

4/20/92



# Minnesota Department of Labor and Industry

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April 15, 1992

Mary Anne Hruby  
Director, Legislative Commission to  
Review Administrative Rules  
Room 55, State Office Building  
100 Constitution Avenue  
St. Paul, Minnesota 55155

Re: Ammonia Piping and Installation Proposed Rules

Dear Ms. Hruby:

Pursuant to M. S. § 176.131, enclosed is a copy of the Statement of Need and Reasonableness in the above matter.

Sincerely,

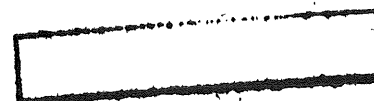
A handwritten signature in cursive script that reads "Kathryn Berger".

Kathryn Berger  
Compensation Attorney

KB/cb

The Legislative Commission  
Review Administrative Rules

APR 20 1992



STATEMENT OF NEED AND REASONABLENESS  
AMENDMENTS TO MINNESOTA RULES CHAPTER 5230  
AMMONIA RULES

2  
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4  
5 INTRODUCTION

6  
7 The rules for installing high-pressure ammonia systems were drafted initially by  
8 a task force of personnel active in ammonia installation established by the  
9 Department of Labor and Industry. The department contracted with an independent  
10 contractor to review and edit the draft prepared by the task force. The primary  
11 source documents used to develop the draft were: American National Standards  
12 Institute/International Institute of Ammonia Refrigeration (ANSI/IIAR) AR-2  
13 EQUIPMENT; DESIGN AND INSTALLATION OF AMMONIA MECHANICAL REFRIGERATION SYSTEMS;  
14 1989 American Society of Mechanical Engineers (ASME) American National Standards  
15 Institute Standard B31.5 REFRIGERATION PIPING; and 1990 American National  
16 Standards Institute/American Society of Heating, Refrigerating and Air  
17 Conditioning Engineers, Inc. (ANSI/ASHRAE) HANDBOOK ON REFRIGERATION SYSTEMS AND  
18 APPLICATIONS.

19  
20 Pertinent parts of these documents have been incorporated into the rules, or in  
21 some cases, rephrased for clarification. Where the background documents differ  
22 in actual language, or are perceived to differ, the language of these rules is  
23 intended to govern the installation and use of ammonia refrigeration systems.  
24 A tabulation of sources is attached as an appendix to this document.  
25

26  
27 The list of source documents used to prepare the rules are used in the context  
28 cited in the rules. These documents are recommended source materials for anyone  
29 designing and installing high-pressure ammonia systems. These rules are not  
30 intended to be a design manual.

31 To assure a consensus of opinion on these rules, a draft was mailed to over 60  
32 of the department's constituents who are active in the design and installation  
33 of ammonia systems. These firms and individuals account for an estimated 90% or  
34 more of the known business entities working with high-pressure ammonia systems  
35 in Minnesota. Each of these parties was asked to review and comment on the  
36 rules. Approximately 10 parties contributed over 75 comments.  
37

38 The comments or recommendations were reviewed by the task force, who advised the  
39 commissioner on the acceptability of each.  
40

41 If these rules require an administrative hearing, the following individuals will  
42 testify on behalf of the department:

43 B. James Berg, Director Code Administration and Inspection Services  
44 Department of Labor and Industry  
45 443 Lafayette Road  
46 St. Paul, Minnesota 55155-4304  
47 Vern Worms, Owner  
48 Cool Air Mechanical  
49 1441 Rice Street  
50 St. Paul, Minnesota 55117

David Zitzmann, Quality Control Manager

Himec-Scheid

1400 7th Street Northwest

Rochester, Minnesota 55901

John Hendrickson, President

Gartner Refrigeration and Manufacturing

3529 Raleigh Avenue South

Minneapolis, Minnesota 55416

Mr. Berg will describe the process for development of the rules, involvement in the process of all parties identified by the agency as being involved in ammonia installation, and discuss critical issues. Messrs. Worms, Zitzmann and Hendrickson will discuss their involvement in national associations related to ammonia, the basis for the adopted codes based on their experience and knowledge, and the suitability of the rules to safe ammonia installation.

The need for the rules mirrors changes in the ammonia industry. The restrictions on the use of--and eventual banning of--chloro-floro-carbon-type (CFC) refrigerants, or FREON™, due to ozone concerns is causing significant changes in the ammonia industry. CFC-type refrigerants are currently the heat transfer medium for the majority of refrigeration systems. In the search for substitute refrigerants, it is anticipated that ammonia will be used in more applications and designs to protect the ozone layer and the rest of the environment.

Designers are studying ammonia for its use in systems in large office buildings that use indirect "chilled-water" type cooling systems. These types of systems may lend themselves to the substitution of ammonia for the currently used CFC-type refrigerant, as ammonia is environmentally safer.

The rules have been drafted in light of such anticipated conversions. The refrigeration industry is converting from an industrial-type system to a more general utility for ammonia refrigerant. Also, the department is responding to industry comments requesting amendments that accurately reflect conditions and practices in Minnesota.

Ammonia is a compound formed by a combination of gaseous nitrogen and hydrogen. Ammonia exists naturally and is bio-degradable when exposed to sunlight, air and water. Ammonia has been used as a refrigerant since the beginning of the refrigeration industry, but was superseded for most uses by FREON™, except for industrial cooling uses.

Ammonia installation and usage was subject to partial regulation from 1972 to about 1982 as part of the State Mechanical Code, Minnesota Rules Chapter 1345. Chapter 1345 has since been repealed (15 SR 71). Since local governments are not equipped to regulate ammonia installations, statewide regulation of ammonia systems by the Department of Labor and Industry was approved in 1989 by the Legislature (M.S. 326.461).

Ammonia refrigeration is used most frequently in large food-processing and food-storage facilities located primarily in rural settings.

## SMALL BUSINESS IMPACT OF THE RULES

2  
3 The customers of ammonia refrigeration equipment are mostly larger businesses,  
4 as opposed to small businesses. The impact of these rules will allow customers  
5 to contract for construction with qualified, licensed installation companies that  
6 will assure safe installation consistent with code.

7  
8 Under these rules, contractor firms that install ammonia refrigerant equipment  
9 are small businesses that will find an increased level of regulation. Most of  
10 the installation contractors currently in the refrigeration marketplace qualify  
11 under these rules to do ammonia installation. Any costs arising from additional  
12 regulation will be offset by the uniformity it brings the marketplace.  
13 Uniformity allows contractors to bid and install work to a single, mandatory  
14 statewide standard instead of working under several standards that may be  
15 different at each job-- even within the same city. Therefore, no significant  
16 cost impact to small business is anticipated.

17  
18 Contractors were given the opportunity to address those parts of these rules  
19 which might not have a clear safety or consumer-protection intent. These rules  
20 represent a consensus of those in the ammonia industry in Minnesota. The  
21 document provides an objective, needed framework for designers, contractors,  
22 workers and customers to develop and install systems with confidence that the  
23 installation will comply with code requirements. The document also allows more  
24 consistent communication between parties.

25  
26 The factors identified in M.S. 14.115, subp. 2 (a)-(e) have been considered.

27 Because the rules address safety issues, less stringent standards for small  
28 businesses are not feasible.

29 Likewise, compliance timelines will be the same for all installers.

30 Reporting requirements are currently limited to a request for a permit, an  
31 application for inspection, and filing of testing results. Therefore, reducing  
32 the reporting requirements further is not possible.

33 The requirements of the rules cannot be reduced from what they are  
34 currently. The rules specify performance standards and, as safety issues, cannot  
35 be modified further or exempted for small businesses.

## 36 37 AGRICULTURE IMPACT OF THE RULES

38  
39 There is no agricultural impact by these rules as defined in M.S. 17.81.

## 40 41 LOCAL GOVERNMENT IMPACT OF THE RULES

42  
43 The impact on local government entities is not expected to exceed \$100,000 in  
44 either of the next two fiscal years following adoption of the rules.  
45  
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52

## NEED FOR AND REASONABLENESS OF RULES

### Part 5230.5000 MINIMUM STANDARDS

This part identifies these rules as the code for ammonia refrigeration systems and clarifies the scope of these rules by providing an explanation of the material to be regulated. The rules are not intended to be a system design manual. It is important that designers of ammonia systems be familiar with the requirements, but they should not rely on the rules for systems design requirements. Specific subparts refer to design requirements for those clearly delineated portions of these rules, but they do not form the basis for a total system design requirement. In the context of the rules, "design requirements" refer to the structural capabilities of a piece of equipment rather than the engineering design of the system.

If any component of a system is designed to operate below  $-20^{\circ}$  Fahrenheit ( $-28.9^{\circ}$  Centigrade), then the entire system must meet the test requirements for that temperature, or the material may comply with one of the exceptions of the American Society of Mechanical Engineers Standard B31.5, Sect. 532.2.

The testing, known as Charpie testing, is commonly used for low temperature systems and is not the same as for other types of systems that are unexposed to these extreme temperatures. B31.5 provides several options for Charpie testing. With proper documentation, any alternative to Charpie testing outlined in B31.5 may be used. Documentation is to be submitted to the Department of Labor and Industry.

The Charpie test is an impact test, specifically used to test component integrity at lower temperatures. The standard sets  $-20^{\circ}$  Fahrenheit ( $-28.9^{\circ}$  Centigrade) as the point for requiring Charpie testing. The requirement to test any component of a system designed to operate at lower temperatures is necessary because, if there is a failure of part of the system, other parts may be exposed to a lower temperature. As temperatures drop, many metals become brittle, and thereby subject to failure if exposed to an impact.

The American Society of Mechanical Engineers/American National Standards Institute B31.5 Safety Code for Pressure Piping, which is used as a primary source document for piping requirements rules, states that impact testing is required for temperatures below  $-20^{\circ}$  Fahrenheit ( $-28.9^{\circ}$  Centigrade).

### Part 5230.5010 INCORPORATION BY REFERENCE

This part references the documents used to develop ammonia rules. It lists documents and provides locations where they may be reviewed or purchased. The list of incorporated documents that is required by law is necessary for designers and installers to refer to more detailed language than appears in these rules, when another code is incorporated. It is reasonable for all designers and installers to locate these references quickly. Documents from ASME, the American Welding Society, and ANSI are those that the installer of an ammonia system must know to comply with the requirements of these rules.

Part 5230.5015 AMMONIA TASK FORCE

This part provides that the commissioner of labor and industry may appoint a task force to provide advice on incorporation of significant changes in the documents used as source material for these rules. This allows the commissioner a forum to receive recommendations regarding changes in industry standards prior to adopting changes in the rules.

It is necessary and reasonable to provide the commissioner with a source of informed recommendations regarding changes in industry standards and professional advice on rule changes to comport with such changes.

Part 5230.5020 DEFINITIONS

Subp. 1, Scope. Provides definitions of the terms used throughout these rules to provide consistent language for all parties. It is necessary to have definitions to ensure consistent use of all technical terms by all parties. Specifically, the definitions cover such categories as ammonia; equipment required for ammonia systems; building requirements; safety requirements; and regulatory terms. The terminology is based on definitions used in the ammonia industry to guide installers, designers, and users of ammonia.

The definitions are reasonable, as they are derived from the source documents identified in part 5230.5010, and they are standard definitions in the trade.

INDUSTRY DEFINITIONS: The following subparts of part 5230.5020 have definitions of technical terms that are standard to the ammonia refrigeration industry. Technical definitions are found in the following subparts:

Subp. 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 28, 29, 30, 31, 32, 34, 36, 37, 38, 39, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74.

The remaining subparts of part 5230.5020 are definitions that are not necessarily of a technical nature. Although they may be standard in the ammonia refrigeration industry, they could be interpreted differently by professionals not in the industry. Therefore, each of the following subparts require further explanation for need and reasonableness:

Subp. 2, Defines "accessible". Ability to access a site is needed to assure service of the equipment and proper safety inspection. It is reasonable to define with consistency what it means for all parties to have accessibility.

Subp. 3, Defines "administrative authority". Parties need to know who will perform the inspection by state law. It is reasonable to specify with consistency who is the administrative authority.

Subp. 6, Defines "anhydrous ammonia". Ammonia is defined to provide users with a definition of what chemical compound, and its properties are being discussed. The definition is needed to provide consistency of language. It is reasonable to provide the definition as a convenience for users so other references will not be required.

2 Subp. 7, Defines "approved". Parties need to know how the word is consistently  
3 defined. Because other state rules are referenced, it is reasonable to identify  
4 the other enforcement agencies involved in electrical, building, plumbing and  
5 other code inspections.

6 Subp. 8, Defines "an approved nationally recognized testing laboratory". The  
7 requirement for an approved nationally recognized testing laboratory is necessary  
8 to assure that testing is done in a properly documented manner by an appropriate,  
9 neutral testing laboratory, under consistent and documented testing procedures.  
10 Parties need to know the criteria that comprise an approved nationally recognized  
11 testing laboratory in order to acquire labels of approval to pass inspections and  
12 testing.

13  
14 Subp. 26, Defines "exit". A definition is necessary and reasonable to identify  
15 an emergency evacuation route. It is reasonable to assure a safe evacuation of  
16 a building or machinery room where an ammonia refrigeration system is installed.

17  
18 Subp. 27, Defines "field test". A definition is needed and reasonable to provide  
19 consistency of language.

20  
21 Subp. 33, Defines "inaccessible". Ability to access a site is needed to assure  
22 service of the equipment and proper safety inspection. It is reasonable for  
23 parties to know whether a site meets the standards of accessibility.

24  
25 Subp. 35, Defines "listed". A definition is needed to recognize equipment that  
26 has been tested and deemed acceptable by an appropriate, nationally recognized  
27 testing laboratory. It is reasonable for parties to know how to identify  
28 acceptable equipment.

29  
30 Subp. 40, Defines "machinery". A definition is needed to provide consistency of  
31 language. The definition is reasonable to establish that all components of the  
32 entire ammonia refrigerant system are considered machinery, regardless of whether  
33 or not they involve mechanical operation.

34  
35 Subp. 41, Defines "machinery room". A definition is necessary and reasonable to  
36 identify the space called the machinery room, assuring that those standards  
37 applying to a machinery room are properly applied.

38  
39 Subp. 42, Defines "machinery room, class T". A machinery room, class T has  
40 tighter standards than a machinery room. This definition requires a minimum fire  
41 separation from the rest of the building and the use of fire rated assemblies.  
42 It is necessary to assure safety of the general public who will be in the  
43 adjacent space by restricting the potential for transfer of ammonia from the  
44 machinery room to the occupied space. It is reasonable to assure the safety of  
45 the general public by limiting the likelihood of a person's exposure to ammonia.

46  
47 Subp. 43, Defines "manufacturer". The definition is needed and reasonable to  
48 ensure that all parties use consistent language.

49  
50 Subp. 47, Defines "nameplate". Requirements that certain information be provided  
51 on a nameplate is universal for inspectors and users. It is reasonable to assure  
52 that the equipment is proper for the application.

2 Subp. 57, Defines "readily accessible". A definition is needed to provide  
3 consistency of language. The term reasonably specifies that the safety of those  
4 who inspect equipment requires intact and stationary equipment, while not having  
5 to use portable access equipment and tools. Overall, the term assures safer  
6 conditions for inspectors than does the more general term, "accessible".

7 Subp. 61, Defines "rupture member". A rupture member allows uncontrolled flow  
8 of ammonia from a system whenever pressure exceeds a predetermined limit.  
9 Prohibiting rupture members is needed to prevent this uncontrolled flow and to  
10 assure the safety of people in the area. It is reasonable that pressure relief  
11 devices that accomplish the same purpose without uncontrolled flow are allowed  
12 by these rules.

13  
14 Part 5230.5025 AMMONIA GOVERNED AND DEFINED

15 This part identifies requirements and standards for ammonia used in refrigerant  
16 systems. This part is necessary because it sets standards for the proper grades  
17 of ammonia allowed for use in refrigeration systems. This part is reasonable  
18 because the use of unacceptable grades of ammonia with unacceptable levels of  
19 impurities may result in improper operations or unsafe conditions.

20  
21 Information on flammable limits and ignition temperature is necessary to assure  
22 that users are aware of the points at which users and the public are exposed to  
23 ammonia and a hazard is prevalent.

24  
25 Part 5230.5250 LOCATIONS GOVERNED AND DEFINED

26 This part provides descriptions of various types of building occupancies for use  
27 with parts 5230.5350 and 5230.5400. It is necessary to define the types of  
28 occupancies when determining the permissible quantities of ammonia and kinds of  
29 ammonia systems in each type of occupancy.

30  
31 This part also identifies locations where ammonia piping is not allowed and  
32 provides limits for the safe location of the ammonia piping. These descriptions  
33 are derived from the Uniform Building Code. As the Uniform Building Code and  
34 other source documents have changing definitions for types of occupancies, a  
35 specific definition was established to provide consistent phrasing.

36  
37 It is necessary and reasonable to identify each type of occupancy, because each  
38 type has different safety standards.

39  
40 Subp. 1, Establishes locations governed by parts 5230.5000 to 5230.6200, in which  
41 ammonia piping systems may be placed, and groups locations by occupancy.

42  
43 Subp. 2, Defines "institutional occupancy". A definition is needed to inform  
44 parties of what is considered in the industry to be "institutional" occupancy.  
45 It is reasonable to cite examples of such occupancy for further understanding by  
46 all parties.

47  
48 Subp. 3, Defines "public assembly occupancy". A definition is needed to inform  
49 parties of what is considered in the industry to be "public assembly" occupancy.  
50 It is reasonable to cite examples of such occupancy for further understanding by  
51 all parties.



1 Subp. 4, Defines "residential occupancy". A definition is needed to inform  
2 parties of what is considered in the industry to be "residential" occupancy. It  
3 is reasonable to cite examples of such occupancy for further understanding by all  
4 parties.

5  
6 Subp. 5, Defines "commercial occupancy". A definition is needed to inform  
7 parties of what is considered in the industry to be "commercial" occupancy. It  
8 is reasonable to cite examples of such occupancy for further understanding by all  
9 parties.

10  
11 Subp. 6, Defines "industrial occupancy". A definition is needed to inform  
12 parties of what is considered in the industry to be "industrial" occupancy. It  
13 is reasonable to cite examples of such occupancy for further understanding by all  
14 parties.

15  
16 Subp. 7, Defines "mixed occupancy". A definition is needed to inform parties of  
17 what is considered in the industry to be "mixed" occupancy. It is reasonable to  
18 cite examples of such occupancy for further understanding by all parties.

19  
20 Subp. 8, Specifies how it is decided that an adjacent location with refrigeration  
21 equipment, other than piping, is governed. This subpart clarifies the  
22 characteristics necessary for an adjacent location containing refrigeration  
23 equipment either to be governed by the occupancy classification of the building  
24 or on its own. This subpart is reasonable to assure that other equipment is  
25 covered under the appropriate occupancy classification. As a result, safety is  
26 not compromised.

27  
28 Part 5230.5300 REFRIGERATING SYSTEM CLASSIFICATION BY TYPE.

29 Defines and provides a schematic line drawing of various types of ammonia systems  
30 for clarification. When used in conjunction with location descriptions and parts  
31 5230.5350 and 5230.5400, this part provides direction in selecting an ammonia  
32 system for each occupancy type and use. The drawings are derived from the 1990  
33 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.  
34 HANDBOOK ON REFRIGERATION SYSTEMS AND APPLICATIONS. EQUIPMENT, DESIGN AND  
35 INSTALLATION OF AMMONIA MECHANICAL REFRIGERATION SYSTEMS.

36  
37 Subp. 1, Introduces the classifications of refrigerating systems. This subpart  
38 is necessary to explain that refrigerating systems are classified by the type of  
39 method employed for extracting heat and to indicate how part 5230.5300 will be  
40 outlined.

41  
42 Subp. 2, 3, 4, Define "direct system," "double direct system," and "indirect  
43 system." These subparts have definitions of technical terms that are standard  
44 to the ammonia refrigeration industry. These definitions are necessary and  
45 reasonable to establish language consistent with industry definitions.

46  
47 Subp. 5, Illustrates direct, double direct and indirect systems. It is necessary  
48 to provide the diagrams to clarify the meanings of terms used in the  
49 refrigeration industry and in these rules, and to ensure no user of these rules  
50 suffers any confusion as to types of refrigeration systems referred to in these  
51 rules. The diagrams, derived from IIAR sources, are reasonable, contemporary  
52 industry usage.

1 Part 5230.5350 RESTRICTIONS ON PLACEMENT OF AMMONIA PIPING, LIMITATIONS ON SYSTEM  
2 SIZING, AND PRESSURE RELIEF VENTING REQUIREMENTS

3 This part regulates the location and maximum quantities of ammonia piping within  
4 all occupancies and types of systems except industrial occupancies. It provides  
5 specific regulations regarding location of ammonia systems and piping, and  
6 specific requirements for location of ammonia cooling coils.

7  
8 This detail is necessary to ensure that, in areas where the general public and  
9 untrained personnel congregate, system design will prevent accidental exposure  
10 to ammonia. This part is reasonable because it reflects contemporary industry  
11 usage.

12  
13 Subp. 1, Scope explains that restrictions for placement of ammonia piping are  
14 included in subparts 2 to 16.

15  
16 Subp. 2, Provides that an ammonia piping system cannot be installed in public  
17 stairways, stair landings, entrances or exits.

18  
19 This subpart is needed to regulate the location and maximum quantity of an  
20 ammonia piping system within all occupancies and types of systems except  
21 industrial occupancies. This detail is reasonable because it assures that, in  
22 areas where the general public and untrained personnel congregate, the design  
23 will prevent accidental exposure to ammonia or to the results of a catastrophic  
24 failure of the system.

25  
26 Subp. 3, Prohibits ammonia piping systems from being installed in public hallways  
27 or lobbies; limits the amount of ammonia refrigerant in an ammonia piping system  
28 installed in residential and commercial occupancies.

29  
30 This subpart is needed to regulate the location and maximum quantity of an  
31 ammonia piping system within residential and commercial occupancies. This detail  
32 is reasonable because it assures that, in areas where the general public and  
33 untrained personnel congregate, the design will prevent accidental exposure to  
34 ammonia or to the results of a catastrophic failure of the system.

35  
36 Subp. 4, Provides regulations regarding permissible quantities of refrigerant in  
37 the ammonia piping system allowed in enclosed places other than the machinery  
38 room; provides regulations regarding permissible quantities of refrigerant in the  
39 ammonia piping system allowed in individual stories of a building served by  
40 evaporator coils.

41  
42 This subpart is needed to regulate the maximum quantity of an ammonia piping  
43 system within enclosed spaces. This detail is reasonable because it assures  
44 that, in areas where the general public and untrained personnel congregate, the  
45 design will prevent accidental exposure to ammonia or to the results of a  
46 catastrophic failure of the system.

47  
48 Subp. 5, Provides regulations regarding permissible quantities of refrigerant in  
49 the ammonia piping system served by evaporator coils allowed in occupied space  
50 served by air ducts.

51

1 This subpart is needed to regulate the maximum quantity of an ammonia piping  
2 system within air ducts. This detail is reasonable because it assures that, in  
3 areas where the general public and untrained personnel congregate, the design  
4 will prevent accidental exposure to ammonia or to the results of a catastrophic  
5 failure of the system.

6  
7 Subp. 6, Provides regulations regarding permissible quantities of refrigerant in  
8 the ammonia piping system served by evaporator coils where the return air space  
9 above a suspended ceiling is one continuous space and not an enclosed air duct  
10 in which return air is confined.

11  
12 This subpart is needed to regulate the maximum quantity of an ammonia piping  
13 system within occupied space. This detail is reasonable because it assures that,  
14 in areas where the general public and untrained personnel congregate, the design  
15 will prevent accidental exposure to ammonia or to the results of a catastrophic  
16 failure of the system.

17  
18 Subp. 7, Specifies requirements for external venting with direct expansion coils  
19 or evaporators used for air conditioning in institutional and public assembly  
20 occupancies. This subpart is needed to identify the circumstances for which  
21 external venting is not required in institutional and public occupancies. The  
22 subpart is reasonable because it presents a tested formula to assure a  
23 distinction between those systems that require venting and those that do not.

24  
25 Subp. 8, Provides regulations regarding permissible quantities of ammonia allowed  
26 in each occupancy; prohibits air conditioning for human comfort using the direct  
27 ammonia system. Prohibition of a direct system for air conditioning for human  
28 comfort provides protection of the public from an accidental release of ammonia  
29 if there is a system failure.

30  
31 Subp. 9, Provides information regarding permissible quantities of ammonia for  
32 direct systems in each type of occupancy.

33  
34 Subp. 10, Indirect systems may have the maximum quantity of ammonia increased  
35 where there is a class T machinery room. The maximum permissible quantity of  
36 ammonia refrigerant may be increased where there is a class T machinery room, and  
37 the other requirements of the subpart are complied with. The increase in the  
38 amount of ammonia refrigerant--under these conditions--is reasonable, as it  
39 allows more refrigerant. However, the restrictions provide adequate safety to  
40 the public.

41  
42 Subparts 8 through 10 are necessary and reasonable to provide specific  
43 information relative to maximum permissible quantities of ammonia in each type  
44 of occupancy. Maximum quantity is based on industry standard, ANSI/ASHRAE SAFETY  
45 CODE FOR MECHANICAL REFRIGERATION, Chapter 15, Sect. 6.3.

46  
47 Subp. 11, Requires a CLASS T machinery room for institutional, public assembly,  
48 residential and commercial occupancies as specified; prohibits devices with open  
49 flames inside a CLASS T machinery room; sets requirements for electrical  
50 equipment in a CLASS T machinery rooms; references the National Fire Protection  
51 Act standard used for life safety and fire exits. The subpart is necessary and  
52 reasonable to assure safety in each type of occupancy.

1 Subp. 12, Requires that ammonia piping that crosses an open space and affords  
2 passageway in a building be installed at least 7-1/2 feet above the floor unless  
3 it is against the ceiling of the space. The subpart is necessary to specify an  
4 adequate overload clearance. The subpart is reasonable because 7-1/2 feet  
5 provide clearance under most circumstances.  
6

7 Subp. 13, Prohibits locations where ammonia piping can be placed. The limitations  
8 are necessary and reasonable to prevent obstruction of passageway by ammonia  
9 piping in a building.  
10

11 Subp. 14, Establishes that part 5230.5350 applies to all occupancies except that  
12 the maximum quantity of ammonia allowed does not apply to industrial occupancy;  
13 specifies that in areas of public assembly, the more restrictive requirements of  
14 this part apply. It is necessary to specify separate requirements for  
15 occupancies other than industrial, because those requirements must assure the  
16 safety of individuals who may be exposed to ammonia.  
17

18 Subp. 15, Specifies that ammonia piping may not be installed vertically through  
19 floors from one story to another, except in certain stated cases. The subpart  
20 is necessary to prevent smoke, gases and fire from travelling from one floor  
21 level to another. The subpart is reasonable to protect people in such  
22 occupancies.  
23

24 Subp. 16, Specifies requirements for installing ammonia piping horizontally in  
25 closed floors including concrete and open joist spaces. The subpart is necessary  
26 to identify where and how piping may be placed when it is installed horizontally.  
27 The subpart is reasonable because it provides for placement of piping in  
28 protected environments.  
29

#### 30 Part 5230.5400 REQUIREMENTS FOR INDUSTRIAL OCCUPANCIES

31 This part identifies requirements for industrial occupancies. Standards for  
32 industrial occupancies are not as stringent as those for other types of  
33 occupancies, because employees in industrial occupancies generally have proper  
34 training and equipment not available to those in other types of occupancies.  
35 Furthermore, those in other types of occupancies could be part of the general  
36 public and would not have the necessary safety training.  
37

38 It is necessary to specify separate requirements for occupancies other than  
39 industrial, because those requirements must assure the safety of individuals who  
40 may be exposed to ammonia. It is reasonable to assume that personnel in  
41 occupancies other than industrial are not trained in safety, and therefore, have  
42 more stringent requirements than personnel in industrial occupancies.  
43

44 Subp. 1, Specifies that there is no maximum quantity of ammonia refrigerant in  
45 an industrial occupancy. Other requirements of 5230.5350 apply. The subpart is  
46 necessary and reasonable to clarify a difference in the amount of ammonia allowed  
47 for industrial occupancies, as compared to other occupancies.  
48  
49  
50  
51  
52

2 Subp. 2, Specifies cross-reference requirements for machinery room in  
3 industrialized occupancies. This subpart is needed and reasonable because  
4 industrial occupancy standards are different from other types of occupancies, due  
5 to a lesser hazard to the general public. However, minimum standards for the  
6 machinery room are required to assure safety of those who may be in the work  
7 area.

8 Subp. 3, Specifies characteristics of a refrigerant storage area, including: the  
9 degree of its being a hazard; what parts should be protected; and when the area  
10 is considered a refrigerant storage area. The subpart is needed to provide for  
11 safe installation and protection for those in the work area. The subpart is  
12 reasonable to provide minimum standards for installation of ammonia.  
13

14 INTRODUCTION to parts 5230.5605 to 5230.5650

15 This part provides standardized criteria and labeling regulations for the parts  
16 of equipment in the ammonia refrigeration system. Equipment requirements in  
17 these parts are based on the American National Standards Institute/ International  
18 Institute of Ammonia Refrigeration AR-2 EQUIPMENT, DESIGN AND INSTALLATION OF  
19 AMMONIA MECHANICAL REFRIGERATION SYSTEMS. Relevant portions of this document  
20 have been used in these rules.  
21

22 Rephrasing of the AR-2 standard is needed for clarity. Rephrasing is reasonable,  
23 as it allows for less technical, more readily understandable language.  
24

25 Occupational Safety and Health Administration (OSHA) safety requirements are  
cited to assure compliance with appropriate employee safeguards.

27 Part 5230.5605 AIR COOLED CONDENSERS

28 This part describes design criteria for air cooled condensers that are applied  
29 to closed-circuit ammonia refrigeration systems.  
30

31 Subp. 1, Establishes that part 5230.5605 refers to air cooled condensers that are  
32 applied to closed-circuit ammonia refrigeration systems.  
33

34 Subp. 2, Lists the design criteria for use of air cooled condensers for ammonia  
35 service.  
36

37 A. Provides a pressure to be contained safely by the condenser.

38 B. Provides a wind velocity to be withstood safely by the condenser.

39 C. Requires compliance with OSHA standards for employee protection.

40 D. Requires that fan speeds be limited to safe speed as recommended by the  
41 manufacturer for the specific application and temperatures.

42 E. Specifies the minimum data that manufacturers must provide on a  
43 nameplate to be placed on an air cooled condenser for ammonia service.  
44

45 This part is necessary and reasonable to assure minimum manufacturing and safety  
46 standards for air cooled condensers and to provide for documentation of  
47 compliance with the standards.  
48

49 Part 5230.5610 AIR COOLED DESUPERHEATERS

50 This part provides that this equipment, which is similar to air cooled  
51 condensers, be designed and tested to the same criteria as those required for air  
52 cooled condensers.

2 This part is needed and reasonable to assure minimum manufacturing and safety  
3 standards for air cooled desuperheaters and to provide for documentation of  
4 compliance with the standards.

5 Part 5230.5615 COMPRESSORS

6 This part describes ammonia compressors that are applied to closed-circuit  
7 ammonia refrigeration systems.

8  
9 Subp. 1, Establishes that part 5230.5615 refers to compressors that are applied  
10 to closed-circuit ammonia refrigeration systems. The subpart also identifies  
11 other types of compressor equipment that compress gas.

12  
13 Subp. 2. Describes the minimum standards which guide the designers and builders  
14 of ammonia compressors.

15 A. Provides the minimum value for the internal pressure withstood safely  
16 by the high-stage, or high-side, compressor for water, air and evaporative  
17 condensing applications.

18 B. Provides the minimum value for the internal pressure that the booster  
19 compressor can withstand safely.

20 C. Requires that the compressor be equipped with a pressure relief device.  
21 The device is used to relieve excess ammonia pressure and discharge it to a safe  
22 location without damage to the equipment or injury to personnel.

23 D. Requires controls to assure interlock protection to the compressor for  
24 listed conditions; provides direction for setting these controls.

25 E. Establishes standards for startup and requires adequate electrical  
26 service and controls for startup and operation.

27 F. Provides protection for the compressor from excessive on-and-off  
28 operation.

29 G. Requires guards and protection for parts of the compressor which rotate  
30 to protect employees under established OSHA standards.

31 H. Requires that compressors with parts used to rotate in only one  
32 direction have a rotation arrow showing the proper direction. The arrow must be  
33 affixed permanently to the compressor or cast in as a permanent part of the  
34 compressor.

35 I. Provides an alternate method for the manufacturer to certify equipment  
36 which is not listed.

37 J. Specifies the minimum data that manufacturers must provide on a  
38 nameplate to be placed on an evaporative compressor for ammonia service.

39  
40 This part is necessary and reasonable to assure minimum manufacturing and safety  
41 standards for compressors and to provide for documentation of compliance with the  
42 standards.

43  
44 Part 5230.5620 EVAPORATIVE CONDENSERS

45 This part describes the various types of evaporative condensers that are applied  
46 to closed-circuit ammonia refrigeration systems.

47  
48 Subp. 1, Establishes that part 5230.5620 refers to evaporative condensers that  
49 are applied to closed-circuit ammonia refrigeration systems.

50  
51 Subp. 2. Describes the minimum standards that guide designers and builders of  
52 evaporative condensers.

- 2 A. Provides a pressure to be contained safely by the condenser.  
3 B. Provides a wind velocity that the condenser can withstand safely.  
4 C. Requires that fan speeds must be limited to safe speed as recommended  
5 by the manufacturer for the specific application and temperatures.  
6 D. Requires compliance with manufacturers' design-fan speed requirements.  
7 E. Specifies the minimum data that manufacturers must provide on a  
8 nameplate to be placed on an evaporative condenser for ammonia service.

9 This part is necessary and reasonable to assure minimum manufacturing and safety  
10 standards for evaporative condensers and to provide for documentation of  
11 compliance with the standards.

12  
13 Part 5230.5625 SHELL AND TUBE CONDENSERS

14 This part describes shell and tube condensers that are used in closed-circuit  
15 ammonia refrigeration systems.

16  
17 Subp. 1, Establishes that part 5230.5625 refers to shell and tube condensers that  
18 are used in closed-circuit ammonia refrigeration systems.

19  
20 Subp. 2, Describes the minimum standards that guide designers and builders of  
21 shell and tube condensers.

22 A. Provides a pressure to be contained safely by the shell and tube  
23 condenser.

24 B. Requires that the condenser provide a pressure relief device.

25 C. Requires that adequate nozzles be provided in the condenser shell to  
attach pressure relief devices.

26  
27 D. Specifies the minimum data that manufacturers must provide on a  
28 nameplate to be placed on shell and tube condensers for ammonia service.

29  
30 This part is necessary and reasonable to assure minimum manufacturing and safety  
31 standards for shell and tube condensers and to provide for documentation of  
32 compliance with the standards.

33  
34 Part 5230.5630 PRESSURE VESSELS

35 This part describes pressure vessels that are used in closed-circuit ammonia  
36 refrigeration systems.

37  
38 Subp. 1, Establishes that part 5230.5630 refers to pressure vessels that are used  
39 in closed-circuit ammonia refrigeration systems.

40  
41 Supp. 2, Describes the minimum standards for pressure vessels and provides  
42 guidelines for designers and builders of ammonia pressure vessels.

43 A. Provides a pressure to be contained safely by the high-side pressure  
44 vessel when using water or evaporative condensing and air-cooled condensing.

45 B. Provides a pressure to be contained safely by the low-side pressure  
46 vessel.

47 C. Requires that pressure vessels larger than a minimum size comply with  
48 the ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, DIVISION 1, 1983 in the  
49 design, fabrication, inspection and testing of such unfired vessels under  
50 construction.

51 D. Requires that pressure vessels be provided with adequate openings for  
52 the attachment of safety relief devices as required in part 5230.5655.

2 E. Specifies the minimum data that manufacturers must provide on a  
3 nameplate to be placed on pressure vessels for ammonia service.

4 Pressure vessels are closely regulated by the American Society of Mechanical  
5 Engineers Boiler and Pressure Vessel Code. The standards have been used  
6 effectively for over 70 years in assuring that vessels are constructed in a safe  
7 manner and will meet the pressure requirements of the systems for which they are  
8 designed.

9  
10 These standards are necessary and reasonable because the low side may become  
11 over-pressurized if the high side releases excess ammonia to the low side. All  
12 pressure vessels on the low side are required to meet the same standards as those  
13 on the high side of the system.

14  
15 Part 5230.5635 EVAPORATORS

16 This part describes evaporators that are used in closed-circuit ammonia  
17 refrigeration systems.

18  
19 Subp. 1, Establishes that part 5230.5635 refers to evaporators that are used in  
20 closed-circuit ammonia refrigeration systems.

21  
22 Subp. 2, Describes the minimum standards that guide builders and designers of  
23 forced-air evaporator coils for ammonia service.

24 A. Provides a pressure to be contained safely by an ammonia forced-air  
25 evaporator coil.

26 B. Requires guards and protection for parts of the compressor which rotate  
27 to protect employees under established OSHA standards.

28 C. Requires that fan speeds be limited to a safe speed as recommended by  
29 the manufacturer for the temperature and nature of the application.

30 D. Specifies the minimum data that manufacturers must provide on a  
31 nameplate to be placed on forced-air evaporator coils for ammonia service.

32  
33 The subpart is necessary and reasonable to require minimum standards to guide the  
34 designers and builders of ammonia forced-air evaporator coils.

35  
36 Subp. 3, Describes the design criteria for flooded-type refrigerant in shell.

37 A. Requires that the shell side in the pressure vessel be provided with  
38 adequate openings to attach safety relief devices.

39 B. Provides a pressure to be contained safely in shell and tube  
40 evaporators.

41 C. Specifies the minimum data that manufacturers must provide on a  
42 nameplate to be placed on shell and tube evaporators for refrigerants in the  
43 shell.

44  
45 Subp. 4, Describes the design criteria for direct expansion type with refrigerant  
46 in tubes.

47 A. Requires that tube material and fabrication comply with national  
48 standards cited.

49 B. Provides a pressure to be contained safely by the ammonia tubes.

50 C. Specifies the minimum data that manufacturers must provide on a  
51 nameplate to be placed on shell and tube evaporators for refrigerants in the  
52 tube.



2  
3 Subparts 3 and 4 are necessary and reasonable to assure minimum manufacturing and  
4 safety standards for evaporators and to provide for documentation of compliance  
5 with the standards.

6 Part 5230.5640 REFRIGERANT PUMP

7 This part describes refrigerant pumps that are used in closed-circuit ammonia  
8 refrigeration systems.

9 Subp. 1, Establishes that part 5230.5640 refers to refrigerant pumps that are  
10 used in closed-circuit ammonia refrigeration systems.

11 Subp. 2, Describes the minimum standards that guide builders and designers of  
12 refrigerant pumps for ammonia service.

13 A. Requires that a pressure relief device suitable for liquid applications  
14 be installed; specifies location and other requirements.

15 B. Provides a pressure to be contained safely by pump casing.

16 C. Requires guards and protection for parts of the pump drives and motors,  
17 which rotate to protect employees under established OSHA standards.

18 D. Requires that a pump be provided with controls that provide starting  
19 only when the pump is unloaded, and that pumps are installed with adequate  
20 electrical service and controls to operate in conformity with manufacturers'  
21 recommendations.

22 E. Specifies the minimum data that manufacturers must provide on a  
23 nameplate to be placed on refrigeration pumps.

24 The subpart is necessary and reasonable to require minimum standards to guide the  
25 designers and builders of refrigerant pumps. It also assures minimum  
26 manufacturing and safety standards for refrigerant pumps and to provide  
27 documentation of compliance with the standards.

28 Part 5230.5645 REFRIGERATION CONTROL VALVES

29 This part describes control valves that contain, or that are directly and  
30 automatically actuated by, the ammonia refrigerant or its associated lubricating  
31 oil.

32 Subp. 1, Establishes that part 5230.5645 refers to control valves that contain  
33 or that are directly and automatically actuated by the ammonia refrigerant or its  
34 associated lubricating oil; lists products covered in this part.

35 Subp. 2, Describes the minimum standards that guide builders and designers of  
36 refrigeration control valves. The subpart is necessary to require minimum  
37 standards to guide the designers and builders of refrigerant pumps.

38 A. Provides a pressure to be contained safely for refrigeration control  
39 valves for water-cooled condensing systems.

40 B. Provides a pressure to be contained safely for refrigeration control  
41 valves for air-cooled condensing systems.

42 C. Provides requirements for pressure and temperature ranges that guide the  
43 design of refrigeration control valves.

44 D. Provides direction for temperature ranges below those listed by  
45 referencing ANSI/ASME B31.5 -1974, CODE FOR REFRIGERANT PIPING.  
46  
47  
48  
49  
50  
51

1 E. Provides that this part does not apply to any system with temperatures  
2 exceeding 450° F. Typical systems will not operate at temperatures exceeding  
3 450° F. At 450° F the temperature exceeds the capabilities of ammonia  
4 refrigeration materials. Specially designed materials will be required for  
5 systems requiring operations at higher temperatures.

6 F. Requires that connection style, design and fabrication for main and  
7 auxiliary connection permit leak-tight field installation, without reducing the  
8 pressure requirements of this part and parts 5230.5900 and 5230.5960.

9 G. Specifies the minimum data that manufacturers must provide on a  
10 nameplate to be placed on refrigeration control valves.

11  
12 The subpart is necessary and reasonable to require minimum standards to guide the  
13 designers and builders of refrigerant control valves. It also assure minimums  
14 manufacturing and safety standards for refrigerant control valves and to provide  
15 documentation of compliance with the standards.

16  
17 Subp. 3, Requires that completely assembled control valves undergo a  
18 manufacturer's bench test, simulating field performance for function.

19  
20 Subp. 4, Requires that completely assembled control valves undergo a  
21 manufacturer's bench test, simulating field performance for tight shut-off.

22  
23 Subp. 5, Requires that completely assembled control valves undergo an internal  
24 pressure test by the manufacturer. Establishes test protocol and requirements.

25  
26 Subparts 3 to 5 are necessary to assure minimum manufacturing and safety  
27 standards for control valves and provide documentation of compliance with the  
28 standards. Subparts 3 to 5 are reasonable because functional, leakage and  
29 pressure testing are required to finalize the installation with a label from an  
30 approved, nationally recognized testing laboratory. Each installation is  
31 uniquely designed for the application at the site, because pre-labeled pump  
32 systems are not available.

33  
34 Part 5230.5650 CONTROLS; ELECTRIC; PNEUMATIC

35 This part describes sensing devices that initiate control pulses or signals  
36 applied for use in ammonia closed-circuit refrigeration systems.

37  
38 Subp. 1, Establishes that part 5230.5650 applies to sensing devices that initiate  
39 control pulses or signals applied for use in ammonia closed-circuit refrigeration  
40 systems.

41  
42 Subp. 2, Specifies the minimum high-side design pressure for water-cooled  
43 condensing and air-cooled condensing. This subpart is necessary and reasonable  
44 to assure minimum manufacturing and safety standards for controls and to provide  
45 for documentation of compliance with the standards.

46 A. Specifies the minimum high-side design pressure for water-cooled  
47 condensing.

48 B. Specifies the minimum high-side design pressure for air-cooled  
49 condensing.

2 Subp. 3, Specifies the minimum data that manufacturers must provide on a  
3 nameplate to be placed on electrical and pneumatic controls. This subpart is  
4 necessary and reasonable to assure minimum manufacturing and safety standards for  
5 electrical and pneumatic controls, and provide documentation of compliance with  
6 the standards.

7 Part. 5230.5655 PRESSURE RELIEF DEVICES

8 This part describes pressure relief devices installed on ammonia closed-circuit  
9 refrigeration systems for the purpose of relieving excess pressure due to fire  
10 or other abnormal conditions.

11  
12 Subp. 1, Establishes that part 5230.5655 refers to pressure relief devices  
13 installed on ammonia closed-circuit refrigeration systems for the purpose of  
14 relieving excess pressure due to fire or other abnormal conditions; highlights  
15 that rupture members are not allowed.

16  
17 A rupture member allows an uncontrolled flow of ammonia from a system whenever  
18 pressure exceeds a predetermined limit. Prohibiting rupture members is needed  
19 to prevent this uncontrolled flow. Prohibiting rupture members is reasonable to  
20 assure the safety of people in the area. It is also reasonable that pressure  
21 relief devices accomplishing the same purpose without uncontrolled flow are  
22 allowed by these rules.

23  
24 Subp. 2, Requires that a pressure-relief device be provided for the ammonia  
25 system; describes a complying pressure relief device; provides direction on  
26 ammonia system pressure-relief protection requirement; refers to other parts of  
27 these rules for further information; requires reheating-type relief devices for  
28 this service; prohibits the use of rupture-member type relief devices.

29  
30 The subpart is necessary and reasonable because pressure-relief devices are  
31 required to prevent accidental release of ammonia into the work area or the  
32 atmosphere. A failure of a rupture relief safety device will result in loss of  
33 the entire charge of ammonia into the work area or into the atmosphere.  
34 Accordingly, these devices are not accepted. Pressure relief devices limit  
35 release of ammonia to the amount required to reduce the pressure into the system  
36 to a safe level.

37  
38 Subp. 3, Limits pressure relief to devices that are only pressure activated.  
39 Requires that all components that can be valved off have a valve to protect from  
40 over-pressurization. This subpart is necessary to protect against any part of  
41 the system developing pressure.

42  
43 This subpart, in conjunction with the remainder of this part and parts 5230.5660,  
44 5230.5665 and 5230.5945, form an integral package to protect from over-  
45 pressurization.

46  
47 It is necessary and reasonable to assure that all components are protected from  
48 over-pressurization; that proper standards for safety devices are used and met;  
49 and that appurtenances are included in the protection and conform to safety  
50 standards.

1 Subp. 4, Prohibits stop valves between the device being protected and the  
2 pressure relief device; provides exception for three-way- type stop valve  
3 connecting two parallel pressure relief devices. It is necessary and reasonable  
4 to assure that there are no pressure points created that are not protected.  
5

6 Subp. 5, Provides direction to the manufacturer, designer and installer of the  
7 ammonia system on the proper placement of the safety device. This subpart is  
8 necessary and reasonable for inspection convenience and pressure relief in proper  
9 parts of the system. Releasing gas rather than liquid into the atmosphere is  
10 less harmful. Gas provides more pressure than does liquid in the same amount of  
11 space.  
12

13 Subp. 6, Provides direction for hydrostatic relief. Refers to another part for  
14 specific requirements.  
15

#### 16 Part 5230.5660 SETTING OF PRESSURE RELIEF DEVICES 17

18 Subp. 1, Requires that pressure relief devices begin to function at a preset  
19 pressure. This subpart is needed to assure that properly designed and installed  
20 pressure relief devices act to safeguard the affected parts of the ammonia system  
21 from rupture and bursting caused by abnormal conditions. This subpart is  
22 reasonable because such bursting would lead to spillage of ammonia refrigerant.  
23

24 Subp. 2, Requires that a pressure relief valve for refrigerant-containing  
25 components be set and sealed by the manufacturer. This subpart ensures that  
26 markings on the device conform to "American Society of Mechanical Engineers,  
27 Boiler and Pressure Vessel Code, Division 1 standards.  
28

29 This subpart is necessary to ensure a relatively safe operating environment for  
30 the ammonia refrigerating system by providing information about the safety  
31 devices forming part of the ammonia system. The subpart requires the  
32 manufacturer to mark the device that supplies minimum data to the installer. The  
33 data gives direction to the installer for safe installation; the owner for safe  
34 use of the equipment; and service personnel for safe and expeditious repair of  
35 the equipment.  
36

37 This subpart is reasonable to require that the manufacturer, as a highly informed  
38 party, provides settings consistent with national standards, rather than  
39 installers and users using settings that might cause a safety hazard.  
40

#### 41 Part 5230.5665 PRESSURE VESSEL PROTECTION 42

43 Subp. 1, Provides for pressure vessel protection. The language is derived from  
44 the national standard for ammonia that is the most current and which represents  
45 the state of the art in the ammonia industry: AMERICAN NATIONAL STANDARD FOR  
46 EQUIPMENT DESIGN AND INSTALLATION OF AMMONIA MECHANICAL REFRIGERATION SYSTEMS  
47 ANSI/IIAR 2-1984. These standards require that the pressure vessel be provided  
48 with pressure relief protection, in accordance with applicable portions of ASME  
49 BOILER AND PRESSURE VESSEL CODE, VIII.  
50

2 Properly designed and installed pressure relief devices act to safeguard the  
3 affected parts of the ammonia system from rupture and bursting caused by abnormal  
4 conditions. Such bursting would lead to spillage of ammonia refrigerant.

5 Subp. 2, Provides direction for installation of relief devices on pressure  
6 vessels of less than ten cubic feet, and requires that such a relief devices be  
7 of a predetermined capacity to assure adequate relieving capacity.

8  
9 Subp. 3, Provides direction for installation of relief devices on pressure  
10 vessels of more than ten cubic feet, and requires that such a relief devices be  
11 of a predetermined capacity to assure adequate relieving capacity.

12  
13 Subparts 2 and 3 are necessary and reasonable to provide different standards for  
14 two different sizes of pressure vessels.

15  
16 Subp. 4, Provides direction for an alternate method of providing needed pressure-  
17 relief protection; prohibits use of rupture-member type relief device for this  
18 service. It is necessary and reasonable to allow a single relief valve to  
19 provide an alternative that otherwise would be restricted under subparts 3 and  
20 5.

21  
22 Subp. 5, Provides direction for the use of relief devices in parallel, in order  
23 to match the required capacity; provides that such an arrangement is considered  
24 to be one pressure relief device. It is necessary and reasonable to provide  
25 clarification in this part. For vessels in parallel and that require pressure  
26 relief, each parallel run will require two or more pressure relief devices.  
27 Pressure relief devices at parallel placements must be considered one pressure  
28 relief device. It is reasonable to provide protection for parallel structures,  
29 as protection on one parallel run would not necessarily provide protection for  
30 the other parallel run of the system.

31  
32 Subp. 6, Allows an evaporator to be shut off from other parts of the system.  
33 Because the evaporator can be separated from the system, it still requires  
34 pressure relief protection, but the requirement for a second parallel pressure  
35 relief value does not apply. Shutting off the evaporator from other parts of the  
36 system removes the evaporator from the system. The subpart is necessary and  
37 reasonable because the evaporator is isolated from the remainder of the system,  
38 and provides adequate pressure relief protection.

39  
40 Subp. 7, Provides a formula used to calculate the required discharge capacity for  
41 the relief device, in order to determine the relief device sizing. The subpart  
42 is necessary and reasonable to assure adequate discharge. Ammonia discharge  
43 requirements vary from other types of high pressure piping discharge  
44 requirements. Therefore, providing an appropriate formula restricts using other  
45 formulas.

46  
47 Subp. 8, Provides a basis for estimated rated discharge capacity and sets size  
48 requirements for pipe and fittings between the pressure relief valve and the  
49 parts of the system that are protected.  
50

2 Subp. 9, Requires that the discharge from the ammonia pressure relief device must  
3 terminate outside the building in a safe, approved location to avoid accidental  
4 release in an occupied area.

5 Subp. 10, Provides that under certain circumstances pressure relief devices may  
6 discharge into a properly protected low side; provides direction for compliance.  
7

8 Subp. 11, Sets standards for manifolding; provides an alternative method for the  
9 design of pressure relief discharge piping; requires minimum size.

10 Subparts 8 through 11 are necessary and reasonable to assure there is no public  
11 exposure to ammonia discharge.  
12

13 Subp. 12, Provides a formula for determining the maximum length of piping which  
14 may be attached to a pressure relief device outlet for discharge to a safe  
15 location. This subpart if necessary and reasonable to assure accuracy in making  
16 this determination.  
17

18 Subp. 13, Provides a chart using various discharge capacities for determining the  
19 maximum length of piping which may be attached to a pressure relief device outlet  
20 for discharge to a safe location. This subpart if necessary and reasonable to  
21 assure accuracy in making this determination.  
22

23  
24 Part 5230.5675 TESTING

25 This part provides for testing of all ammonia components used in the system.  
26 This part is needed because testing is required to assure the integrity of the  
27 system particularly for welded components. This part is reasonable because  
28 documentation may be required by the administrative authority to provide a record  
29 of the actual testing, since representatives of the administrative authority  
30 would not be at the manufacturer's worksite.  
31

32 Part 5230.5680 CONSTRUCTION MATERIAL SELECTION; PIPE, VALVES, FITTINGS,  
33 ACCESSORIES  
34

35 Subp. 1, Describes the specific type of equipment that this part regulates;  
36 provides direction regarding types of materials suitable for ammonia service;  
37 prohibits certain materials for ammonia service. This subpart is necessary and  
38 reasonable to delineate clearly the materials that are suitable for ammonia  
39 service and will not deteriorate under normal operating conditions.  
40

41 Subp. 2, 3, 4, 5, 6, Provides direction for usage of other materials acceptable  
42 for ammonia service. These subparts are necessary and reasonable to: identify  
43 which materials may not be used ammonia service; allow other materials that are  
44 acceptable for use; and prohibit use of materials that cannot be used safely for  
45 ammonia service.  
46

47 Properly designed and installed piping systems are necessary for the safe  
48 containment of the ammonia refrigerant and for use of ammonia refrigerant.  
49 Separate subparts appear for liquid lines and vapor lines, since there are  
50 differences in pressures between the two states of ammonia.  
51

52 Part 5230.5690 ULTIMATE STRENGTH REQUIREMENT

2 This part requires all pressure-containing components of the system to be listed  
3 by a nationally recognized testing laboratory or be designed, constructed and  
4 assembled to have an ultimate strength equal to three times the design pressure  
5 of the intended system.

6 This part is needed and reasonable to assure minimum manufacturing standards and  
7 to provide for documentation of compliance with the standards for pressure-  
8 containing components.

9  
10 Part 5230.5700 BUILDING STRUCTURE AND MACHINE ROOM DESIGN

11 The requirements of this part provide for safety in the design and construction  
12 of the machine room housing the ammonia equipment. Also included in this part  
13 are safety features for installation of the ammonia equipment within the room.  
14 Subparts 1 through 15 are necessary and reasonable to assure that the site is  
15 safe for the equipment and for the safety of those who may have to be in the  
16 machine room.

17  
18 Subp. 1, Requires the minimum clearances provided to allow repair and maintenance  
19 personnel sufficient space around the equipment to perform the tasks needed to  
20 keep the ammonia system in a safe and efficient condition.

21  
22 Subp. 2, Provides requirements for safe access to ammonia equipment located on  
23 the roofs of buildings; provides direction to persons designing such access;  
24 provides for roof access to allow repair and maintenance personnel to carry tools  
25 and parts to the equipment located on the roof.

26  
27 Subp. 3, Requires the roof access opening to be a minimum distance from the edge  
28 of the roof or similar hazards unless a rail or guard is provided. The  
29 requirement is necessary and reasonable to protect employees entering or exiting  
30 the area.

31  
32 Subp. 4, Requires ammonia equipment to have an accessible electrical disconnect;  
33 requires that the ammonia equipment have a 110-volt convenience outlet for  
34 workers' tools and equipment; provides for electrical disconnect to allow workers  
35 to safely shut-off the equipment before service and maintenance. The provision  
36 for electrical outlet is necessary and reasonable to allow the use of electrical  
37 tools without potentially dangerous field-expedient wiring.

38  
39 Subp. 5, Provides that ammonia equipment be installed so that vibrations from the  
40 equipment will not damage the building or equipment adjacent to the building.  
41 Furthermore, the subpart prevents the system from being damaged by unnecessary  
42 vibration.

43  
44 Subp. 6, Requires manual shut-off valves and sets standards for location,  
45 accessibility and identification. This part provides for shut-off valves to  
46 allow workers the ability to shut off the equipment safely before service and  
47 maintenance, isolating the ammonia-containing parts of the system.

48  
49 Subp. 7, Requires that piping not be located above electrical equipment, with a  
50 specific requirement to prevent water from dripping onto the electrical  
51 equipment.

1 Subp. 8, Provides direction for the strength of the building and structure to  
2 support ammonia equipment.

3  
4 Subp. 9, Provides direction for the strength of the foundations to support  
5 ammonia equipment.

6  
7 Subp. 10, Provides for the strength of the roof to support related ammonia  
8 equipment.

9  
10 Subp. 11 and 12, Requires that adequate drains be provided for safe and sanitary  
11 disposal of waste water. The requirement for sanitary disposal is consistent  
12 with plumbing regulations. It is necessary and reasonable that, in the event of  
13 a leak, the water that may contain ammonia is safely disposed to assure safe  
14 removal from the work area.

15  
16 Subp. 13, Provides requirements for the means of egress. In the event of a leak  
17 or a spill, safe and timely evacuation of the machinery room is a necessity. The  
18 doors also provide access to emergency responders, hazardous material response  
19 teams and/or repair personnel.

20  
21 Subp. 14, Requires that a means be provided for removal of ammonia equipment, so  
22 the integrity of the structure is not compromised during repair or replacement.  
23 It provides for removal of heavy equipment and reduces chances of personnel being  
24 injured during removal and replacement.

25  
26 Subp. 15, Requires a separate location for the ammonia machinery room. Because  
27 ammonia is a hazardous inhalant, it is reasonable to require a machinery room  
28 location separate from places where people might congregate.

29  
30 Part 5230.5705 OPEN FLAMES

31 This part prohibits open flames or the apparatus to produce such a flame. It  
32 provides exceptions for portable sources of ignition. These restrictions are  
33 necessary and reasonable to reduce ignition sources, which can come in contact  
34 with the flammable ammonia refrigerant.

35  
36 Part 5230.5710 VENTILATION FOR MACHINERY ROOMS

37  
38 Subp. 1, Establishes that part 5230.5710 refers to ventilation standards that  
39 govern protection of the environment; this part does not cover human occupancy  
40 standards.

41  
42 Subp. 2, Provides that the temperature rise shall be limited to a maximum value  
43 stated. This subpart is necessary and reasonable to control the maximum  
44 temperature value, which reduces equipment failure and lengthens the life of  
45 electrical controls and interlocks, enhancing the ability of safety and operating  
46 controls to operate properly.



2 Subp. 3, Provides direction for machinery room ventilation by offering  
3 alternative methods to meet ventilation requirements; provides for machinery room  
4 ventilation and requires an alarm; provides for manual controls of a specified  
5 type. This subpart is necessary and reasonable to assure: required ventilation;  
6 alarming in case of failure of mechanical ventilation; and alarming when vapor  
7 approaches the lower explosive limit.

8 Subp. 4, Requires that ducts which serve the machinery room serve no other area  
9 or purpose in the building and be dedicated to the ammonia system.

10 Subp. 5, Provides a requirement for a minimum quantity of natural ventilation and  
11 openings into the machinery room, based on the quantity of ammonia refrigerant  
12 in the system. Requirements are listed in tabular form in subpart 9.

13 Subparts 5 and 9 are necessary and reasonable to provide standards for proper  
14 ventilation.

15 Subp. 6, Provides direction for location of a ventilation air inlet and outlet.

16 Subp. 7, Provides direction for air discharge outside of the building. This  
17 subpart is necessary and reasonable to assure proper dispersion.

18 Subp. 8, Provides direction for use of water wash of exhaust from the ammonia  
19 machinery room. This subpart is necessary and reasonable for those limited  
20 circumstances when atmospheric dispersion is impractical or unsafe.

21 Subp. 9, Sets standards for the quantity of natural ventilation and openings into  
22 the machinery room based on the quantity of ammonia refrigerant in the system.  
23 Requirements are listed in tabular form.

#### 24 Part 5230.5820 ELECTRICAL STANDARDS FOR AMMONIA INSTALLATIONS

25 Subp. 1, Requires that the electrical system comply with the applicable safety  
26 standards and State Electrical Code (M.S. 326.241 to 326.248).

27 Subp. 2, Requires that a heavy-wall, galvanized conduit be used for electrical  
28 installation.

29 Subparts 1 and 2 are necessary and reasonable to set a consistent standard for  
30 electric wiring, because it is flammable.

31 Subp. 3, Sets a minimum safe level of lighting needed in the machinery room for  
32 service and maintenance; provides direction for location of an electrical  
33 disconnect switch for refrigeration equipment; requires that an electrical outlet  
34 be installed for safe use of equipment needed to service, repair and maintain the  
35 ammonia system.

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1 The requirement for adequate lighting is necessary and reasonable to provide  
2 workers with sufficient lighting to accomplish the service and maintenance of the  
3 ammonia system efficiently. Provides for electrical disconnect to allow workers  
4 ability to safely shut-off the equipment before service and maintenance. Provides  
5 for electrical outlet to use electrical tools without the use of potentially  
6 dangerous field-expedient wiring.  
7

#### 8 Part 5230.5825 INSULATION 9

10 Subp. 1, Requires that piping which can become cold enough to develop  
11 condensation dripping be insulated to prevent such condensation.  
12

13 Subp. 2, Requires that surfaces adjacent to piping, such as suction lines,  
14 accumulators and surge drums, be insulated to prevent condensation.  
15

16 Subparts 1 and 2 are necessary and reasonable because condensation not controlled  
17 by insulation has the potential to damage equipment and create hazard for  
18 personnel by creating slippery conditions on floors and walkways.  
19

20 Subp. 3, Requires that piping which can become hot be insulated. This subpart  
21 is necessary and reasonable to prevent burns and other injuries to personnel.  
22

#### 23 Part 5230.5915 PIPING JOINTS 24 25

26 Subp. 1, 2, 3, Provides direction regarding types of material suitable for  
27 ammonia service; provides the minimum standards for such material and piping  
28 joints, threaded pipe, welded pipe, flanges for ammonia service, ammonia gaskets  
29 and unions for ammonia service. Subparts 1 through 3 are necessary and  
30 reasonable to set very specific standards for piping joints to prevent failures.  
31 Properly designed and installed piping systems are necessary for the safe  
32 containment of the ammonia refrigerant.  
33

34 Subp. 4, Restricts the pressure allowed for pipe, fittings and components to a  
35 percentage of the component design working pressure. This subpart is necessary  
36 and reasonable to prevent components from operating at design pressure, because  
37 the system should routinely operate below that temperature to provide a safety  
38 margin.  
39

40 Subp. 5, Requires that the assembly of ammonia components must comply with these  
41 rules. This subpart is necessary and reasonable to clarify whether work is done  
42 as pre-fabrication in a shop or onsite as field erection. The completed work,  
43 in either case, must be done consistent with requirements of these rules.  
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## Part 5230.5925 WELDING

2  
3 Subp 1, Requires that welders be certified under job procedure; places  
4 responsibility of performance and testing on the employer. This subpart is  
5 necessary because improper welding is one of the most significant causes of  
6 accidents involving ammonia systems. Ammonia refrigeration systems are composed  
7 of pipe with many welded joints. Welding is a highly skilled, labor-intensive  
8 method of joining piping that requires detailed regulations and specifications  
9 necessary to control the workmanship and inherent safety of the ammonia  
10 refrigeration system.

11  
12 Subp. 2, Scope indicates that part 5230.5925 applies to the installation and  
13 repair of ammonia piping systems and component parts, such as pipe, hangers,  
14 braces and supports.

15  
16 Subparts 3 through 19 are needed to clarify requirements for welding  
17 certification, procedures and qualifications, and for destructive and  
18 nondestructive testing of test weldments. These subparts are reasonable because  
19 most high pressure piping consists of welded pipe and components. Proper  
20 documentation is required to assure quality of the welding.

21  
22 Subp. 3, Describes the minimum standards required by welders to weld ammonia  
23 systems and provides direction to designers and installers of ammonia equipment  
24 described, using the procedures as listed.

25  
26 Subp. 4, Provides direction for the applicability of the welding standards in the  
27 ammonia system.

28  
29 Subp. 5, Provides a uniform expiration date for welding certifications and  
30 direction for recertification.

31  
32 Subp. 6, Requires that welders on projects for ammonia piping systems must submit  
33 welding procedure specification and procedure qualification records, and a permit  
34 application for approval before the beginning of project.

35  
36 Subp. 7, Prohibits welding on ammonia piping systems without welding procedures  
37 specification and welding procedures qualification in place.

38  
39 Subp. 8, Requires that welding of an ammonia piping system's components meet the  
40 requirements of the welding procedures specification and procedure qualification  
41 record.

42  
43 Subp. 9, Requires that a certified welding procedure for each project be a  
44 welding procedure specification supported by the procedure qualification record.

45  
46 Subp. 10, Requires that the administrative authority objectively evaluate the  
47 welding procedure specification and procedure qualification.

48  
49 Subp. 11, Requires that welders of a certain project be certified according to  
50 the certified welding procedure for that project.

2 Subp. 12, Requires mandatory documents for the welding procedure specification,  
3 welding procedure qualification, and procedure qualification record to be  
4 available at the worksite.

5 Subp. 13, Requires that the welds for the ammonia system be identifiable, and  
6 provides direction and recommendations for meeting this requirement and direction  
7 in providing documentation of the individual welder qualification; provides a  
8 method to use to for such qualification; provides alternatives for a program that  
9 measures individual qualification for each project; and a method of non-  
10 destructive testing to assure quality control and quality assurance; and  
11 requirements for repair welding.

12 Subp. 14, Requires that a welder certified for a project be assigned an  
13 identification number unique to that welder; requires that welds be stamped or  
14 marked; requires the use of a welding log.

15 Subp. 15, Requires the contractor to establish and maintain the necessary  
16 documents contained in the above subparts: welding procedure specification;  
17 welding procedure qualification; procedure qualification record; identification  
18 number of the welder; and welding log.

19 Subp. 16, Requires a guide bend test to be used when certifying the welding  
20 procedure specification and welder qualification of a gas metal arc welding or  
21 a submerged arc welding.

22 Subp. 17, Allows the administrative authority to perform nondestructive testing,  
23 including radiography for inspections of the welding of ammonia piping systems,  
24 at the expense of the installing contractor.

25 Subp. 18, Provides that repair welds meet the requirements of this part.

26 Part 5230.5930 STOP VALVES

27 This part sets requirements for manual shut-off valves used to service ammonia  
28 equipment.

29 Subp. 1, Requires that stop valves for stopping flow of refrigerant for service  
30 be located at the inlet and outlet of each component of the system, including  
31 compressor, condenser, receiver, evaporator, vessels, pumps and other items.  
32 This subpart is necessary and reasonable for safe and proper operation of the  
33 system.

34 Subp. 2, Sets requirements for the design of manual valves; provides direction  
35 regarding types of materials suitable for ammonia service; prohibits certain  
36 materials for ammonia service. This subpart is necessary and reasonable to  
37 assure that valves used do not create unsafe conditions, as restrictions are  
38 placed on quick-closing valves that would create pressure spikes (pressure  
39 change).

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Subp. 3, Requires that a sufficient number of stop valves be installed. This subpart is necessary and reasonable to locate valves properly to allow equipment to be isolated for routine service and maintenance. Valves are also used by emergency responders, hazardous material response teams and/or repair personnel to isolate the system during leaks, spills and emergencies.

#### Part 5230.5935 MISCELLANEOUS MATERIALS

Subp. 1, Scope establishes that part 5230.5935 will address standards for miscellaneous materials.

Subp. 2, Sets standards for pressure gauge lines.

Subp. 3, Sets standards for factory-installed accessories.

Subparts 2 and 3 are necessary and reasonable, as compression-type fittings with a 2,000-pound-per-square-inch rating are accepted as this type of fitting and will withstand most operating conditions. Engineering equivalencies are accepted, with the certification of a registered professional engineer, to allow for other types of materials or newer technologies. The sign-off by the registered professional engineer is to assure that adequate documentation of the equivalency is developed.

#### Part 5230.5940 PIPING HANGERS AND SUPPORTS

Subp. 1, Specifies the function of piping hangers and supports. This subpart is necessary and reasonable because proper hangers and supports are essential to an ammonia refrigeration system to provide protection for the system from pressure spikes (pressure changes), which can damage the piping system and create the possibility of a leak or rupture.

Subp. 2, Provides in tabular form criteria for the supporting systems for ammonia piping and equipment. This subpart is necessary and reasonable to provide direction for supporting high pressure piping.

#### Part 5230.5945 PRESSURE RELIEF PROTECTION

Subp. 1, Requires pressure relief protection as a part of the ammonia refrigeration system. This subpart is necessary and reasonable, as properly designed and installed pressure-relief devices act to safeguard the affected parts of the ammonia system from rupture and bursting caused by abnormal conditions. Such bursting would lead to spillage of ammonia refrigerant.

Subparts 2 through 6 are necessary and reasonable, in conjunction with parts 5230.5655, 5230.5660 and 5230.5665, to protect from over-pressurization.

Subp. 2, Provides that part of the criteria for the provision of pressure-relief protection should include the requirements for pressure-relief devices and the requirements for equipment.

Subp. 3, Sets requirements to prevent recirculation of ammonia.

2 Subp. 4. Requires that a shut-off valve not be installed in the relief piping  
3 between the device and atmosphere.

4 Subp. 5, Requires that termination of the discharge piping be accomplished in a  
5 manner which does not endanger either personnel on the site or emergency  
6 responders coming to the site.

7  
8 Subp. 6, Provides a method of providing multiple relief devices discharging into  
9 a common manifold piping system to a safe location.

10  
11 Part 5230.5950 INSTALLATION REQUIREMENTS

12  
13 Subp. 1, Requires that foundations and supports for condensing units or pressure  
14 units be of substantial and noncombustible construction. This subpart is  
15 necessary and reasonable to assure protection of the system.

16  
17 Subp. 2, Provides, and is necessary and reasonable, for protection of personnel  
18 from moving machinery parts to reduce injury during maintenance and service of  
19 the equipment.

20  
21 Subp. 3, 4, Requires that condensing units or compressor units with enclosures  
22 be readily accessible for servicing and inspection.

23 These subparts are necessary and reasonable because the clearances provided allow  
24 repair and maintenance personnel sufficient space around the equipment to perform  
25 the tasks needed to keep the ammonia system in a safe and efficient condition.

26  
27 Subp. 5, Requires that water supply and discharge connections be made according  
28 to safety and health standards of the Minnesota Plumbing Code (M.S. 326.27 to  
29 326.45) and requirements of the Minnesota Pollution Control Agency (M.S. Chapter  
30 116). This subpart is necessary and reasonable to protect the water supply from  
31 contamination and allow the sanitary disposal of the discharge. It is necessary  
32 that in the event of a leak, any water that contains ammonia is safely disposed.

33  
34 Subp. 6, Sets requirements for water discharge lines; requires that these lines  
35 not connect directly to the waste or sewer system. This subpart is necessary and  
36 reasonable because the requirement for sanitary disposal is consistent with other  
37 public health regulations. It is important that in the event of a leak, any water  
38 that contains ammonia is safely disposed.

39  
40 Subp. 7, Requires that adequate lighting be provided for workers. This subpart  
41 is needed and reasonable to provide workers with sufficient lighting to  
42 accomplish service and maintenance of the ammonia system safely and efficiently.

43  
44 Subp. 8, Provides that the electrical portions of the ammonia system comply with  
45 the applicable portions of the State Electrical Code (M.S. 326.241 to 326.248).  
46 This subpart is necessary and reasonable to set a specific standard for  
47 electrical equipment and wiring.

48  
49 Subp. 9, Requires that air ducts are installed to comply with approved standards  
50 for installation. This subpart is necessary to guide the designer when duct work  
51 must pass through a class T machinery room. This subpart is reasonable to ensure  
52 integrity of a class T machinery room.

2 Subp. 10, Provides requirements that act as a criteria for the installation of  
3 piping that must pass through ductwork; requires that such piping and materials  
4 withstand a minimum temperature without leakage. This subpart is necessary and  
5 reasonable to assure there is no migration of refrigerant into occupied spaces.

6 Subp. 11, Requires that piping erected on a premise be visible for inspection  
7 before being covered or enclosed. This subpart is necessary and reasonable to  
8 assure proper safety inspection.

9  
10 Part 5230.5960 FOUNDATIONS AND EQUIPMENT

11  
12 Subp. 1, Requires that supports and foundations be adequate to prevent vibration  
13 and movement of equipment.

14  
15 Subp. 2, Requires that supports conform to the manufacturer's recommendations.

16  
17 Subparts 1 and 2 are necessary and reasonable to assure the system is protected  
18 from vibration and movement.

19  
20 Part 5230.6100 SYSTEM TESTING

21  
22 Subp. 1, Requires that a contracting pipefitter be responsible for system  
23 tightness and for system testing to assure tightness. The requirement is  
24 necessary to assure proper, safe operation of the installed system. This subpart  
25 is necessary and reasonable because properly designed and installed piping  
26 systems are necessary for the safe containment of the ammonia refrigerant and for  
27 the efficient utilization of the ammonia refrigerant. Detailed regulations and  
28 specifications are reasonable to control the quality of installation and  
29 ultimately, the inherent safety of the ammonia refrigeration system.

30  
31 Subp. 2, Requires that a testing program for ammonia refrigeration systems be  
32 designed, using requirements provided in subparts 3 to 5; requires that parts of  
33 the testing be done sequentially. This subpart is necessary and reasonable to  
34 assure system tightness and reliability, and to prevent loss of the refrigerant.

35  
36 Subp. 3, Requires that tests be performed to assure system tightness. This  
37 requirement is necessary and reasonable to prevent loss of the refrigerant and  
38 assure reliability.

39  
40 Subp. 4, Prohibits using combustible gases, carbon dioxide or halogen materials  
41 as a testing gas in the ammonia piping system. Requires that only dry nitrogen  
42 or air be used for system testing; provides a detailed list of precautions to be  
43 used during the testing procedure.

44  
45 Subp. 5, Requires a test of introducing ammonia into the system for pressure  
46 testing; provides measures to reduce hazards while the system is in operation;  
47 requires that all costs of tests be borne by the installing contractor. This is  
48 necessary and reasonable to clarify who is responsible for covering testing  
49 costs.

2 Subparts 4 and 5 are necessary and reasonable to assure the integrity of the  
3 system, and that there be no danger of explosion or introduction of hazardous  
4 materials into the atmosphere. The subparts also identify a method of changing  
5 the system and correcting leaks.

6 Subp. 6, Provides for witnessing of tests by high pressure piping inspectors.  
7 Witnessing of testing is needed when the administrative authority requires  
8 additional assurance regarding the integrity of the system. It is reasonable to  
9 assure the additional documentation of observation by a third party, independent  
10 inspector. It is also reasonable for the administrative authority to waive  
11 witnessing when no significant safety concern is involved in the testing.

12  
13 Part 5230.6110 SIGNS

14  
15 Subp. 1, Requires that an ammonia piping system have a sign attached to the  
16 piping; requires identification of the installer, test pressures sustained by the  
17 system, and the number pounds of ammonia in the system. Signs are necessary to  
18 provide emergency responders and hazardous material response teams with basic  
19 information in the event of an emergency or spill.

20  
21 Subp. 2, Requires that signs identifying ammonia piping and equipment display a  
22 list of specified components of the equipment; provides requirements for labeling  
23 high pressure and low pressure piping. Signs are necessary and reasonable to  
24 provide emergency responders and hazardous material response teams with basic  
25 information in the event of emergency or spill.

