

COLDCREW

Welcome to the  
**Webinar**

# An Introduction to the ANSI/ IIAR 6-2019 Standard

For ammonia refrigeration plant engineers, managers,  
technicians, contractors and consultants.



Click the phone icon  below to for dial in info.

## Presenters



**Tony Lundell**, *Director of Standards and Safety*  
International Institute of Ammonia Refrigeration (IIAR)

Responsible for facilitating and developing the IIAR Suite of Standards, Process Safety Management (PSM) and Risk Management Programs (RMP)



**Jim Kovarik** *VP, NDT Technology*  
LIXI, Inc. and Gamma Graphics Services (GGS)

On the ANSI/IIAR 6-2019 Standard Subcommittee and BSR/IIAR CO2 Standard Subcommittee, RETA board member

# Content

- 01** Purpose of IIAR 6
- 02** Navigating the Document
- 03** Implementation
- 04** Q&A

**01**

# Purpose of IIAR 6

# American National Standards Institute

Establishes the rules for standards development in the US and abroad. [www.ansi.org](http://www.ansi.org)



Focused on consumer safety and health and protection of environment



Ensures process is fair, accessible and responsive to the needs of affected stakeholders and interested parties.



Approves standards written by accredited organizations for industry and community adoption.

# International Institute of Ammonia Refrigeration

Membership-based technical society that is focused on advocacy, education and standards. [www.iiar.org](http://www.iiar.org)



Accredited ANSI  
Standards Developer



Began developing  
Bulletins for refrigeration  
systems in 1976, before  
PSM and RMP



Began developing the  
*IIAR Suite of  
Standards* in 2007



Hallmarks of the ANSI Standard Writing Process: Consensus, Public Review, Changes

# ANSI / IIAR 6-2019 Standard

Inspection, Testing, and Maintenance of Closed-Circuit Ammonia Refrigeration Systems

 Approved by ANSI April 26, 2019, the standard will be adopted to code

- An owner shall be in compliance with IIAR 6 when it is adopted by the (local) authority having jurisdiction (AHJ) or when it is adopted by the owner, whichever is first.
- IIAR 6 shall ensure that an Inspection, Testing, and Maintenance (ITM) Program is developed by the owner to reduce the probability of an ammonia release.
- IIAR 6 is intended to be **part of** a Mechanical Integrity (MI) Program
- Offers a **baseline** for 'this is what you need to address and how often'. You will need to reference other resources in addition to Standard 6 for a complete program

# ANSI / IIAR 6-2019 Standard

Inspection, Testing, and Maintenance of Closed-Circuit Ammonia Refrigeration Systems

- Specifies the **minimum requirements** for Inspection, Testing, and Maintenance (ITM) Tasks
- Includes record keeping for minimum safe requirements
- Can be used to perform a Gap Analysis where an owner has already significantly established a program for their inspections, testing, and maintenance.
- Capture (includes) parts of IIAR Bulletins 108 and 116
- Supersedes (replaces) IIAR Bulletins 109 and 110:
  - **Bulletin 109** *Guidelines for: IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System*
  - **Bulletin 110** *Guidelines for: Start-Up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems*
  - These bulletins are replaced by Appendix B (Informative) Ammonia Refrigeration System Safety Checklists



# ANSI / IIAR 6-2019 Standard

Inspection, Testing, and Maintenance of Closed-Circuit Ammonia Refrigeration Systems

- Is **not an all-encompassing** Mechanical Integrity Standard
- Addresses **(only) equipment that is common** to stationary closed-circuit ammonia refrigeration systems. All systems will not include each type of equipment the standard addresses, and all equipment in a system may not be covered in the standard.
- Is not intended to be Written Maintenance Procedures, Overall Preventative Maintenance (PM's) Program, Inclusive 5-Year MI Compliance Audit, Maintenance Training Program or an Overall Quality Assurance Program

**03**

# Navigating the Document

# Contents

The Standard contains **Normative** and **Informative** content.

An asterisk (\*) in the Normative body indicates there is additional (Informative) supporting information in the Appendices.

The associated appendix information is located in a corresponding section number preceded by "A."

## Contents

NORMATIVE	Part 1 General.....	1
	Chapter 1. Purpose, Scope, and Applicability .....	1
	1.1 Purpose.....	1
	1.2 Scope.....	1
	1.3 Applicability.....	1
	Chapter 2. Definitions .....	3
	2.1 General.....	3
	2.2 Defined Terms.....	3
	Chapter 3. Reference Standards .....	5
	3.1 International Institute of Ammonia Refrigeration (IIAR).....	5
	3.2 International Safety Equipment Association (ISEA).....	5
	Chapter 4. Program Administration.....	7
	4.1 Management Responsibilities.....	7
	Part 2 Program Requirement.....	9
	Chapter 5. General .....	9
5.1 ITM Program Requirements.....	9	
5.2 Frequency.....	10	
5.3 Record Keeping Requirements.....	11	
5.4 Inspection Requirements.....	13	
5.5 Testing Requirements.....	13	
5.6 Maintenance Requirements.....	14	
Chapter 6. Compressors .....	17	
6.1 Inspection, Testing, and Maintenance Tasks .....	17	
Chapter 7. Refrigerant Pumps.....	21	
7.1 Inspection, Testing, and Maintenance Tasks .....	21	
Chapter 8. Condensers .....	23	
8.1 Inspection, Testing, and Maintenance Tasks .....	23	
Chapter 9. Evaporators.....	26	
9.1 Inspection, Testing, and Maintenance Tasks .....	25	
Chapter 10. Pressure Vessels .....	29	
10.1 Inspection, Testing, and Maintenance Tasks .....	29	
Chapter 11. Piping.....	33	
11.1 Inspection, Testing, and Maintenance Tasks .....	33	
Chapter 12. Safety Systems.....	39	
12.1 Inspection, Testing, and Maintenance Tasks .....	39	
Chapter 13. Overpressure Protection Devices .....	43	
13.1 Inspection, Testing, and Maintenance Tasks .....	43	
Chapter 14. Purgers.....	47	
14.1 Inspection, Testing, and Maintenance Tasks .....	47	
Chapter 15. Ammonia Refrigerant and Secondary Coolants.....	49	
15.1 Inspection, Testing, and Maintenance Tasks .....	49	
INFORMATIVE	Part 3 Appendices.....	51
	Appendix A. (Informative) Explanatory Material .....	51
	Appendix B. (Informative) Ammonia Refrigeration System Safety Checklists .....	83
	Appendix C. (Informative) Water Contamination in Ammonia Refrigeration Systems.....	111
	Appendix D. (Informative) Avoiding Component Failure in Industrial Refrigeration Systems Caused by Abnormal Pressure or Shock.....	117
	Appendix E. (Informative) Risk-Based Inspection, Testing, and Maintenance.....	123
	Appendix F. (Informative) References and Sources of References.....	125

### Part 1: General

Purpose, scope, definitions, reference and administration (p 1-7)

### Part 2: Program Requirement

Instructions and tasks for approaching inspection, testing and maintenance on the ammonia refrigeration system(s), connected equipment, ancillary safety systems, and installed devices. (p 9-49)

### Part 3: Appendices\*

Supporting information and checklists (p 51-125)

# Part 1 - General

Purpose, scope, definitions, reference, administration (p 8-13)

**Program administration and the results of the program are the responsibility of the owner or the owner's representative.**



## Part 2 – Program Requirement: General

Requirements, frequency and record keeping (p 14-19)

### Requirements

1. Each inspection and test performed shall be documented.
2. Inspection and testing procedures shall follow RAGAGEP.
3. The frequency of inspection and testing shall be consistent with applicable manufacturers' recommendations and operating history.

### Frequency

Frequency time tables exist for inspection, testing, maintenance and record retention.

### Record Keeping

#### 1. Record all inspections and testing

Include date, who tested, what was tested, and results. Where applicable for testing, include activation set points and a functional description of control logic.

