



WAGNER-MEINERT LLC
Engineers – Contractors

POLICY FOR OPENING AMMONIA REFRIGERATION SYSTEMS (Line Break) (Section 9)

OVERVIEW (Job Sites)

- (1) This Policy will only be used if the job site customer does not have a policy, or is less stringent than this policy.
- (2) The policies will be compared with participation from the customer and a determination of which policy is to be utilized.

DOCUMENTS

APPENDIX 9A LINE BREAK PERMIT (Page 10-11)

PURPOSE:

Wagner-Meinert, LLC recognizes that during everyday operations it may become necessary to shutdown and modify parts of the systems. This policy is intended to supplement the existing Standard Operating Procedures portion of our customer's Process Safety Management Programs.

The purpose of a policy for opening the ammonia refrigeration system is to ensure employee safety and to maintain the integrity of the system.

SCOPE:

Under the guidelines of Process Safety Management, Standard Operating Procedures have been established for individual pieces of equipment and should be used whenever possible. This policy is in place to provide instructions when opening of the system is required in locations not covered by the Standard Operating Procedures.

REFERENCES:

- A) Paragraph (j) OSHA 29 CFR 1910.119, Process Safety Management
- B) OSHA Instruction CPL 2-2.45A, Process Safety Management of Highly Hazardous Chemicals-Compliance Guidelines and Enforcement Procedures
- C) American National Standards Institute/International Institute of Ammonia Refrigeration. ANSI/IIAR 2-1999, American National Standard for Equipment, Design, and Installation of Ammonia Mechanical Refrigeration Systems.
- D) American National Standards Institute/American Society of Heating, Refrigerating and Air Conditioning Engineers, LLC, ANSI/ASHRAE 15-1994, Safety Code for Mechanical Refrigeration.
- E) American Society of Mechanical Engineers/American National Standards Institute, ASME/ANSI B31.5-1987, Refrigerant Piping.
- F) IIAR Bulletin R-1, A Guide to Good Practices for the Operation of an Ammonia Refrigeration System, International Institute of Ammonia Refrigeration.
- G) IIAR Bulletin #105, Guidelines for Application and Maintenance of Safety Pressure Relief Valves for Refrigerant Systems, International Institute of Ammonia Refrigeration.
- H) IIAR Bulletin #106, Guidelines for Prevention, Preparation, Response and Cleanup of Ammonia Releases, International Institute of Ammonia Refrigeration.
- I) IIAR Bulletin #107, Suggested Safety and Operating Procedures When Making Ammonia Refrigeration Plant Tie-ins.
- J) IIAR Bulletin #109, Minimum Safety Criteria for a Safe Ammonia Refrigeration System.
- K) IIAR Bulletin #110, Guidelines for Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems.
- L) IIAR Bulletin #111, Guidelines for Ammonia Machinery Room Ventilation, International Institute of Ammonia Refrigeration.

- M) IIAR Bulletin #116, Guidelines for Avoiding Component Failure in Industrial Refrigerating Systems Caused By Abnormal Pressure or Shock, International Institute of Ammonia Refrigeration.
- N) RETA Industrial Refrigeration Course I, II, III, IV, V, VI, VII, and VIII.
- P) Part 1926--Safety And Health Regulations For Construction

DEFINITIONS:

Definitions of regulatory specific terms can be found in "S8 Glossary of Regulatory Terms" section of the "IIAR Risk Management Guidelines for Ammonia Refrigeration".

Definitions of refrigeration specific terms can be found in "S9 Glossary of Refrigeration Terms" section of the "IIAR Risk Management Guidelines for Ammonia Refrigeration".

