



THE COLD FRONT

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IRC Research & Technology Forum

Are you interested in keeping abreast of current code and regulatory changes that impact industrial refrigeration systems? Are you wondering about current research and emerging technologies in the area of industrial refrigeration? Are you interested learning about the latest refrigeration education at a distance via the web?

The [Industrial Refrigeration Consortium](#) is pleased to announce the [2nd Annual Research & Technology Forum](#) to be held the afternoon of January 23rd, 2002. This event will feature presentations by IRC staff and IRC member companies/agencies.

The 2002 IRC R&T forum will provide an opportunity to exchange information about current refrigeration research, regulatory updates, emerging technologies, refrigeration education, and to explore needs for future research in the area of industrial refrigeration.

The [2nd Annual Research & Technology Forum](#) session topics will include:

IRC Research & Technical Assistance Activities

- ✓ Ammonia Sensors
- ✓ Benchmarking Industrial Refrigeration Systems

Around the Industry

- ✓ An Ammonia Refrigeration Operator Education Program
- ✓ Risk Management Program Update

Technology Transfer Activities

- ✓ Relief Valves –Overview of changes to ASHRAE Standard 15
- ✓ Refrigeration Education via the Web

The forum will be held at the Pyle Center on the University of Wisconsin-Madison campus. The forum is open to all interested in industrial refrigeration. IRC members, prospective members and invited guests should plan on staying for the IRC's annual business meeting to be held on January 24, 2002. To obtain registration materials, contact us or download them from our website. If you have any questions regarding travel arrangements or presentation topics, please contact the IRC at 866-635-4721 or info@irc.wisc.edu.

Emergency Eye Wash and Shower Stations

Eye wash and shower stations play an important role in minimizing the extent of injuries from chemical exposures in the workplace. In facilities that utilize industrial refrigeration, the principal chemical of concern is anhydrous ammonia. Water is the frontline medium for rendering first aid in the event of personal exposure to ammonia.

Ammonia is aggressively corrosive toward body tissue. Since ammonia is extremely hygroscopic, it preferentially migrates to areas on the body high in moisture including: eyes, throat, lungs, and dermal areas with elevated wettedness (armpits, crotch, etc.). Exposure to ammonia vapor tends to target those high moisture areas causing chemical burns. Exposure to liquid ammonia can cause both chemical and freeze burns due to the combined effects of ammonia's alkalinity and low temperature at atmospheric pressure (-28°F).

Most material safety data sheets (MSDS) for anhydrous ammonia recommend immediately flushing exposed areas with water for at least 15 minutes (some recommend a 30 minute decontamination period). The eye wash and shower station is an essential tool to accomplish the recommended decontamination.

During the past several months, the IRC has received several questions on the topic of emergency eye wash and shower stations. Questions range from: "Where should I locate eye wash and shower stations in my plant?" to "What source of water should I supply to the eye wash/shower station?". These are excellent questions. Often times, the true functionality of an eye wash and shower station is not tested until an exposure occurs. Any weaknesses in this important safety system will erode the benefit it's attempting to provide. Let's look at sources providing guidance on eye wash and shower stations.



Pertinent Regulations

First, OSHA has two regulations that refer to the need for eye wash and shower stations. The first is published in [CFR 1910.151\(c\) Medical Services and First Aid](#), which states:

Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Similar guidance is provided in [CFR 1926.50\(g\)](#). Because of anhydrous ammonia's corrosive characteristics, 1910.151 is an applicable regulation in plants utilizing ammonia refrigeration systems.

In addition to OSHA regulations, there are other codes and standards that identify the need for emergency eye wash stations and showers. Section 6.3.1.4 of [ANSI/IIAR 2 – 1999 Equipment, Design, and Installation of Ammonia Mechanical Refrigerating Systems](#) states:

An eye-wash and body shower unit shall be located just outside the machinery room exit door, and it is



Noteworthy



- Welcome [Nor-Am Cold Storage](#), the newest IRC member!
- The IRC has a professional staff position open. Do you know of someone interested in teaching, researching and evaluating industrial refrigeration systems? Contact Doug Reindl (dreindl@facstaff.wisc.edu) for more information.
- Send items of note for next newsletter to [Todd Jekel](#), tbjekel@facstaff.wisc.edu

recommended that one be located centrally inside the machinery room.

Section 4.3(b) of IIAR Bulletin 112 Ammonia Machinery Room Design states:

Because of the potential for eye and skin exposure to ammonia, accessible eyewash and body shower facilities shall be provided. Because of the importance of quick flushing of the eyes in the event of a spray or splash of liquid ammonia, eyewash facilities should be located in the area of the machinery room.

ANSI Z358.1 – 1998 Emergency Eye Wash and Shower Equipment is a guideline for the proper selection, installation, and maintenance of emergency decontamination equipment. ANSI Z358.1 is widely used for laboratory environments. Although not widely recognized in the industrial refrigeration arena, ANSI Z358.1 can serve as a useful guideline for document for specifying the design, performance, installation, use, training, and maintenance of emergency eye wash and shower stations.

Eye Wash and Shower Station Locations

ANSI Z358.1 requires locating emergency eye wash and shower stations in an area reachable within 10 seconds following an exposure event. The emergency equipment

must also be installed on the same level as the posing hazard with the travel path free from obstructions.