26  
27 Subp. 3, Requires color identification of controls and pieces of equipment. The  
28 requirement is necessary to allow emergency responders to identify easily the  
29 controls needed to shut-down a system and/or shut-off ammonia in the event of an  
30 emergency or spill. The requirement is reasonable to provide for shut-off valves  
31 to allow workers to shut off the equipment safely before service and maintenance,  
32 which isolates the parts of the system that contain ammonia.

33  
34 Part 5230.6115 REFRIGERANTS

35  
36 Subp. 1, Establishes warning requirements when charging and/or discharging  
37 refrigerants in the ammonia refrigerant system; prohibits leaving a service  
38 container connected to a system while charging or withdrawing a refrigerant;  
39 prohibits heating ammonia cylinders. The subpart is necessary and reasonable to  
40 provide direction to personnel during the transfer of ammonia refrigerant in and  
41 out of the system. Compliance with the cautionary requirements will reduce the  
42 leakage and/or spillage of ammonia during the transfer operation.

43  
44 Subp. 2, Requires that refrigerants withdrawn from refrigerating systems be  
45 transferred only to approved containers.

46  
47 Subp. 3, Requires that containers used for refrigerants withdrawn from a  
48 refrigerating system not be filled more than the rated capacity weight for the  
49 containers and the type of refrigerant used.

50  
51 Subparts 2 and 3 are necessary and reasonable to assure the refrigerant is not  
52 contaminated and there is no loss of refrigerant.



2 Subp. 4, Provides for a maximum amount of refrigerant to be stored in the  
3 machinery room. It is necessary to reduce the amount of ammonia, which  
4 potentially could be involved in an emergency or a spill. It is reasonable to  
5 reduce the exposure for emergency responders and hazardous material response  
6 teams and/or repair persons who would be called upon to deal with the emergency.

7 Part 5230.6120 MASKS OR HELMETS

8  
9 Subp. 1, Requires that two masks or helmets to be used by personnel, be located  
10 adjacent to each machinery room. The requirement is necessary to protect  
11 personnel when responding to ammonia system spills, leaks or emergencies during  
12 the transfer of ammonia. This subpart is reasonable to reduce the hazards  
13 involved in the maintenance, repair and service of the ammonia system, and  
14 reduces the hazards involved in transferring and charging the ammonia  
15 refrigerant. It also provides personnel with a minimum level of personal  
16 protective equipment necessary to deal with ammonia spills, leaks and or  
17 emergencies.

18  
19 Subp. 2, Requires that only complete helmets or masks suitable for ammonia be  
20 used. This subpart is necessary and reasonable to assure that proper equipment  
21 is used.

22  
23 Subp. 3, Requires that canisters or cartridges of helmets or masks be renewed or  
24 replaced immediately after being used or having the seals broken; provides a  
25 requirement for renewal of canisters that have expired dates. The regulations  
26 are necessary and reasonable to assure that helmets or masks remain protective  
27 at all times.

28  
29 Subp. 4, Sets standards for masks and helmets. The requirement is necessary and  
30 reasonable for eye and face protection.

31  
32 Part 5230.6125 MAINTENANCE AND OPERATION

33  
34 Subp. 1, Requires the user of an ammonia refrigerating system to keep it clean  
35 and accessible. This subpart is necessary and reasonable to reduce public  
36 exposure to the refrigerant and keep the system operating most efficiently.

37  
38 Subp. 2, Requires that an ammonia piping system containing more than 50 pounds  
39 have a sign placed near the ammonia compressor that gives directions for how to  
40 operate the system. The sign is necessary and reasonable to aid emergency  
41 responders and hazardous-material response teams who may have to shut down the  
42 system or shut off the ammonia.

43  
44 In addition to directions, the sign must include information on how to contact  
45 the nearest municipal or state authority with jurisdiction, in the event of an  
46 emergency or spill. This is necessary to provide a minimum level of aid to  
47 emergency responders, hazardous-material response teams or repair personnel to  
48 handle leaks, spills or emergencies. It is reasonable to provide the information  
49 needed to shut off ammonia or shut down the system.

50  
51 Part 5230.6130 DECLARATION OF TEST

1 This part requires an official declaration of testing to be completed for all  
2 ammonia piping systems. It must be signed by a licensed contractor. An  
3 inspector, if present, should also sign it. Testing and documentation is  
4 necessary to verify quality of installation.  
5

#### 6 Part 5230.6200 AMMONIA HANDLING AND STORAGE 7

8 Subp. 1, This part summarizes types of containers currently available for storage  
9 and shipment of ammonia; describes applicable regulations for such containers;  
10 requires openings for charging ammonia into the system in a safe and efficient  
11 manner. Properly designed and installed piping systems are necessary and  
12 reasonable for the safe containment of ammonia refrigerant.  
13

14 Subp. 2, Specifies requirements for pipes used as unloading lines from larger  
15 tanks and containers. This subpart is necessary and reasonable because such  
16 piping must conform to requirements for liquid lines.  
17

18 Subp. 3, Requires a maximum storage capacity for ammonia storage tanks; provides  
19 a minimum pressure to be used to guide designers and installers of an ammonia  
20 storage system; describes standards used to construct a storage vessel. It is  
21 necessary and reasonable to assure that storage tanks are large enough and built  
22 to proper standards to hold the refrigerant.  
23

24 Subp. 4, Requires that the ammonia storage capacity be filled to a specified  
25 percentage. The requirement is necessary to allow for expansion of ammonia.  
26 Prohibits the use of mercury-filled manometers for ammonia service. This subpart  
27 is necessary and reasonable to protect from mercury being released to the  
28 atmosphere in the case of an accident.  
29

30 Also, the subpart requires that gauge glasses have excess flow valves. The  
31 requirement is necessary and reasonable to protect personnel in the event of  
32 breakage.  
33

34 Subp. 5, Describes procedures to transfer ammonia safely; specifies material to  
35 be used for such transfer; requires continuous supervision during the transfer.  
36 This subpart is necessary and reasonable to assure that transferring of ammonia  
37 is done under safe conditions.  
38

39 Subp. 6, Requires that two masks or helmets, to be used by personnel, be located  
40 adjacent to the unloading or charging operation. The requirement is reasonable  
41 to protect personnel when responding to ammonia system spills, leaks or  
42 emergencies during the transfer of ammonia. This subpart is necessary to reduce  
43 the hazards involved in the maintenance, repair and service of the ammonia system  
44 and reduces the hazards involved in transferring and charging the ammonia  
45 refrigerant. It also provides personnel with a minimum level of personal  
46 protective equipment necessary to deal with ammonia spills, leaks and or  
47 emergencies.  
48

DEPARTMENT OF LABOR AND INDUSTRY

APPENDIX

Reference Document

for

Rules Relating to Ammonia Refrigeration Systems

The references below will be abbreviated as follows throughout this document:

ANSI = American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air Conditioning Engineers

ASHRAE = American Society of Heating, Refrigerating and Air Conditioning Engineers

IIAR = ANSI/International Institute of Ammonia Refrigeration (IIAR)

B 31.5 = Refrigeration Piping Manual

Section IX = American Society of Mechanical Engineers, Boiler and Pressure Vessel Code

5230.5020 DEFINITIONS.

Subp. 1-74 ANSI/ASHRAE, Chapter 15.  
Minnesota Rules Chapter 1305

5230.5025 AMMONIA GOVERNED AND DEFINED.

ANSI/IIAR; Chapter 2.

5230.5250 LOCATIONS GOVERNED AND DEFINED.

Subp. 2-8 ANSI/ASHRAE, Chapter 3.

5230.5300 REFRIGERATING SYSTEM CLASSIFICATION BY TYPE.

Subp. 1-5 ANSI/ASHRAE, Chapter 4.

5230.5350 RESTRICTIONS ON PLACEMENT OF AMMONIA PIPING, LIMITATIONS ON SYSTEM SIZING, AND PRESSURE RELIEF VENTING REQUIREMENTS.

Subp. 1-8. ANSI/ASHRAE, Chapter 6.

Subp. 9-16. ANSI/ASHRAE, Chapter 6.3; and ANSI/IIAR, Chapter 4.

5230.5400 REQUIREMENTS FOR INDUSTRIAL OCCUPANCIES.

Subp. 1-3. ANSI/ASHRAE, Sect. 7.

5230.5605 AIR COOLED CONDENSERS through 5230.5650 CONTROLS; ELECTRIC; PNEUMATIC.

Subp. 1-2. ANSI/IIAR, Chapter 2, Sect. 3.

5230.5655 PRESSURE RELIEF DEVICES; 5230.5660 SETTING OF PRESSURE RELIEF DEVICES; and 5230.5665 PRESSURE VESSEL PROTECTION.

through Subp. 12. ANSI/ASHRAE, Chapter 10.

5230.5665 PRESSURE VESSEL PROTECTION.

Subp. 13. ANSI/IIAR, Sect. 3.11.4.13.

5230.5675 TESTING.

ANSI/IIAR, Chapter 2, Sect. 5.6.

5230.5680 CONSTRUCTION MATERIAL SELECTION; PIPE, VALVES, FITTINGS, ACCESSORIES.

Subp. 1-6. ANSI/ASHRAE, Sect. 2, Chapter 5.

5230.5690 ULTIMATE STRENGTH REQUIREMENT.

ANSI/IIAR, Chapter 2, Sect. 3.

5230.5700 BUILDING STRUCTURE AND MACHINE ROOM DESIGN.

Subp. 1-15. ANSI/IIAR, Chapter 2, Sect. 4.

5230.5705 OPEN FLAMES.

ANSI/ASHRAE, Chapter 6.2.3.

5230.5710 VENTILATION FOR MACHINERY ROOMS.

Subp. 1-9. ANSI/ASHRAE, Chapter 7.4; and ANSI/IIAR, Chapter 2, Sect. 4.3.

5230.5915 PIPING JOINTS.

Subp. 1-5. ANSI/IIAR, Chapter 2, Sect. 5.2; and B31.5.

5230.5925 WELDING.

Subp. 1-19. B31.5 and Section IX Welding Qualifications.

5230.5930 STOP VALVES.

Subp. 1-3. ANSI/ASHRAE, Chapter 8.6.5; and B31.5.

5230.5940 PIPING HANGERS AND SUPPORTS; and 5230.5945 PRESSURE RELIEF PROTECTION.

ANSI/IIAR, Chapter 2, Sect. 5.3.

5230.5950 INSTALLATION REQUIREMENTS; 5230.5960 FOUNDATIONS AND EQUIPMENT; and 5230.6100 SYSTEM TESTING.

Subp. 1-11. ANSI/IIAR, Chapter 2, Sect. 5.5.

5230.6110 SIGNS; 5230.6115 REFRIGERANTS; and 5230.6120 MASKS OR HELMETS.

through Subp. 3. ANSI/ASHRAE, Chapter 13.

5230.6120 MASKS OR HELMETS.

Subp. 4. ANSI/ASHRAE, Chapter 14.

5230.6125 MAINTENANCE AND OPERATION.

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