PROCEDURES:

Our Policy for opening the ammonia refrigeration system is composed of written procedures for each of the elements of the program, including:

- 1.0 PREPARATION FOR REPAIRS**
- 2.0 ISOLATION OF THE PIPING SYSTEM TO BE WORKED ON**
- 3.0 PUMPOUT OF THE ISOLATED PIPING**
- 4.0 OPENING / CUTTING AND WELDING**
- 5.0 PRESSURE TESTING**
- 6.0 RETURNING ISOLATED PIPING TO SERVICE**
- 7.0 FOLLOW-UP**

1.0 PREPARATION FOR REPAIRS

- 1.1 Verify that the change is being done in accordance to the Management of Change form.
- 1.2 Verify the delivery of materials and equipment necessary for the cut-in (pipe, fittings, lifts, cranes, welders, grinders, cutting torches, etc....).
 - 1.2.1 It is essential that piping and fittings conform to the Materials Of Construction guidelines.
 - 1.2.2 All equipment should be tested to insure safe operation.

- 1.2.3 Those individuals making the cut-in, or assisting in the cut-in, should be familiar with the Operation and Maintenance manuals of the equipment to be used.
- 1.3 If Sub-contractors are being utilized, verify that they conform to the requirements of the Wagner-Meinert, LLC safety policies.
 - 1.3.1 Sub-contractors must be aware of, and adhere to, all Wagner-Meinert, LLC Safety policies.
- 1.4 If the system is being opened to install new equipment, the new equipment should be installed prior to the cut-in, if possible.
- 1.5 Notify facility personnel of the operation to be performed.
 - 1.5.1 Plant personnel affected by the cut-in should be notified.
 - 1.5.2 Plant personnel should be trained on the dangers associated with ammonia, including Early Exposure Detection Techniques.
 - 1.5.3 If the system is to be open over several shifts, all affected shifts must be notified.
- 1.6 Test all Personnel Protective Equipment (PPE) that may be used during the cut-in. All PPE should be tested per manufacturers recommendations.

2.0 ISOLATION OF THE PIPING SYSTEM TO BE WORKED ON

DO NOT ATTEMPT TO ISOLATE ANY PART OF THE PIPING UNTIL THE ISOLATION POINTS AND ASSOCIATED PIPING HAVE BEEN FIELD VERIFIED AND THE FOLLOWING PROCEDURES HAVE BEEN COMPLETED.

- 2.1 Instruct all personnel of isolation procedure.
- 2.2 Consult the system documentation for isolation points. Field verify all affected piping.
- 2.3 Consult the Management of Change form for any specific hazards associated with the change.
- 2.4 Put on personnel protective equipment.
- 2.5 Make sure all safety equipment which may become necessary is available. See PPE policy for Personal Protective Equipment.

2.6 Shut off valves to isolate the section of the system you will be working on. **DO NOT ISOLATE SECTIONS OF LIQUID PIPING WITH LIQUID TRAPPED IN THAT SECTION. THIS CAN CREATE A HYDROSTATIC LOCK, AND CAN RESULT IN RUPTURED PIPING AND A RELEASE OF AMMONIA! PIPING RUPTURES MAY INCLUDE FLYING DEBRIS, RELEASES OF OTHER DANGEROUS CHEMICALS, EXPLOSIONS, ETC.**

2.7 Apply Lockout/Tagout per the Lockout/Tagout policy.

3.0 PUMPOUT OF THE ISOLATED PIPING

3.1 Pump out the section of the piping you have just isolated.

3.2 Once the section is pumped out, hold the pumped out section in a vacuum long enough to verify that the all isolation valves are holding. If Ammonia Liquid is still present in the piping system you may not be able to hold a vacuum. All Ammonia should be removed from the piping prior to any cutting operations.

3.3 Dry Nitrogen vapor should be used to purge Ammonia Vapors from the piping.

4.0 OPENING / CUTTING AND WELDING

4.1 Verify that the piping is not under pressure nor in a vacuum. **IF PIPING IS IN A VACUUM, AIR DRAWN IN DURING THE CUTTING PROCESS CAN CREATE AN EXPLOSIVE MIXTURE. (PURGE WITH NITROGEN)**

4.2 Position fans to blow air away from the person welding or cutting.

4.3 Verify that the Hot Work Permits have been issued per the Wagner-Meinert, LLC Hot Work Permit policy or the customers policy.

