IIAR 4



Approved by the
American National
Standards Institute
January 26, 2015

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International Institute of
Ammonia Refrigeration

IIAR 5



ANSI/IIAR 5-2013

American National
Standard

Standard for
Start-up and Commissioning
of Closed-Circuit Ammonia
Refrigeration Systems

IIAR

5



Approved by the American National Standards Institute July 31, 2013

IIAR 5

Company: Resource Compliance, Inc... Facility: RC Template Company User: Peter Thomas

RESOURCE COMPLIANCE

Logout User

PS **PSSRWITER** Home Add New User Equipment Reports

View: Active Complete All System Templates Filter Add New PSSR

| PSSR # ↓ | PSSR Name | Due Date | Approved Date |
|--|-----------------------------|----------|---------------|
| Advanced Search: <input type="text"/> Clear | | | |
| 10 Records per page Previous Showing 1 - 3 of 3 Next | | | |
| 01 | New Refrigeration Equipment | | |

Category 1 - To be completed before ammonia is brought on site

Delete

Category # 1 Category Name To be completed before ammonia is brought on site

Add new question Toggle Unanswered Show Questions

1. Was the system designed by, and installed under the supervision of, persons who by reason of knowledge, training and experience are competent for the tasks? [ANSI/IIAR 5-2013 §6.1.1] YES NO N/A
2. Has a system component inventory list been prepared? [ANSI/IIAR 5-2013 §6.2.1] YES NO N/A
3. For each system component included on the inventory list, have the specifications and details from the following list been included? [ANSI/IIAR 5-2013 §6.2.1] YES NO N/A
4. Does the inventory list contain a record of the maximum working pressure(s) and minimum temperatures? [ANSI/IIAR 5-2013 §6.2.2] YES NO N/A

IIAR 7



ANSI/IIAR 7-2013

American National
Standard

Standard for Developing
Operating Procedures
for Closed-Circuit
Ammonia Mechanical
Refrigerating Systems

IIAR



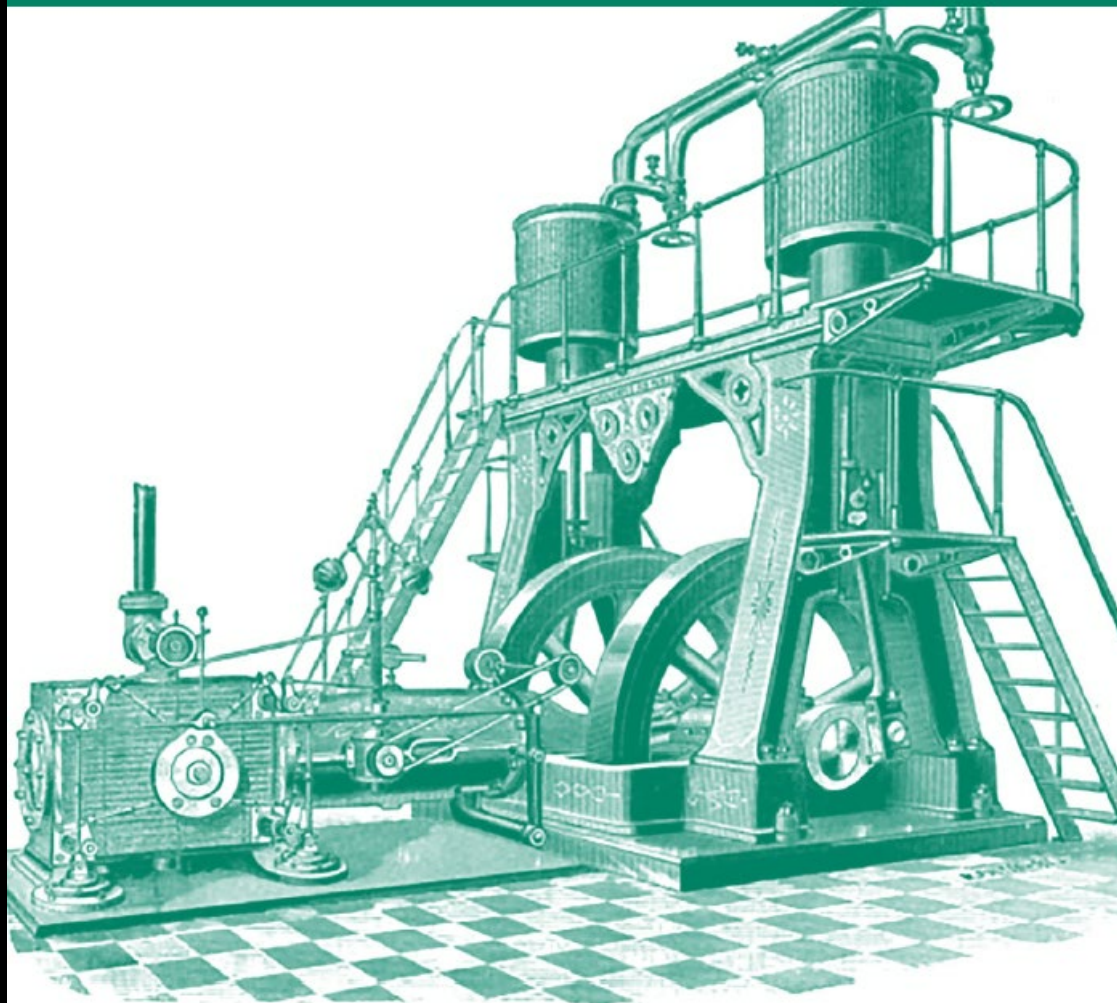
Approved by the American National Standards Institute August 21, 2013