#### 2. Record all deficiencies found as a result of inspection and testing

Include corrective action with description, party responsible for remedy, expected completion date

#### 3. Record follow up

Include actual completion date (of remedy)

## Part 2 – Program Requirement: Equipment

Instructions and tasks for approaching inspection, testing and maintenance on the ammonia refrigeration system(s), connected equipment, ancillary safety systems, and installed devices. (p 21-47)

<p><b>In IIAR 6, there is a chapter dedicated to each type of equipment.</b></p> <p><b>Each chapter outlines:</b></p> <ol style="list-style-type: none"> <li>1. An ITM task list for the equipment</li> <li>2. ITM frequency</li> <li>3. Supporting details</li> </ol>	<b>CH 6</b>	Compressors	<b>CH 11</b>	Piping
	<b>CH 7</b>	Refrigerant Pumps	<b>CH 12</b>	Safety Systems
	<b>CH 8</b>	Condensers	<b>CH 13</b>	Overpressure Protection Devices
	<b>CH 9</b>	Evaporators	<b>CH 14</b>	Purgers
	<b>CH 10</b>	Pressure Vessels	<b>CH 15</b>	Ammonia & Coolants

# ITM Task Tables for Equipment

Inspection, Testing, and Maintenance will be performed on all equipment in the system.



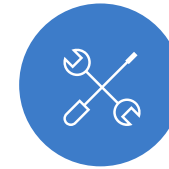
## Inspection

The evaluation and assessment of equipment, a component, a system, or a portion of a system using human senses such as vision, hearing, touch, smell, or a combination thereof.



## Testing

A procedure that commonly employs instruments, devices, and/or gauges to determine the operational status of equipment, a component, or a device in the refrigeration system.









## Maintenance

Work performed to keep equipment, components, and devices operating safely or to make repairs

## Part 3 – Appendices

Informative supporting information and checklists (p 48 – 123). This informative appendix is not a part of the standard. It provides explanatory information related to the standard’s provisions.

- |  |   |   |   |
|--|---|---|---|
|    | <b>(Informative) Explanatory Material</b><br>Contains the supporting information to items in the standards noted by an asterisk (*) |    | <b>Avoiding Component Failure (...) Caused by Abnormal Pressure or Shock</b><br><i>Obtained from sources believed to be reliable</i>  |
|    | <b>Ammonia Refrigeration System Safety Checklists</b><br>Inspection checklists. Replaces Bulletin 109                               |    | <b>Risk-Based Inspection, Testing, and Maintenance</b><br>The study and risk ranking of equipment and system failures based on probability (likelihood) and consequence (severity). |
|  | <b>Water Contamination in Ammonia Refrigeration Systems</b><br><i>Obtained from sources believed to be reliable</i>                 |  | <b>References and Sources of References</b><br>ANSI, ASME, IIAR, ISEA, OSHA, EPA  |



**03**

# Implementation

# Integrating Into Your MI Program

This standard's implementation can be a benchmark or **starting point** for minimum safe requirements.



## Collect<sup>+</sup>

Collect (and/or acquire) IIAR 6 plus all docs that supports your current MI program. Incl but not limited to codes, IOMs and internal requirements



## Review & Analyze

Thoroughly review IIAR 6 and perform a Gap Analysis between IIAR 6 requirements and your current program



## Develop

Internal operational requirements must be written to establish items such as risk mitigation, thresholds, etc.



## Update

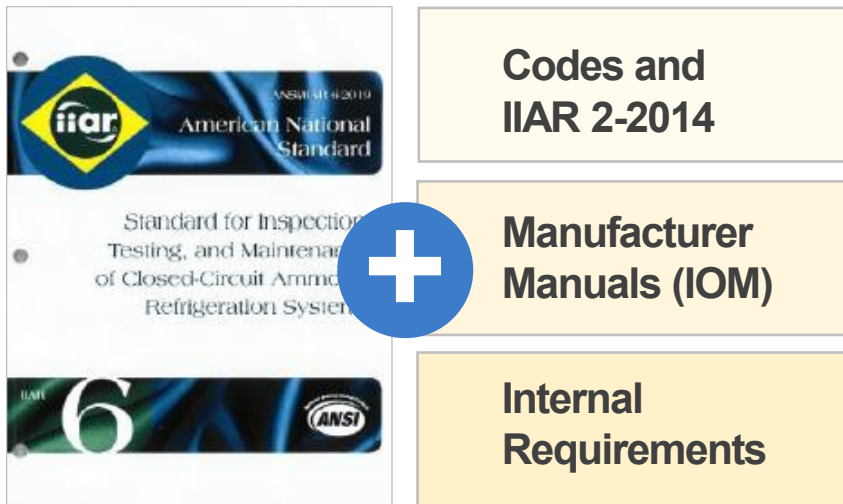
Document updates to your PSM/RMP program based on new standard and any updated internal requirements



## Execute

# Excerpt from Ch 11

## Example – Piping Inspection ITM Task List



Codes: Benchmark for safe design

IOMs: Benchmark for operating requirements

IR: Acceptable risk levels and operating limits/thresholds

**11.1 \*Inspection, Testing, and Maintenance Tasks.** ITM tasks shall be performed on carbon steel and stainless steel piping at the indicated frequencies set forth in Table 11.1 or per manufacturers’ instructions, unless a different frequency is justified in accordance with Section 5.2.1.

**TABLE 11.1**  
**Piping Inspection, Testing, and Maintenance Tasks**

ITM Task Description	Frequency			
	Insulated		Non-Insulated	
Inspection	Carbon Steel	Stainless Steel	Carbon Steel	Stainless Steel
a) Visually inspect metal surfaces for pitting or surface damage	NA	NA	A	A
<b>IR</b> b) Visually inspect for damage or moisture incursion in insulation (i.e., dampness, condensation, frost, ice buildup)	A	A	NA	NA
c) Visually inspect for indications of degradation of the protective coating (i.e., paint)	NA	NA	A	WA-A
d) Visually inspect supports for cracks and degradation	A	A	A	A
e) Visually inspect mounting bolts are in place	A	A	A	A
f) Visually inspect piping for indications of movement	A	A	A	A
<b>2</b> g) Visually inspect seismic joints and restraints	WA-A	WA-A	WA-A	WA-A
h) Visually inspect materials used under roof pipe stands for indications of degradation (e.g., bases or sleepers)	WA-A	WA-A	WA-A	WA-A
i) Visually inspect piping supports are in place and for indications of degradation that could impede their ability to provide continued support of the piping as designed	A	A	A	A
j) Visually inspect insulation protective jacketing	A	A	NA	NA
k) Visually inspect condition of connections (i.e., interchanging parts: valves, fittings, flanges, bolting, gaskets) and threaded joints	NA	NA	A	A
<b>2</b> l) Visually inspect to verify all piping system openings, except relief discharge termination points, are plugged, capped, or locked closed with appropriate administrative controls	A	A	A	A
m) Visually inspect to verify self-closing/quick-closing valves are installed on oil pots	A	A	A	A
<b>2</b> n) Visually inspect ammonia refrigeration pipe labeling for correct placement, accuracy, and degradation	A	A	A	A

**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, Others as noted.

**2** Standard 2    **M** IOMs    **IR** Internal Requirements

# Considerations

IIAR 6 details **minimum requirements**.

## Review & Analyze

### 1. Perform a Gap Analysis.

Compare and identify what needs to be modified and/or developed in your program to meet the requirements of IIAR 6. Track all changes, maintain a document that states what has been updated and when.

*\*[www.rce-chill.com/iiar-6-what-do-you-need-to-know/](http://www.rce-chill.com/iiar-6-what-do-you-need-to-know/)*

### 2. When in doubt be more conservative.

Example: Recommendations such as ITM task frequencies will be insufficient for your facility. Where a history of repeated deficiencies has been recorded, or conditions are 'unknown', task frequencies / methods should be re-evaluated.

## Develop

1. If your program does not state operating thresholds such as pipe wall thickness, pressures or temps – you will need to establish this.
2. Appendix E, Risk Based (ITM)

## Document

1. Update any and all affected plans, procedures, processes, work orders, schedules, SOP's, templates, checklists, etc.

## Execute

1. Train your team on all changes to your MI program
2. Follow all documented processes
3. With added pressure from EPA NCI program, no time is too early to begin.

**04**

**Q&A**

# THANK YOU

for attending!

[info@coldcrew.org](mailto:info@coldcrew.org)

For follow-up questions or comments

[coldcrew.org/webinars](http://coldcrew.org/webinars)

For a recording of today's session and future webinars



**Tony Lundell**, *Director of Standards and Safety*  
International Institute of Ammonia Refrigeration (IIAR)



**Jim Kovarik** *VP, NDT Technology*  
LIXI, Inc. and Gamma Graphics Services (GGS)

## Next Webinar

Adopting the IIAR 6 Standard:  
The New Requirements for Inspection