4.4 Any concerns or additional precautions outlined in the Hot Work Permit must be addressed prior to commencement of hot work.

4.5 Make necessary cut-ins. **(Before any actual pipe cutting is done, a non-heat producing tool (drill, hacksaw, port-a-band saw, etc.) to produce a pilot hole in the top of the pipe to insure the piping is safely evacuated.)**

4.6 If the cut-ins are being made to install valves for future service, the downstream pipe stub of the valves should be capped with gauge valves installed in the caps. The gauge valve can be used to bleed the section of pipe for future tie-ins.

5.0 PRESSURE TESTING

5.1 PREPARATION

All joints shall remain non-insulated until field leak testing has been completed. Prior to testing, the following preparations shall be made:

- 5.1.1 Valve off and isolate from any test pressures all refrigeration compressors, liquid pumps, pressure switches, pressure transducers and any other components that may be damaged.
- 5.1.2 Remove all safety pressure-relief devices and cap or plug the openings. This does not include hydrostatic relief valves.
- 5.1.3 Open all solenoid, pressure regulating, check or other control devices by means of their manual lifting stems. Check valves or other components w/o manual opening stems require testing from both directions.
- 5.1.4 Open all other valves except those leading to the atmosphere. Exclude valves that are being used to isolate that part of the system.
- 5.1.5 Cap, plug, or lock shut all valves and devices leading to the atmosphere per Lockout/Tagout Program.
- 5.1.6 The test gas shall be introduced into the system through the charging valve, or other suitable point fitted with a stop valve. The test pressure shall be verified using a calibrated pressure gauge located on the part of the system being tested. No leak repairs shall be made while that part of the system is under pressure. Test pressure is to be witnessed by an authorized plant person and the testing report is to be signed by that person.
- 5.1.7 The system ammonia compressor(s) shall not be used as a source of pressure for the field leak testing.
- 5.1.8 A suitable dry gas such as Nitrogen shall be used for field leak testing. The following fluids shall not be used for field leak testing an ammonia system:
 - 5.1.8.1 Oxygen or any combustible gas or combustible mixture of gases
 - 5.1.8.2 Carbon dioxide
 - 5.1.8.3 Halocarbon refrigerant
 - 5.1.8.4 Water or water solutions
 - 5.1.8.5 Air

5.2 LEAK TEST

- 5.2.1 The High Side and Low Side of the system shall be tested at the **greater** of:
 - 5.2.1.1 The relevant field leak testing pressure.

5.2.1.2 The design working pressure for which that part of the system has been designed per local and state codes or industry standard..

5.2.2 Dry nitrogen shall be used to raise the pressure in the ammonia system to that required for this test with the following provisions:

5.2.2.1 There shall be a suitable regulator located between the pressure source and the ammonia system, to control the supply pressure.

5.2.3 Test the section of pipe for leaks. This can be done utilizing leak detection soap. If leaks exist, remove pressure from pipe, repair leak per maintenance procedures, then retest pipe.

5.2.4 All discovered leaks shall be repaired, all defective material shall be replaced and the test process repeated until the system is proven tight with respect to this test.

5.3 PURGING

5.3.1 The system shall be purged to remove all non-condensable gases which remain after field leak testing.

6.0 RETURNING ISOLATED PIPING TO SERVICE

6.1 Install insulation as required. All insulation is to be applied prior to refrigerating the piping.

6.2 Put new branch lines and/or systems into service one at a time.

6.2.1 Open one branch line / system. This is to prevent overloading the compressors. Refer to Standard Operating Procedures for specific instructions as to proper testing and procedures required prior to startup.