American National Standard for

ANSI/IIAR 8-2015

Decommissioning of Closed-Circuit Ammonia Refrigeration Systems

IIAR 8



iiar[®]
International Institute of
Ammonia Refrigeration

Approved by the American National Standards Institute
January 26, 2015

IIAR 8

PS PSSRWITER Home Add New User Equipment Reports

View: Active Complete All System Templates Filter Add New PSSR

| PSSR # ↓ | PSSR Name | Due Date | Approved Date |
|---|---|--------------------------|-------------------------------|
| Advanced Search: <input type="text"/> Clear | | | |
| 10 Records per page Previous Showing 1 - 3 of 3 Next | | | |
| ▶ 01 | New Refrigeration Equipment | | |
| ▶ 02 | Decommissioning Refrigeration Equipment | | |
| ▶ 03 | General PSSR | | |

▼ **Category 1 - Preparation**

Delete

Category # Category Name

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

Bulletin No. 109

Bulletin No. 109 10/97

Guidelines for:

IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System

International Institute of
Ammonia Refrigeration



ID Number: _____

PRESSURE VESSELS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Pressure Vessel

Vessel Location: _____

Vessel Identification Mark/No.: _____

Application

- High Pressure Receiver
 Intercooler
 Accumulator
 Oil Pot
 Pump Receiver, Low Temp
 Pump Receiver, High Temp
 Other (Describe) _____

Application Data

Normal Operating Pressure (psig): _____ Temperature (°F): _____

Vessel Size (Diam. x LH, ft): _____ Normal Liquid Level (ft): _____

Normal Ammonia Inventory (cubic ft): _____

Design Capacity (Specify: Pumpdown, Surge Vol., TR, etc.): _____

Vessel Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Max. Design Working Pressure (psig): _____

Maximum Allowable Pressure (psig): _____ At (°F): _____

Minimum Design Metal Temperature (°F): _____ At (psig): _____

Test Pressure Applied (psig): _____

National Board No.: _____ ASME Certification Stamp? Yes No

Safety Relief Valve Data

Type: Dual Single None

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured or Recertified: _____ ASME Seal Unbroken? Yes No

Pressure Setting (psig): _____ Capacity (lbs. air/min): _____

Valve Connections: Inlet _____ Outlet _____ Pipe Size: Inlet _____ Outlet _____

Is Valve Properly Installed and Piped to Termination? Yes No

If No, Explain: _____

Visual Liquid Level Indicator

- Tubular
 Flat Armored
 Armored Bullseye
 High Pressure Industrial
 None

ID Number: _____

PRESSURE VESSELS

| Requirement/Recommendation | Conforms | Recommended Action/Comments | Safety Status | Target Date |
|--|--|-----------------------------|---------------|-------------|
| a) Nameplate legible and complete? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| b) Operating within limitations: | | | | |
| 1) Maximum pressure? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 2) Minimum temperature? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| c) Vessel ASME stamp legible? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| d) Certification drawings on file? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| e) Manufacturer data report on file? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| f) Does vessel have known alterations/modifications? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 1) If yes, was vessel recertified? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 2) Is revised data report on file? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| g) Relief valve: | | | | |
| 1) Proper type? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 2) Correct setting? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 3) Capacity correct? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 4) Installation correct? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 5) Piping to termination correct? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 6) Relief valve replaced or recertified within last 5 years of service? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 7) ASME seal unbroken? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| h) Tubular linear liquid level indicator (sight glass): | | | | |
| 1) Protected from traffic hazards? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 2) 360° guards? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| 3) Internal check shutoff valves? | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |
| i) Vessel properly identified? (Name, pressure level per IIAR Bulletin 114) | <input type="checkbox"/> Yes <input type="checkbox"/> No | | | |

j) Vessel condition (check one): no visible corrosion
 slight visible corrosion
 extensive corrosion
 unknown (insulated)

k) Insulation condition (check one): no vapor retarder leaks
 slight vapor retarder leaks
 extensive vapor retarder leaks
 not insulated

l) Relief valve condition (check one): clean, no visible corrosion
 slight external corrosion
 extensive corrosion

Are there any other conditions that might negatively affect safe vessel operation? Yes No

If yes, describe _____

Bulletin No. 110

Guidelines for:

Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems

International Institute of
Ammonia Refrigeration

iiar®

Bulletin No. 114

Guidelines for:

Identification of Ammonia Refrigeration Piping and System Components

International Institute of
Ammonia Refrigeration

iiar®

Bulletin No. 114

Pre-March 2014



Post-March 2014



Bulletin No. 114

A Guide to Bulletin 114: Piping Colors

In its updated form, IAR Bulletin 114 will provide a method for expanding color identification guidelines, and will serve as a recommendation for an expanded piping color scheme.

The guideline will address: un-insulated line finishes; insulated lines with insulation jacketing; and intermittent markers. The colors specified by the guideline have been designated by Pantone color numbers, from the Pantone Color Matching System, and are identified by the document as "targets" for shade, tone, and color.

The bulletin makes an allowance for slight variations that are expected as a result of variance in manufacturing, UV deterioration, dust and other unforeseen factors that may alter the appearance of color either at installation or after the jacketing or markers have been in service.

According to the draft bulletin, facilities may select an alternate color scheme as long as that color scheme is consistent throughout a facility. Regardless of the color scheme selected, Bulletin 114 specifies that a legend or key to the meaning of the colors should be posted in a conspicuous area. Listed below are the eight Pantone colors recommended under IAR's piping color scheme, which is slated for release as an update to IAR Bulletin 114 early next year.

High Pressure Liquid Piping

Ammonia high pressure liquid piping should be **Ammonia Refrigeration Orange (PANTONE® Color 152 C)** for services > 70 psig as follows:

- High Pressure Liquid (HPL)
- Condenser Drain (CD)
- Sub Cooled Liquid (SCL)
- Liquid Injection Cooling (LIC)
- Thermosyphon Supply (TSS)
- Intermediate Pressure Liquid (IPL)
- Thermosyphon Return (TSR)

Ammonia High Pressure Vapor Piping

Ammonia high pressure vapor piping should be **Ammonia Refrigeration Yellow (PANTONE® Color 109 C)** for services > 70 psig as follows:

- Booster Discharge (BD)
- Hot Gas Defrost (HGD)
- High Stage Discharge (HSD)
- Foul Gas (FG)

Low Pressure, High Temperature Liquid and Vapor Piping

Low pressure, high temperature liquid and vapor piping should be **Ammonia Refrigeration Light Blue (PANTONE® Color 298C)** for the services within the 0°F to +45°F range (saturated pressure 66.3 psig>P>15.7 psig).

If more than one temperature or pressure level exists within this range, additional colors can be selected to further distinguish these subsystems. Note that any alternate colors can be selected if they are easily distinguishable, do not duplicate defined uses within this guideline and are identified in an accessible legend. The services for the low pressure, high temperature range are as follows:

- High Temperature Recirculated Liquid (HTRL)
- Medium Temperature Recirculated Suction (MTRS)
- Booster Suction (BS)
- High Temperature Suction (HTS)
- Economizer Suction (ES)
- High Temperature Recirculated Suction (HTRS)
- High Stage Suction (HSS)
- Defrost Relief (DR)
- Medium Temperature Suction (MTS)

Low Pressure, Low Temperature Liquid and Vapor Piping

Low pressure, low temperature liquid and vapor piping should be **Ammonia Refrigeration Dark Blue (PANTONE® Color 3015c)** for the services within the -1°F to -20°F range (saturated pressure 15.7 psig>P>3.6 psig).

If more than one temperature or pressure level exists within this range, additional colors can be selected to further distinguish these subsystems. Note that any alternate colors can be selected if they are easily distinguishable, do not duplicate defined uses within this guideline and are identified in an accessible legend. The services for the low pressure, low temperature range are as follows:

- Low Temperature Recirculated Suction (LTRS)
- Low Temperature Recirculated Liquid (LTRL)
- Low Temperature Suction (LTS)
- Low Temperature Liquid (LTL)

Low Pressure, Low-Low Temperature Liquid and Vapor Piping

Low pressure, low-low temperature liquid and vapor piping should be **Ammonia Refrigeration Purple (PANTONE® Color 2617 C)** for the services within the -21°F to -60°F range (saturated pressure P< 3.6 psig).

If more than one temperature or pressure level exists within this range, additional colors can be selected to further distinguish these subsystems. Note that any alternate colors can be selected if they are easily distinguishable, do not duplicate defined uses within this guideline and are identified in an accessible legend. The services for the low pressure, low-low temperature range are as follows:

- Low-Low Temperature Recirculated Suction (LLTRS)
- Low-Low Temperature Recirculated Liquid (LLTRL)
- Low-Low Temperature Suction (LLTS)
- Low-Low Temperature Liquid (LLTL)

Non-Pressurized Refrigeration Piping and Related Process Piping:

Pressure Relief Vent Grey (PANTONE® Color 430 C) for:

- Pressure Relief Vent Piping (RV)

Water Green (PANTONE® Color 3415 C) for:

- Water Piping

Sprinkler Red (PANTONE® 485 C) for:

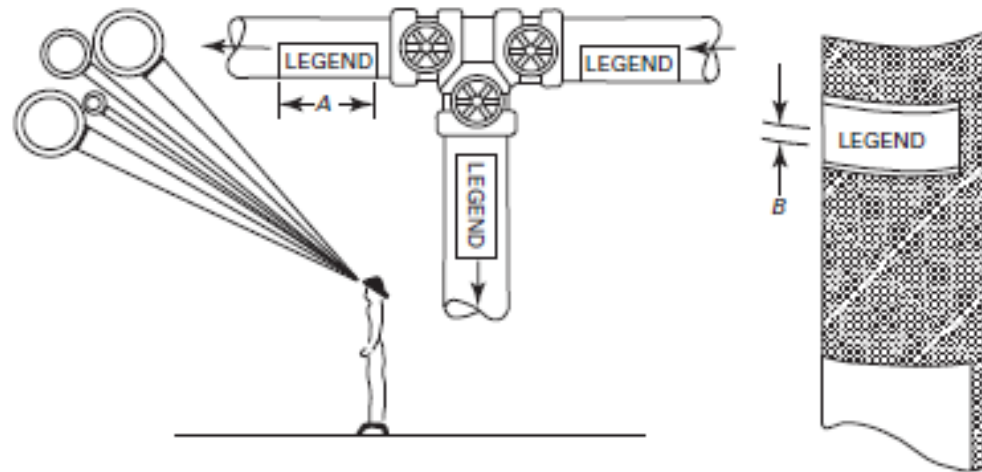
- Fire Sprinkler Piping

ASME A13.1

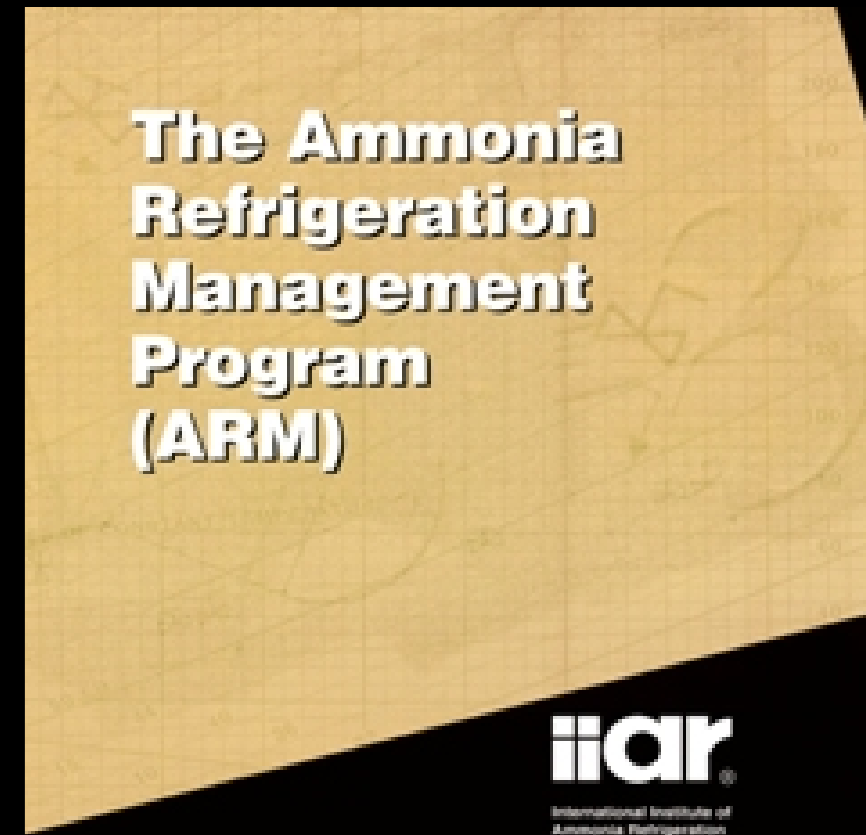
Table 2 Designation of Colors

| Fluid Service | Background Color | Letter Color | Color and Letter Sample |
|--|------------------|--------------|-------------------------|
| Fire quenching fluids | Safety red | White | Letters |
| Toxic and corrosive fluids | Safety orange | Black | Letters |
| Flammable and oxidizing fluids | Safety yellow | Black | Letters |
| Combustible fluids | Safety brown | White | Letters |
| Potable, cooling, boiler feed, and other water | Safety green | White | Letters |
| Compressed air | Safety blue | White | Letters |
| To be defined by the user | Safety purple | White | Letters |
| To be defined by the user | Safety white | Black | Letters |
| To be defined by the user | Safety gray | White | Letters |
| To be defined by the user | Safety black | White | Letters |

Fig. 2 Location of Identification Markers



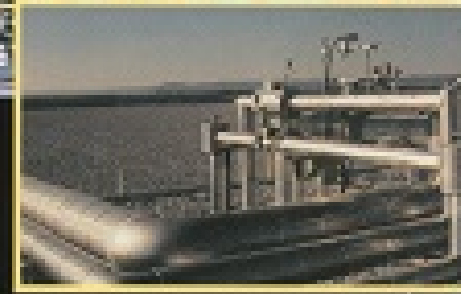
PSM/RMP Guidebook



ARM-LC Guidebook

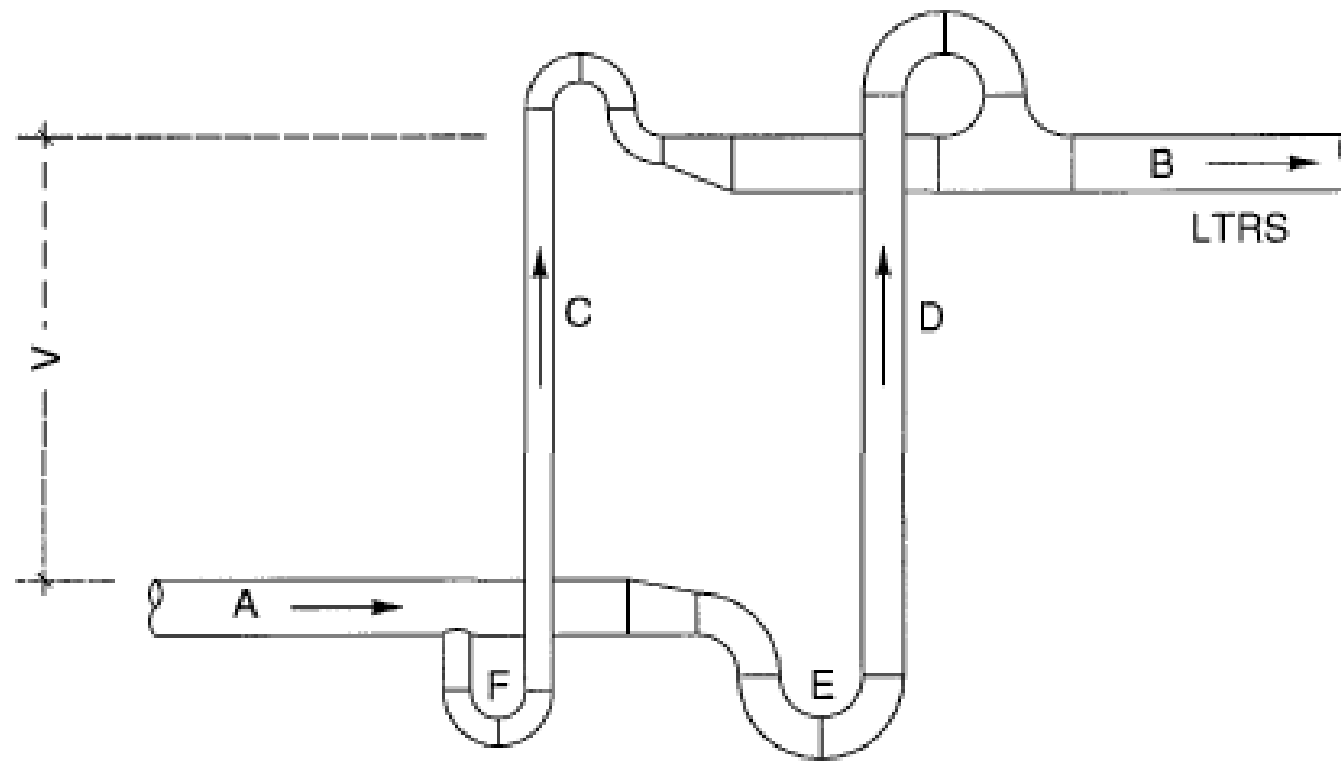


Piping Handbook



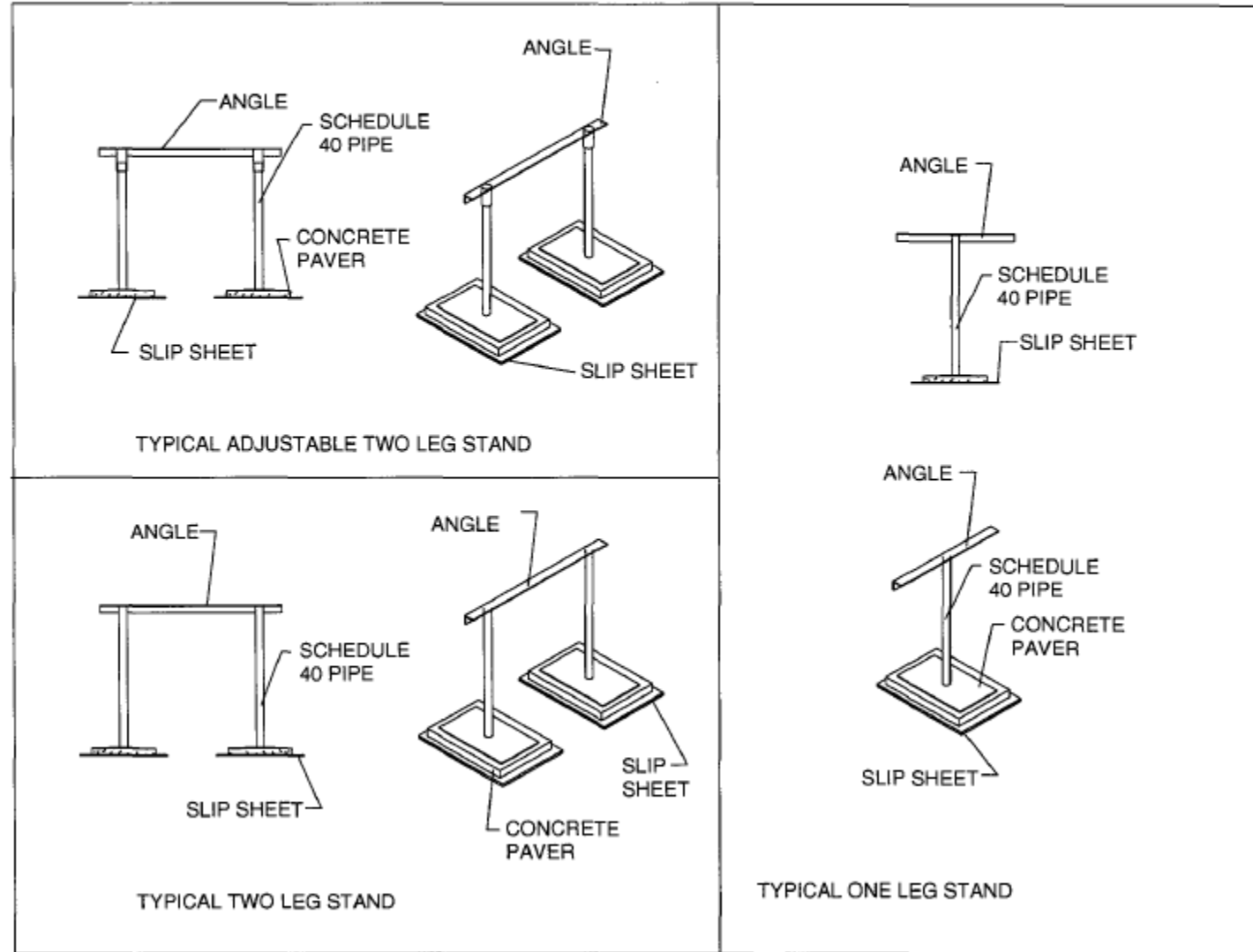
Ammonia Refrigeration Piping Handbook

Figure 1-6
Double Vertical Return Riser



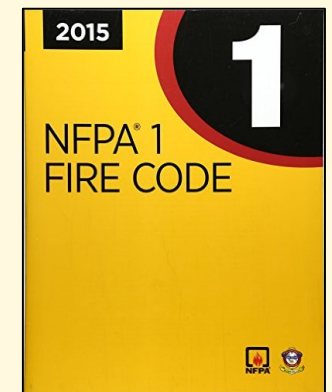
- F= SMALL TRAP
- E= LARGE TRAP
- D= LARGE RISER
- C= SMALL RISER
- A= EVAPORATOR UNIT OUTLET
- B= SECTION MAIN
- V= HEIGHT OF VERTICAL RISE

Figure 2-5
Leg Stands



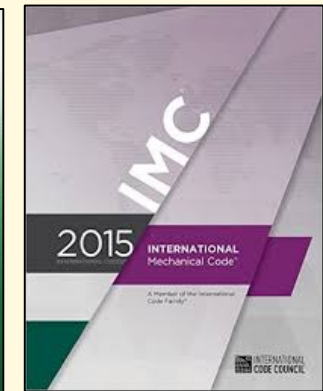
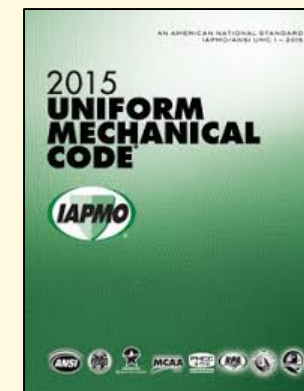
IIAR and Model Codes

- **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.



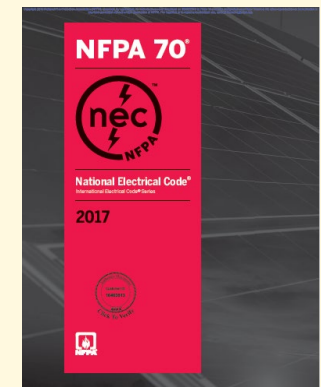
IIAR and Model Codes

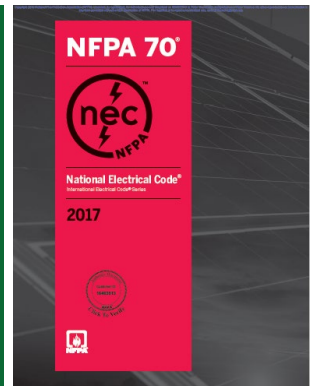
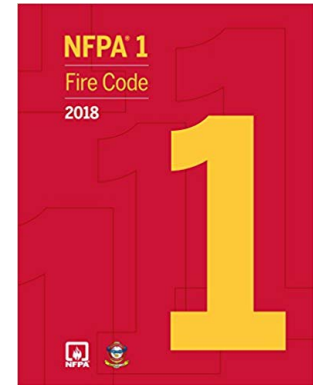
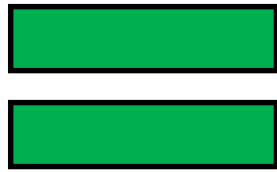
- **2018 UMC §1102.2 Ammonia Refrigeration Systems.** Refrigeration systems using ammonia as the refrigerant shall comply with **IIAR 2**, **IIAR 3**, **IIAR 4**, and **IIAR 5** and shall not be required to comply with this chapter.
- **2018 IMC §1101.6 General.** Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15, **IIAR 2**, **IIAR 3**, **IIAR 4** and **IIAR 5**.



IIAR and Model Codes

- **NFPA 70-2017 §505.5** Refrigerant machinery rooms that contain ammonia refrigeration systems and are equipped with adequate mechanical ventilation that operates continuously or is initiated by a detection system at a concentration not exceeding 150 ppm shall be permitted to be classified as “unclassified” locations. Informational Note: For further information regarding classification and ventilation of areas involving closed-circuit ammonia refrigeration systems, see ANSI/ASHRAE 15-2013, Safety Standard for Refrigeration Systems, and **ANSI/IIAR 2-2014**, Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems.





Questions?

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