These requirements can present particular problems for many facilities that utilize ammonia industrial refrigeration systems. For example, several plants have asked: what is the best approach for providing this emergency equipment in areas near evaporative condensers, which are typically roof-mounted? Should permanent-piped shower stations be installed on the roof? Should a portable shower station be placed on the roof for access during service work?

We can tell you that some plants have elected to install permanent-piped shower stations on their roof. In northern climates, roof-mounted emergency showers need to be protected from freezing. Another option that warrants consideration is a portable eye wash/shower station.

Supply Water

In many situations, emergency eye wash and shower stations are piped directly from a plant potable cold water source. Depending on the location of the plant and the time of year, the temperature of potable water supply will range between 45°F and 65°F. Keeping in mind that most medical guidance suggests that exposed surfaces of the body be flushed for a period of at least fifteen minutes, it becomes all too clear that sustaining a fifteen minute dwell time under 55°F water is virtually impossible. In some cases, exposure to cold water can exacerbate the health hazard to the injured – contributing to shock or hypothermia. If you doubt it, try taking a fifteen minute shower with 55°F supply water temperature sometime!

Insure that the supply water temperature to the eye wash and shower station is tepid (lukewarm). ANSI Z358.1 requires tepid water to be delivered for emergency decontamination purposes. Supply water temperatures in the 78°F – 92°F range are generally desirable to achieve the tepid recommendation.

Control Valves

The shower or eye wash station must have an on-off control valve that stays open once actuated until intentionally (i.e. manually) turned off. This allows the individual to remove clothing or hold open eyelids for decontamination without having to simultaneously hold open a valve.

Freeze Protection

In cases where the temperature of the installed shower can drop below 32°F, freeze protection is required.

Maintenance & Training

Test the eye wash and shower stations quarterly to insure their functionality. A more extensive evaluation should be conducted on an annual basis to ensure compliance with the flow and water distribution requirements outlined in ANSI Z358.1. Employees who are at risk of exposure to the hazardous chemicals require training in the proper use of eye wash and shower stations. It is essential that all



employees are aware of the eye wash and shower station locations.

Drain Water

Think about where the resulting drain water will go. The contaminated water should not create its own hazard. Consider the applicable local, state, and federal regulations related to the disposal of the drain water.

Conclusion

The proper location, installation, performance, training, and maintenance of eye wash and shower stations are all crucial to minimize the extent of injury to personal exposure to hazardous chemicals. ANSI Z358.1-1998 establishes minimum performance and use requirements for eye wash and shower station equipment. Several of the recommendations outlined in ANSI Z358.1 are particularly relevant to facilities that utilize ammonia as a refrigerant. Consider re-evaluating your eye wash and shower stations to achieve performance in accordance with this standard.

[Upcoming Ammonia Refrigeration Courses](#)

[Intermediate Ammonia Refrigeration Systems](#)
December 5-7, 2001 Madison, WI

[Ammonia Refrigeration: Uncovering Energy Efficiency Opportunity Improvements](#)
February 11-13, 2002 Madison, WI

[Introduction to Ammonia Refrigeration Systems](#)
March 6-8, 2002 Madison, WI
May 15-17, 2002 Seattle, WA

[Ammonia Refrigeration System Safety](#)
April 15-17, 2002 Madison, WI

Visit www.engr.wisc.edu/epd/ for more information.

Relief Vent Line Criteria Changes

Background

On February 5, 2000, the ASHRAE Standards Committee approved [Standard 15 Addendum c](#). This change revised the calculation for allowable relief vent piping line length limits. The change was significant. Anyone interested in obtaining a copy of Addendum c can download it directly from the ASHRAE website free of charge by browsing at <http://www.ashrae.org/STANDARDS/15c.pdf>.

What is the Impact?

What is the impact of the new line length limit calculation for relief vent pipes? The answer depends upon one's perspective. For a given pipe size, relief valve type, and set pressure, the new calculation decreases the allowable line length limit. From another perspective, the "capacity" of a fixed size pipe will decrease for a given line length. In other words, for existing installations that need to comply with [Addendum c](#), the relief capacity (lb_{air}/min) through the vent line will decrease. Since the relief capacity is dictated by the size of the vessel, evaluating existing installations requires special care. If the existing vent line is too small in diameter or too long to carry the required capacity, installation of a larger size relief vent pipe will be required.

IRC TechNote Available to Members

The IRC staff has prepared a [TechNote](#) that discusses the issues raised by the change in Standard 15, including:

- the need for relief devices in industrial refrigeration systems
- the previous line length limit calculation and the new method for determining line length limits
- the impact of the change, and
- a new tool developed by the IRC to expedite the process of analyzing or evaluating relief vent piping systems.

New Vent Line Analysis Tool

The number of "what if" questions related to [Addendum c](#) is large. To help in evaluating requirements for relief valve type and capacity, and vent line size and length, the IRC has created the [Pressure Relief Vent Line Analysis Program](#). The program is user-friendly and allows quick analyses of a vessel's relief requirements.

The TechNote and analysis program are available to IRC members at no charge. Interested IRC members may download the analysis program at <http://members.irc.wisc.edu/>. Should you have any questions, feel free to contact us.