6.2.2 Test controls for that branch.

6.2.3 Balance that section.

6.2.4 Slowly lower the temperature in that room (if applicable).

6.2.5 Return to 6.2.1 and put the next branch into service.

6.2.6 Remove Lockout Tags from valves as they are returned to service.

7.0 FOLLOW-UP

- 7.1 After several hours inspect the area for leaks and abnormalities.
- 7.2 Finalize Hot Work permits
- 7.3 Finalize Management of Change form
- 7.4 Update Equipment lists, Refrigeration drawings, Log Sheets and other system documentation to incorporate system changes.

DOCUMENT MANAGEMENT:

The Safety Director is responsible for developing and maintaining the program.

If after reading this program, you find that improvements can be made, please contact the Safety Director. We encourage all suggestions because we are committed to the success of our written Policy for Opening The Ammonia Refrigeration Systems. We strive for clear understanding, safe behavior, and involvement from every level of the company.

CHANGE CONTROL:

All management system changes are reviewed, approved or disapproved by the Safety Committee.

This program was initially developed on September 19, 2000, replacing the former Policy for Opening the Ammonia Refrigeration Systems entirely.

Revision No. 1 (September 19, 2000)
Revision or Review No. 2 (January 15, 2001)
Revision or Review No. 3 (January 10, 2002)
Revision or Review No. 4 (January 11, 2003)
Revision or Review No. 5 (September 10, 2003)
Revision or Review No. 6 (January 15, 2004)
Revision or Review No. 7 (January 10, 2005)
Revision or Review No. 8 (January 3, 2006)
Revision or Review No. 9 (September 6, 2007)
Revision or Review No. 10 (March 24, 2010)
Revision or Review No. 11 (October 10, 2011)

PERSONNEL:

The Owners of Wagner-Meinert have the ultimate responsibility for the Policy for Opening the Ammonia Refrigeration Systems. They have designated the Safety Director to manage the Policy for Opening the Ammonia Refrigeration Systems.

LINE BREAK PERMIT (APPENDIX 9A)



After determining it is necessary to open critical utility delivery systems, (such as ammonia, steam, air, water or chemical). **This permit must be completed for each line break. This permit is valid for one shift only for the date of issue and applies only to the work specified below.**

Permit Requested By: _____

Date: _____ Time: _____

Location: _____

Work Performed By: _____

Work To Be Done: _____

PERMIT APPROVAL

I CERTIFY THAT ALL CONDITIONS LISTED ON THE REVERSE SIDE OF THIS PERMIT HAVE BEEN CONFIRMED AND I AUTHORIZE WORK.

Signature: _____
Authorized Person

POST FINAL INSPECTION

Comments and any problems encountered	
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I CERTIFY THAT THE JOB SITE WAS REINSPECTED AFTER COMPLETING WORK AND NO LEAKS OR ABNORMALITIES WERE FOUND. SYSTEM DOCUMENTATION WILL BE COMPLETED TO INCORPORATE CHANGES AS REQUIRED.

Signature: _____
Authorized Person

This permit was not designed to apply to all welding and cutting situations. The specific circumstances of each welding and cutting job should be carefully reviewed and appropriate safety precautions may be necessary before work begins and while performing work

POST FINAL INSPECTION

THE WORK AREA MUST NOT BE LEFT UNATTENDED AT ANY TIME WITHOUT SECURING OPEN ULTILITY DELIVERY SYSTEM.

1. Training of personnel with assigned roles.		
All personnel have been trained	Yes	No
All personnel have been informed of potential hazards	Yes	No

2. Other permits required for this job.		
Hot Work	Yes	No
Confined Space	Yes	No

3. Line to be opened has been isolated (locked out).	___ Yes	___ No
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4. All energy sources (stored/potential) have been relieved.	___ Yes	___ No
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5. Line contains:

6. Test performed (describe):

7. Special hazards:

8. Personal protective equipment required:

9. Other requirements if needed:
