



Fire Code Requirements for Ammonia System Modifications & Upgrades

Joe McElvaney
Fire Protection Engineer
Phoenix Fire Department

Purpose

To foster communication and understanding between refrigeration users and the Fire Department.



When is a Construction Permit Required?

- New ammonia refrigeration system.
- Modification to existing ammonia system.

Construction permits will be required from both the Fire Department and Development Services Department



When is a Permit NOT Required?

- When it is a “like for like” replacement



Like for like?



Tonight's Topics



- Detection
- Ventilation
 - Piping
- Cross-over Valves
 - Diffusion Tank
 - Control Box
- Other Safety Equipment
- Emergency Response Documents

Detection—IFC 606.8

- In all rooms containing ammonia.
- Include spec sheet on plan submittal to verify detector coverage (cu. ft.).
- Multiple locations may be required.
- Alarm must be separate & distinct.
- Initial Activation: 25 – 50 ppm
 - Triggers horns/strobes & sends signal to fire alarm panel.
- 300 ppm—
 - Shuts off compressors, closes king valve and places ventilation system on high.

Detection

- Inspector will verify:
 - EACH detector operation
 - EACH horn/strobe function
 - Proper shut down for EACH compressor
 - Ventilation fan activation
 - Proper signal to fire alarm panel



Ventilation—IFC 606.9.2 PMC

- Installed per Phoenix Mechanical Code
- Inspector will verify operation of all E-Stops (break-glass type)—IFC 606.9.2:
 - Clearly labeled
 - Shuts off compressors
 - Activates Ventilation on HI



Clearly Labeled?

Ventilation/Detection

- Ventilation/Detection system needs uninterrupted power source.
 - PFD construction permit needed for above-grade sub base generator fuel tank (PFC 105.7.11)
 - Requires a separate installation permit from DSD.

Piping—IFC 606



- Plan Submittal—color code hi side vs. low side
- Pressure test with inert gas. To be verified by inspector or third party PE technical report.
- Label every 20', every change of direction and each side of wall piercing (IFC 2703.2.2.1(2))
- Per IIAR Bulletin 114

Community Risk Reduction

- Fire Department goal is to prevent any leak to atmosphere. Therefore, new ammonia systems will have at least 3 overpressure safety features:
 - Compressor by-pass
 - Hi to low side cross-over valves
 - PRVs piped to diffusion tank



Compressor By-Pass

- Screw compressors— provide separate crossover valve for each hi and medium pressure zone.
- Reciprocal compressors— confirm if built-in to compressor operation.
- Set 15 psi (or lower) below pressure relief valves.

Verify through 3rd party inspection.



Cross-Over Valves—PFC 606.10.1

- Screw compressors—provide separate crossover valve for each hi and medium pressure zone.
- Reciprocal compressors—confirm if built-in to compressor operation.
- Set 15 psi (or lower) below pressure relief valves.

Verify through 3rd party inspection.

Ammonia Diffusion Tank– PFC 606.12.3



- Automatic Fill (mechanical or electrical)
- Sight glass
- Low level alarm
- PRVs to diffusion tank
- Include calc. for water back pressure
- Check valve (burst valve) in line
- Sign to read “FDC to Ammonia Diffusion Tank ONLY”

Ammonia Control Box Instructions—PFC 606.12.3

- Instructions confirmed by a stamped engineer.
- Placed in the control box, and with emergency response documents.
- Include the following:
 - Type of dump system
 - Flow Diagram
 - Whether PRVs dump to tank
 - Specific instructions on action taken for a fire or overpressure.
 - Include hazards/ use cautions



Diffusion Tanks (cont'd)

- Inspector to verify:
 - Automatic fill function
 - Sight glass
 - Activation of low level alarm activation
 - FDC sign
 - FDC has PFD threads
 - Control Box Instructions



Emergency Response Documents—IFC 2701.5.1

- Hazmat Permit Application (incl. site map & HMIS)
- Emergency Response Plan
- PIDs (or flow diagram)
- Off Site Receptor Map
- Tier 2 Report

Placed inside an office area,
or at an approved exterior
location in a Knox Box
cabinet.



Miscellaneous Requirements

- Emergency system signage (PFC 606.7)
- Site Addressing (PFC 505.1)
- Proper NFPA 704 placards/diamond (2703.5)
 - Inside: 3/4/0/COR
 - Outside: 3/1/0/COR
- FD Access (if no 24/7 security) (PFC 506)
 - Dual-hinge Knox padlock to gates
 - Knox lock box near door to compressor room.
 - Knox box cabinet at entrance.
- Non-interrupted power source for ventilation/detection system.
- Remove all non-functioning (old) fire safety/ammonia equipment.

Modifications

- Detection
 - Required in areas/rooms modified
- Ventilation
 - Required if compressor room altered
- Cross-over Valves
 - Required on new compressors

Modifications (cont'd)

- Diffusion Tank
 - Confirm correct sizing
 - PRVs to diffusion tank
 - Include calculations for water back-pressure



Ammonia Control Box— PFC 606.12.3

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 - Flow Diagram
 - Whether PRVs dump to tank
 - Specific instructions on action taken for a fire or overpressure.
 - Include hazards/cautions.

Mechanical Integrity Audits

- All future M.I. audits must be stamped by an AZ professional engineer.
- Submit to the Fire Department (Special Hazard Unit) every 5 years.
- Provide a timeline for corrections, with most serious findings corrected immediately.

QUESTIONS??