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# Chapter 296-826 WAC

## Safety Standards for Anhydrous Ammonia

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This book contains rules for Safety Standards for anhydrous ammonia, as adopted under the Washington Industrial Safety and Health Act of 1973 (Chapter 49.17 RCW).

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# Chapter 296-826 WAC Anhydrous Ammonia

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WAC	Page
<b>WAC 296-826-099 Definitions.....</b>	<b>1</b>
<b>WAC 296-826-100 Scope. ....</b>	<b>3</b>
<b>WAC 296-826-200 Employee safety.....</b>	<b>5</b>
WAC 296-826-20005 Personal protective equipment (PPE).....	5
WAC 296-826-20010 Training.....	6
WAC 296-826-20015 Chemical reactions. ....	6
WAC 296-826-20020 Emergencies.....	7
<b>WAC 296-826-300 Design, construction, and installation. ....</b>	<b>8</b>
WAC 296-826-30005 General specifications. ....	8
WAC 296-826-30010 Specifications for portable DOT containers. ....	9
WAC 296-826-30015 Nonrefrigerated stationary containers.....	10
WAC 296-826-30020 Refrigerated storage. ....	10
WAC 296-826-30025 Systems mounted on trucks, semi-trailers, and trailers. ....	11
WAC 296-826-30030 Systems mounted on farm trucks or trailers for transporting ammonia. ....	11
WAC 296-826-30035 Systems mounted on farm equipment for ammonia application.	12
296-826-30040 DOT containers.....	12
WAC 296-826-30045 Installation. ....	12

WAC 296-826-30050	Reinstallation. ....	14
WAC 296-826-30055	Installation. ....	15
WAC 296-826-30060	Reinstallation. ....	16

**WAC 296-826-400 Equipment and systems..... 17**

WAC 296-826-40005	Electrical. ....	17
WAC 296-826-40010	Hose specifications.....	17
WAC 296-826-40015	General requirements for all systems. ....	19
WAC 296-826-40020	Non-refrigerated systems. ....	20
WAC 296-826-40025	Systems mounted on trucks, semi-trailers, and trailers. ....	20
WAC 296-826-40030	Refrigerated storage compressors.....	21
WAC 296-826-40035	Refrigeration load. ....	22
WAC 296-826-40040	Separators for refrigerated storage.....	22
WAC 296-826-40045	Automatic control equipment for refrigerated storage. ....	22
WAC 296-826-40050	Other refrigerated storage equipment.....	23
WAC 296-826-40055	Compressors for refrigerated systems.....	23

**WAC 296-826-500 Appurtenances..... 25**

WAC 296-826-50005	Appurtenance requirements for all systems.....	25
WAC 296-826-50010	Non-refrigerated stationary containers.....	31
WAC 296-826-50015	Refrigerated tanks. ....	34
WAC 296-826-50020	Systems mounted on trucks, semi-trailers and trailers. ....	37
WAC 296-826-50025	Systems mounted on farm trucks or trailers for transportation of ammonia. ....	40
WAC 296-826-50030	Systems mounted on farm equipment for ammonia application.	43
WAC 296-826-50035	Portable DOT containers. ....	46

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<b>WAC 296-826-600 Operations.....</b>	<b>47</b>
Summary .....	47
Mounting and Loading Containers .....	47
WAC 296-826-60005 Mounting containers on trucks, semi-trailers and trailers.....	47
WAC 296-826-60010 Mounting containers on farm trucks or trailers for transporting ammonia. ....	49
WAC 296-826-60015 Tank car loading or unloading.....	49
WAC 296-826-60020 General specifications. ....	51
WAC 296-826-60025 Additional requirements for systems mounted on trucks, semi-trailers, and trailers for transporting ammonia.....	52
WAC 296-826-60030 Non-refrigerated containers.....	53
WAC 296-826-60035 Refrigerated tanks. ....	54
WAC 296-826-60040 Welding.....	54

## **WAC 296-826-099 Definitions.**

**Appurtenance.** All devices that are added onto the system such as pumps, compressors, safety relief devices, liquid-level gauging devices, valves, and pressure gauges.

**Capacity.** The total volume of the container measured in U.S. gallons, unless otherwise specified.

**Container.** All vessels, tanks, cylinders or spheres used for transportation, storage or application of anhydrous ammonia.

**Cylinder.** A container constructed according to the United States Department of Transportation Specifications with a water capacity of 1000 pounds or less.

**Design pressure.** The same as the “maximum allowable working pressure” as used in the Unfired Pressure Vessel Code.

**DOT regulations.** The Department of Transportation (DOT) Hazardous Materials Regulations and Specifications for Shipping Containers found in Title 49 -- Transportation, Code of Federal Regulations, Parts 171 to 190, inclusive.

**Filling density.** The ratio of the weight of the gas in a container to the weight of water at 60°F that the container will hold. One lb. H<sub>2</sub>O = 27.737 cu. in. at 60°F.

For determining the weight capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60°F in air is 8.32828 pounds.

**Gas.** Anhydrous ammonia in either the gaseous or liquefied state.

**Hydrostatic relief valve.** An automatic pressure activated valve for liquid service.

- (a) It is characterized by a throttle or slow-weep opening, a non-pop-action.
- (b) Refer to American National Standards Institute, *Terminology for Pressure Relief Devices*, B95.1, for more information.

**“psig” and “psia”.** Abbreviations that mean the following:

- (a) “psig” refers to pounds per square inch gauge.
- (b) “psia” refers to absolute pounds per square inch.

**Safety relief valve.** An automatic spring-loaded or equivalent-type pressure-activated device for gas or vapor service.

- (a) It is characterized by a pop-action upon opening, and is sometimes referred to as a pop valve.
- (b) Refer to American National Standards Institute, *Terminology for Pressure Relief Devices*, B95.1 for more information.

**Semi-trailer.** Every vehicle that meets both of the following:

- (a) Designed for carrying property and for being drawn by a motor vehicle;
- (b) Constructed so that some part of its weight and the weight of its load rests upon or is carried by another vehicle.

**Systems.** An assembly of equipment consisting of the container or containers, appurtenances, pumps, compressors, and interconnecting piping.

**Tank motor vehicle.** Any motor vehicle designed or used for the transportation of anhydrous ammonia that has either:

- (a) A tank designed to be permanently attached to any motor vehicle; or
- (b) A container that is not permanently attached but needs to be loaded and unloaded without being removed from the motor vehicle due to its size, construction, or means of attachment.

**Trailer.** Every vehicle meeting all of the following:

- (a) Designed for carrying property and for being drawn by a motor vehicle;
- (b) Constructed so that no part of its weight except the towing device rests on the towing vehicle.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-099, filed 11/17/15, effective 12/17/15.  
Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-900, filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-100 Scope.**

This chapter applies to employers who use, handle, store, distribute, or transport anhydrous ammonia.

- (1) Operations covered by this chapter include, but are not limited to:
  - (a) All distributors of anhydrous ammonia, including distributors who store and transport anhydrous ammonia on trucks delivering to a farm.
  - (b) Any employer who stores and handles anhydrous ammonia to use in water treatment plants, acid production, metal processing, pollution control, or make products such as:
    - (i) Fertilizers;
    - (ii) Synthetic resins;
    - (iii) Plastics and intermediates;
    - (iv) Hexamine for explosives;
    - (v) Dyes;
    - (vi) Insecticides.
- (2) Operations not covered by this chapter include:
  - (a) The manufacture of anhydrous ammonia.
  - (b) Mechanical refrigeration systems where ammonia is used solely as a refrigerant.
  - (c) Pipelines transporting anhydrous ammonia into or out of a storage facility.
  - (d) Agricultural operations within the scope of Chapter [296-307](#) WAC. When a distributor delivers anhydrous ammonia to a farmer, the requirements for agricultural operations apply:
    - (i) As soon as the farmer takes possession of the truck or equipment containing ammonia from the distributor; this includes the farmer picking up the farm truck or equipment from the distributor.
    - (ii) An ammonia distributor begins performing agricultural operations using their ammonia at the farm.

*References:*

1. *For requirements on agricultural operations using anhydrous ammonia, go to Part U-1 of Chapter [296-307](#) WAC.*
2. *If you use, handle, store, distribute, or transport anhydrous ammonia in quantities of 10,000 pounds or more, follow the requirements found in another chapter, Process Safety Management of Highly Hazardous Chemicals, Chapter [296-67](#) WAC.*
3. *To protect employees handling ammonia, in addition to this chapter, you will need the following requirements found in other chapters:*
  - a. *The following sections from the Safety and Health Core Rules, Chapter [296-800](#) WAC:*
    - i. *Accident prevention program, WAC [296-800-140](#);*
    - ii. *Emergency washing, WAC [296-800-150](#);*
    - iii. *Personal protective equipment, WAC [296-800-160](#).*
  - b. *Emergency response, Chapter [296-824](#) WAC;*
  - c. *Airborne contaminants, Chapter [296-841](#) WAC;*
  - d. *Respirators, Chapter [296-842](#) WAC.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-100, filed 11/17/15, effective 12/17/15.  
Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-100, filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-200 Employee safety.**

**Your responsibility:** To protect employees who use, handle, store, distribute, or transport anhydrous ammonia.

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
Personal protective equipment (PPE)	<a href="#">WAC 296-826-20005</a>
Training	<a href="#">WAC 296-826-20010</a>
Chemical reactions	<a href="#">WAC 296-826-20015</a>
Emergencies	<a href="#">WAC 296-826-20020</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-200, filed 11/17/15, effective 12/17/15.  
Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-200, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-20005 Personal protective equipment (PPE).**

- (1) You must provide the following PPE, at no cost to employees, at all stationary storage installations:
  - (a) Two respirators in readily accessible locations as required by Chapter [296-842](#) WAC, Respirators. <http://www.lni.wa.gov/safety/rules/chapter/842/>.
  - (b) One pair of protective gloves, boots, pants, a protective slicker, and a jacket made of:
    - (i) Rubber; or
    - (ii) Other material that cannot be penetrated by ammonia.
  - (c) Tight-fitting vented goggles and one full-face shield.
  - (d) An easily accessible shower or 50 gallons of clean water in an open-top container.
- (2) You must equip tank motor vehicles with all of the following equipment for emergency purposes:
  - (a) At least 5 gallons of water to flush liquid ammonia from skin or eyes.
  - (b) Respiratory equipment suitable for anhydrous ammonia as required by Chapter [296-842](#) WAC, Respirators.
  - (c) A pair of protective gloves made of neoprene rubber or other material that cannot be penetrated by ammonia.
  - (d) Tight-fitting goggles and a full-face shield.

*Note: Additional safety equipment is recommended when more than one employee is present.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-20005, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 09-05-071, § 296-826-20005, filed 2/17/09, effective 4/1/09; 06-10-067, § 296-826-20005, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-20010 Training.**

You must train employees who handle ammonia on all of the following:

- (1) Safe operating practices;
- (2) Emergency procedures;
- (3) Proper use of personal protective equipment (PPE).

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-20010 filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-20010, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-20015 Chemical reactions.**

You must prohibit the use of ammonia with other chemicals unless the possible reactions have been adequately investigated.

*Note: Under some circumstances, ammonia and ammonium compounds can form explosive products with other chemicals. For additional information, refer to the following:*

1. Section 491M “Manual on Hazardous Chemical Reactions” of the NFPA, 1969 Edition; and
2. CG-388, the “Chemical Data Guide for Bulk Shipment by Water,” 1969.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30015, filed 5/2/06, effective 9/1/06.]

## WAC 296-826-20020 Emergencies.

- (1) You must make sure only trained personnel designated to respond if a leak occurs in an ammonia system do all of the following:
  - (a) Evacuate affected personnel to non-contaminated areas.
  - (b) Shut off appropriate valves.
  - (c) Put on all of the following PPE in concentrated ammonia atmospheres and in unknown concentrations of ammonia:
    - (i) Self-contained breathing apparatus (SCBA);
    - (ii) A plastic or rubber suit;
    - (iii) Gauntlet-type plastic or rubber gloves.
- (2) You must make sure a physician treats all employees with eye injuries caused by liquid ammonia. In addition:
  - (a) Immediately flush liquid ammonia from skin or eyes continuously for a minimum of 15 minutes using water or eye wash solutions as required by the Safety and Health Core Rules: First aid, WAC [296-800-150](#).
  - (b) Do not use neutralizing solutions or ointments on affected areas.

*Note: Drivers unable to stop a leak during transport should:*

1. *Move the vehicle to an isolated area.*
2. *Use the current Department of Transportation (DOT) Emergency Response Guidebook to establish safe distances to isolate a leaking tank from the driver and the public.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30015 filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-300 Design, construction, and installation.**

**Your responsibility:** To make sure containers and tanks used for storing, distributing, or transporting anhydrous ammonia meet design, construction, and installation requirements.

<b>Requirements for this topic...</b>	<b>Begin in this section:</b>
Container Location and Marking	<a href="#">WAC 296-826-30005</a>
Non-refrigerated Containers	<a href="#">WAC 296-826-30040</a>
Refrigerated Tanks	<a href="#">WAC 296-826-30055</a>

### **Container Location and Marking**

<b>You must meet the requirements...</b>	<b>in this section</b>
General specifications	<a href="#">WAC 296-826-30005</a>
Specifications for portable DOT containers	<a href="#">WAC 296-826-30010</a>
Non-refrigerated stationary containers	<a href="#">WAC 296-826-30015</a>
Refrigerated storage	<a href="#">WAC 296-826-30020</a>
Systems mounted on trucks, semi-trailers, and trailers	<a href="#">WAC 296-826-30025</a>
Systems mounted on farm trucks or trailers for transporting ammonia	<a href="#">WAC 296-826-30030</a>
Systems mounted on farm equipment for ammonia application	<a href="#">WAC 296-826-30035</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-300, filed 11/17/15, effective 12/17/15.  
 Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-300, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-30005 General specifications.**

- (1) You must locate containers either:
  - (a) In buildings or parts of the building provided for ammonia storage; or
  - (b) Outside, away from densely populated areas.
- (2) You must locate containers according to Table 1, Minimum Distances for Container Location.

<b>Table 1 Minimum Distances for Container Location</b>			
Nominal Capacity of Container	Minimum Distances (feet) from Container to:		
	Line of Adjoining Property Which May Be Built Upon, Highways & Mainline of Railroad	Place of Public Assembly	Institution Occupancy
Over 500 To 2,000	25	150	250
Over 2,000 To 30,000	50	300	500
Over 30,000 To 100,000	50	450	750
Over 100,000	50	600	1,000

- (3) You must make sure containers are located to meet all of the following:
- (a) Away from readily ignitable materials such as weeds, long dry grass, and waste.
  - (b) So there is no adverse impact on employee health through unnecessary exposure.
  - (c) At least 50 feet away from dug wells and other sources of potable water.

<b><i>Exception:</i></b>
<i>If the container is a part of a water treatment installation, this requirement does not apply.</i>

- (4) You must maintain legibility of all container and valve markings.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30005, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30005, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-30010 Specifications for portable DOT containers.**

<b><i>Important:</i></b>
<i>This section applies to systems that use cylinders, portable tanks (DOT-51), or “ton containers” (DOT-106A, DOT-110A), constructed according to DOT specifications.</i>

- (1) You must locate containers aboveground, never buried below the ground.
- (2) You must put containers on firm ground or secure them.
- (3) You must guard against settling on the outlet piping by using a flexible connection or a special fitting.
- (4) You must protect containers from all of the following:
  - (a) Ignitable debris;
  - (b) External damage including corrosion;
  - (c) Heat sources, like radiant flames and steam pipes;
  - (d) Moving vehicles.
- (5) You must prohibit the use of heat to raise the container pressure.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30010, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30010, filed 5/2/06, effective 9/1/06.]

#### **WAC 296-826-30015 Nonrefrigerated stationary containers.**

- (1) You must construct and test containers according to the Unfired Pressure Vessel Code.
- (2) You must make sure the minimum design pressure of the container is 250 psig.
- (3) You must make sure all containers with a capacity exceeding 250 gallons are constructed to meet one or more of the following:
  - (a) Stress relieved after fabrication according to the Unfired Pressure Vessel Code;
  - (b) Have stress relieved cold-formed heads;
  - (c) Hot-formed heads.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30015, filed 5/2/06, effective 9/1/06.]

#### **WAC 296-826-30020 Refrigerated storage.**

- (1) You must make sure the minimum design temperature is the same as the refrigerated temperature of the tank.
- (2) You must construct and test containers, with a design pressure exceeding 15 psig, according to the Unfired Pressure Vessel Code.
- (3) You must select construction materials from those listed from *API Standard 620, 4th Edition 2002, Recommended Rules for Design and Construction of Large, Welded Low Pressure Storage Tanks*.

- (4) You must construct tanks with a design pressure with 15 psig or less according to API Standard 620, 4th Edition, 2002.
- (5) You must use ASME Code as a guide in the selection of austenitic steels or nonferrous materials, if used at the design temperature.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30020, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30020, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-30025 Systems mounted on trucks, semi-trailers, and trailers.**

- (1) You must construct and test containers, when transported within the state of Washington, according to both of the following:
  - (a) A minimum design pressure of 250 psig;
  - (b) The Unfired Pressure Vessel Code.
- (2) You must construct containers used for interstate transport according to DOT regulations.
- (3) You must make sure the shell or head thickness of any container is at least 3/16 of an inch.
- (4) You must make sure electrical lighting circuits meet all of the following:
  - (a) Have suitable over-current protection, such as fuses or automatic circuit breakers.
  - (b) Are suitably secured, insulated, and protected against physical damage.
  - (c) Have wiring with sufficient carrying capacity and mechanical strength.
- (5) You must use only electric light.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30025, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30025, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-30030 Systems mounted on farm trucks or trailers for transporting ammonia.**

You must construct and test containers, with a design pressure exceeding 15 psig, according to the Unfired Pressure Vessel Code.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30030 filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30030, filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-30035 Systems mounted on farm equipment for ammonia application.**

You must construct and test containers according to the Unfired Pressure Vessel Code.

### **Non-refrigerated Containers.**

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
DOT containers	<a href="#">WAC 296-826-30040</a>
Installation	<a href="#">WAC 296-826-30045</a>
Reinstallation	<a href="#">WAC 296-826-30050</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30035, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30035, filed 5/2/06, effective 9/1/06.]

### **296-826-30040 DOT containers.**

You must make sure containers meet DOT specifications.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16) § 296-826-30040 filed 11/17/15 effective 12/17/15  
Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30040, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-30045 Installation.**

- (1) You must provide a minimum distance of 5 feet between aboveground and underground containers that have more than a 1200 gallon capacity each.
- (2) You must protect containers from floating away, in areas with a potential for high flood waters, by providing either:
  - (a) Secure anchorage; or
  - (b) Adequate pier height.
- (3) You must follow Table 2 for aboveground, non-refrigerated containers.

<b>Table 2 Aboveground Non-refrigerated Container Requirements</b>	
<b>If you have:</b>	<b>Then:</b>
Aboveground containers	Provide one of the following: <ol style="list-style-type: none"> <li>1. Substantial reinforced concrete footings and foundations; or</li> <li>2. Structural steel supports mounted on reinforced concrete foundations.</li> </ol>
	Make sure the reinforced concrete foundation meets all of the following: <ol style="list-style-type: none"> <li>1. Extends below the established frost line.</li> <li>2. Is of sufficient width and thickness to support the total weight of the containers and contents.</li> <li>3. Has the lowest point of the tank at least 18 inches above the ground.</li> </ol>
	Make sure the footings meet all of the following: <ol style="list-style-type: none"> <li>1. Extend below the established frost line.</li> <li>2. Are of sufficient width and thickness to support the total weight of the containers and contents.</li> </ol>
Floating type foundations on containers installed aboveground	Make sure they are designed to adequately support the tank, contents, and pumping equipment.
A horizontal, aboveground container	Mount the container on a foundation that permits expansion and contraction. Prevent the weight of excessive loads from resting on the supporting portion of the shell. Provide saddle bearing that extends over at least 1/3 the circumference of the shell. Prevent corrosion on the portions of the container in contact with the foundations or saddles.

- (4) You must follow Table 3 for underground, non-refrigerated containers.

<b>Table 3 Underground Non-refrigerated Container Requirements</b>	
<b>If you have:</b>	<b>Then:</b>
Underground containers	<ol style="list-style-type: none"> <li>1. Set the containers on firm foundations or earth.</li> <li>2. Surround containers with soft earth or sand well tamped into place.</li> <li>3. Make sure the top of the container is at least 1 foot below the surface of the ground.</li> <li>4. If ground conditions make this impractical, use precautions to prevent physical damage to the container.</li> </ol> <p><b>Exemption:</b> <i>It is not necessary to cover the portion of the container where a manhole and other connections are attached.</i></p> <ol style="list-style-type: none"> <li>5. Securely anchor or weight containers when necessary to prevent floating.</li> <li>6. Have a protective corrosion-resistant coating, applied before it is placed underground, that is both of the following:                         <ol style="list-style-type: none"> <li>a. Satisfactory to the authority having jurisdiction; and</li> <li>b. Equal to either hot dip galvanizing or 2 preliminary coatings of red lead followed by a heavy coating of coal tar or asphalt.</li> </ol> </li> <li>7. Lower containers onto firm foundations without damaging the protective corrosion-resistant coating.</li> </ol>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16) § 296-826-30045 filed 11/17/15 effective 12/17/15  
 Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30045, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-30050 Reinstallation.**

- (1) You must prohibit the reinstallation of non-refrigerated, previously installed underground, containers unless they meet both of the following:
- (a) Pass a hydrostatic pressure retest using the original pressure specified by the Unfired Pressure Vessel Code under which the tank was constructed; and
  - (b) Show no evidence of serious corrosion.
- (2) You must maintain a corrosion-resistant coating on reinstalled underground containers.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30050,, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30050, filed 5/2/06, effective 9/1/06.]

## Refrigerated Tanks.

### WAC 296-826-30055 Installation.

<i>You must meet the requirements...</i>	<i>in this section</i>
Installation	<a href="#">WAC 296-826-30055</a>
Reinstallation	<a href="#">WAC 296-826-30060</a>

- (1) You must support tanks on noncombustible foundations designed for the type of tank.
- (2) You must provide protection against flotation or other water damage, where high floodwater might occur.
- (3) You must prevent the effects of freezing and consequent frost heaving, in tanks used for product storage at less than 32°F, by providing either support or heat supply.
- (4) You must prevent accidental discharge of liquids from spreading into uncontrolled areas by providing, to the area surrounding a refrigerated tank or group of tanks, one of the following:
  - (a) A drainage system provided with at least a 1% slope that terminates in an impounding basin with a capacity as large as the largest tank served; or
  - (b) A diked enclosure with a capacity as large as the largest tank served.
- (5) You must meet, when using a diked enclosure or an impounding basin in a drainage system, the following requirements:
  - (a) Make the wall of earth, steel, or concrete. If made of earth, meet both of the following:
    - (i) The top is flat and at least 2 feet wide; and
    - (ii) There is a stable slope consistent with the angle of the earth used.
  - (b) Design the wall to be both:
    - (i) Liquid tight; and
    - (ii) Able to withstand the hydrostatic pressure and the temperature.
- (6) You must provide for drainage of rain water, that does not permit the release of ammonia, from diked or impounding areas.

*Note:*

1. *It is recommended that the ground in an impounding basin or within a diked enclosure be graded so that small spills or the early part of a large spill will accumulate at one side or corner contacting both:
  - a. *A relatively small area of ground; and*
  - b. *Exposing a relatively small surface area for heat gain.**
2. *Shallow channels in the ground surface or low curbs of earth can help guide the liquid to these low areas without contacting a large ground area.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30055, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30055, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-30060 Reinstallation.**

You must make sure moved and reinstalled containers of a size to require field fabrication are reconstructed and re-inspected to meet the original Unfired Pressure Vessel Code under which the tank was manufactured, and do the following according to the same code:

- (1) A pressure retest;
- (2) Any necessary rerating.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-30060, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-30060, filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-400 Equipment and systems.**

**Your responsibility:** To make sure all equipment and systems are operated and maintained safely.

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
Electrical	<a href="#">WAC 296-826-40005</a>
Hose specifications	<a href="#">WAC 296-826-40010</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16) § 296-826-400 filed 11/17/15 effective 12/17/15  
Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-400, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-40005 Electrical.**

- (1) You must use electrical equipment and wiring on ammonia installations that is either of the following:
  - (a) General purpose; or
  - (b) Weather resistant.
- (2) You must follow the electrical requirements found in another chapter, Chapter [296-24](#) WAC, Part L for Class 1, Group D locations when the concentrations of ammonia in air are in excess of 16% by volume.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40005, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40005, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-40010 Hose specifications.**

- (1) You must make sure hose used in ammonia service and subject to container pressure meets both of the following:
  - (a) The Joint Rubber Manufacturers Association, RMA-IP-14, *Specifications for Anhydrous Ammonia Hose* 7th Edition 2003; and
  - (b) The Fertilizer Institute's *Hose Specifications for Anhydrous Ammonia*.
- (2) You must make sure hose assemblies are able to withstand a 500-psig pressure test.
- (3) You must follow Table 4 for hose specifications.

<b>Table 4 Hose Specifications</b>	
<b>If you have:</b>	<b>Then:</b>
Hose subject to container pressure	Design it with a minimum working pressure of 350 psig; and  Burst pressure of 1750 psig.
Hose and their connections	Design them for the maximum low side working pressure when located on either:  1. The pressure reducing valves on devices discharging to atmospheric pressure; or 2. The low pressure side of flow control.  Design, construct, and install so there is no leakage when connected.
Liquid transfer hose that is not drained of liquid upon completion of transfer operations	Equip with an approved shut off valve at the discharge end.  Prevent excessive hydrostatic pressure in the hose.
Hose with an outside diameter one-half inch and larger	Make sure the hose is marked and legible at 5-foot intervals.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40010, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40010, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-40015 General requirements for all systems.**

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
General requirements for all systems	<a href="#">WAC 296-826-40015</a>
Non-refrigerated systems	<a href="#">WAC 296-826-40020</a>
Systems mounted on trucks, semi-trailers, and trailers	<a href="#">WAC 296-826-40025</a>

- (1) You must prohibit the use of cast iron fittings. The use of malleable or nodular iron such as Specification ASTM A47 or ASTM A395 is permitted.
- (2) You must make sure all metal flexible connections for permanent installations have a minimum working pressure of 250 psig.
- (3) You must make sure all pipes, tubes, and fittings used for ammonia service meet all of the following:
  - (a) Made of material with a design pressure at least equal to the maximum service pressure.
  - (b) Well supported and have provisions for all of the following:
    - (i) Expansion;
    - (ii) Contraction;
    - (iii) Vibration;
    - (iv) Jarring;
    - (v) Settling.
- (4) You must protect all exposed pipes from damage resulting from undue strain including:
  - (a) Moving machinery;
  - (b) The presence of vehicles.
- (5) You must use ammonia-resistant joint compounds.
- (6) You must make sure, after assembly, that all piping and tubing is leak free at a pressure not less than the normal operating pressure of the system.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40015, filed 5/2/06, effective 9/1/06.]

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**WAC 296-826-40020 Non-refrigerated systems.**

- (1) You must make sure piping on non-refrigerated systems is:
  - (a) ASTM A-53-2004 Electrical Resistance Welded and Electric Flash Welded Pipe or equal.
  - (b) At least schedule 80 when joints are threaded.
  - (c) At least schedule 40 when joints are either welded or welded and flanged.
- (2) You must prohibit the use of piping or tubing made of any of the following:
  - (a) Brass;
  - (b) Copper;
  - (c) Galvanized steel.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40020, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40020, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-40025 Systems mounted on trucks, semi-trailers, and trailers.**

You must make sure all piping, tubing, and fittings are:

- (1) Securely mounted;
- (2) Protected against physical damage.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40025, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40025, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-40030 Refrigerated storage compressors.**

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
Refrigerated storage compressors	<a href="#">WAC 296-826-40030</a>
Refrigeration load	<a href="#">WAC 296-826-40035</a>
Separators for refrigerated storage	<a href="#">WAC 296-826-40040</a>
Automatic control equipment for refrigerated storage	<a href="#">WAC 296-826-40045</a>
Other refrigerated storage equipment	<a href="#">WAC 296-826-40050</a>
Compressors for refrigerated systems	<a href="#">WAC 296-826-40055</a>

- (1) You must make sure compressors have all of the following:
  - (a) Their own driving unit;
  - (b) Discharge pressure that is governed by the condensing conditions;
  - (c) Suitable compressor operation controls based on the load pressure in the container;
  - (d) At least two compressors either of which is of sufficient size to handle the intended loads;
  - (e) Standby equipment equal to the largest normally operating piece of equipment installed when more than 2 compressors are provided;
  - (f) Automatic controls installed to prohibit the operation of alternate compressors unless the controls will function with alternate compressors.
- (2) You must make sure compressors are sized to operate with a suction pressure that is both of the following:
  - (a) At least 10% below the minimum setting of the safety relief valves on the storage tank;
  - (b) Able to withstand 120% of the design pressure of the tank.
- (3) You must install an oil separator of suitable size in the compressor discharge line that is both:
  - (a) Designed for at least 250 psig; and
  - (b) Equipped with a drain valve and gauging device.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40030, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40030, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-40035 Refrigeration load.**

- (1) You must make sure the total refrigeration load includes the loads imposed by all of the following:
  - (a) Heat flow into the container caused by the temperature difference between both:
    - (i) The ambient temperature; and
    - (ii) The design storage temperature.
  - (b) Heat flow into the tank caused by maximum sun radiation.
  - (c) Filling the tank with ammonia warmer than the design storage temperature.
- (2) You must provide emergency power capable of handling loads imposed by both of the following:
  - (a) The temperature difference between the ambient temperature and the design storage temperature; and
  - (b) Sun radiation.

*Note: Emergency power is not necessary for facilities able to effectively vent vapors when the refrigeration system is not operating.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40035, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40035, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-40040 Separators for refrigerated storage.**

You must install an entrainment separator, of suitable size and design pressure, in the compressor suction line that is equipped with both of the following:

- (1) A drain valve; and
- (2) A gauging device.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16) § 296-826-40040 filed 11/17/15 effective 12/17/15 Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40040, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-40045 Automatic control equipment for refrigerated storage.**

- (1) You must install an emergency alarm to detect minimum and maximum allowable operating pressure changes.
- (2) You must install an emergency alarm and shut off in the condenser system to detect excess discharge pressure caused by the failure of the cooling medium.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40045, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40045, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-40050 Other refrigerated storage equipment.**

- (1) You must discharge ammonia to storage by using either:
  - (a) A receiver with an automatic float valve; or
  - (b) A high pressure liquid drain trap of suitable capacity.
- (2) You must make sure receivers are:
  - (a) Designed for at least 250 psig; and
  - (b) Equipped with all of the following:
    - (i) Necessary connections;
    - (ii) Safety relief valves;
    - (iii) Gauging devices.
- (3) You must cover insulated containers and pipelines with material that meets all of the following:
  - (a) Thick enough for the temperatures it will be exposed to;
  - (b) Supported;
  - (c) Weather and fire resistant.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40050, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40050, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-40055 Compressors for refrigerated systems.**

- (1) You must make sure condensers are designed:
  - (a) For at least 250 psig; and
  - (b) To manually or automatically purge non-condensibles.

*Note: Condensers may be cooled by any of the following:*

1. Air;
2. Water;
3. Air and water.

- (2) You must make sure compressors used for refrigerating ammonia meet all of the following:
  - (a) Are connected to plant piping with shut off valves located as close as practical to compressor connections.

- (b) Have a safety relief valve that is both:
  - (i) Large enough to discharge the full capacity of the compressor; and
  - (ii) Connected to the discharge and placed before any shut off valve.
- (c) Have an oil separator on the discharge side, where necessary to prevent contamination.
- (d) Have a drainable liquid trap or other adequate method on the compressor suction to minimize the entry of liquids into the compressor.
- (e) Pressure gauges on the suction and discharge ends graduated to at least one and one-half times the maximum pressure that can develop.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-40055, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-40055, filed 5/2/06, effective 9/1/06.]

## **WAC 296-826-500 Appurtenances.**

**Your responsibility:** To follow the requirements in this section when using appurtenances.

<b><i>You must meet the requirements...</i></b>	<b><i>in this section</i></b>
Appurtenance requirements for all systems	<a href="#">WAC 296-826-50005</a>
Non-refrigerated stationary containers	<a href="#">WAC 296-826-50010</a>
Refrigerated tanks	<a href="#">WAC 296-826-50015</a>
Systems mounted on trucks, semi-trailers and trailers	<a href="#">WAC 296-826-50020</a>
Systems mounted on farm trucks or trailers for transportation of ammonia	<a href="#">WAC 296-826-50025</a>
Systems mounted on farm equipment for ammonia application	<a href="#">WAC 296-826-50030</a>
Portable DOT containers	<a href="#">WAC 296-826-50035</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-500, filed 11/17/15, effective 12/17/15.  
 Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-500, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-50005 Appurtenance requirements for all systems.**

- (1) You must make sure each appurtenance installed before February 8, 1973, is determined to be safe by meeting one of the following:
  - (a) Approved, tested, and installed by either:
    - (i) The American National Standard for the Storage and Handling of Anhydrous Ammonia (in effect at the time of installation);
    - (ii) The Fertilizer Institute Standards for the Storage and Handling of Agricultural Anhydrous Ammonia (in effect at the time of installation).
  - (b) Accepted, certified, listed, or labeled, by a nationally recognized testing laboratory.
  - (c) Inspected or tested by a federal, state, municipal, or local authority responsible for enforcing occupational safety provisions, when no nationally recognized laboratory will provide approval.
  - (d) Tested and approved by a registered professional engineer or other qualified person if the system is a custom-designed or custom-built unit and no other recognized entity will provide approval.
- (2) You must keep a document on file signed by the qualified person that indicates the unit is safe. Include the test bases, test data and results and the qualifications of the qualified person.

- (3) You must make sure container appurtenances are both of the following:
  - (a) Designed for at least the working pressure for the portion of the system where installed; and
  - (b) Fabricated from materials suitable for anhydrous ammonia service.
- (4) You must make sure fixed liquid level gauges, except on refrigerated storage:
  - (a) Are designed so the maximum volume of the container filled by liquid does not exceed 85% of its water capacity; and
  - (b) Have a coupling into which it is threaded that is placed at the 85% level of the container. If located elsewhere, install the dip tube of this gauge so it cannot be easily removed.
- (5) You must equip each container, except those filled by weight, with an approved liquid level gauging device that does all of the following:
  - (a) Has a design pressure equal to or greater than the design pressure of the container;
  - (b) Is arranged so the maximum liquid fill level of the container can be readily determined.
- (6) You must follow additional requirements found in Table 5, Appurtenance Requirements for all Systems.

<b>Table 5 Appurtenance Requirements for all Systems</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Safety relief devices	Do not have discharge termination in or beneath any building.
Safety relief valves	Have a flow capacity that is not restricted by any connection to it on either the upstream or downstream side.
Connections to containers	Have shut off valves located as close to the container as possible. <i><b>Exemption:</b> Safety relief devices, gauging devices or devices fitted with a No. 54 drill size hole are not required to have shut off valves located as close to the container as possible.</i>
Connections and the line, including valves and fittings	Have a greater rated flow than the excess flow valves that protects them.

<b>Table 5 Appurtenance Requirements for all Systems</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Excess flow valves, where required	Meet all of the following: <ol style="list-style-type: none"> <li>1. Are designed with a bypass no larger than a No. 60 drill size opening to allow equalization of pressures.</li> <li>2. Close automatically at the rated flow of vapor or liquid specified by the manufacturer.</li> <li>3. Maintain legible markings.</li> </ol>
Excess flow valves provided with shut off valves	Are designed to close if the shut off valve breaks during installation.
Excess flow and back pressure check valves, where required	Are located either: <ol style="list-style-type: none"> <li>1. Inside the container; or</li> <li>2. Outside the container as long as the excess flow valve is:                             <ol style="list-style-type: none"> <li>a. As close as possible to the entrance of the line; and</li> <li>b. Installed without excessive stress that could result in breakage between the container and the valve.</li> </ol> </li> </ol>
Liquid level gauging devices that: Require bleeding of the product into the atmosphere such as the rotary tube, fixed tube, and slip tube devices	Are either: <ol style="list-style-type: none"> <li>1. Designed so that the maximum opening of the bleed valve is not larger than No. 54 drill size; or</li> <li>2. Provided with an excess flow valve.</li> </ol> <p><b>Exemption:</b></p> <ol style="list-style-type: none"> <li>1. <i>If openings from the containers or through fittings are attached directly onto the container where pressure gauge connections are made, then there is no need for excess flow valves as long as the openings are not larger than a No. 54 drill size</i></li> <li>2. <i>This requirement does not apply to farm vehicles used for the application of ammonia as covered by WAC 296-826-50030.</i></li> </ol>

- (7) You must follow Table 6, Safety Valve Start to Discharge Rate, and Table 7, Safety Relief Valve Rate of Discharge, for the following systems:
- (a) Non-refrigerated stationary containers;
  - (b) Mounted on trucks, semi-trailers, and trailers used for the transportation of ammonia;
  - (c) Mounted on farm wagons for the transportation of ammonia;
  - (d) Mounted on farm equipment for the application of ammonia.

**EXEMPTION:**

*The rate of discharge of spring-loaded safety relief valves installed on underground containers may be reduced to 30% of the rate of discharge specified in Table 6, Safety Relief Valve Rate of Discharge, so long as the container is not uncovered after installation until the liquid ammonia has been removed*

<b>Table 6 Safety Valve Start to Discharge Rate</b>		
<b>Containers</b>	<b>Minimum</b>	<b>Maximum*</b>
ASME U-68, U-69	110%	125%
ASME U-200, U-201	95%	100%
ASME 1952, 1956, 1959, 1962, 1965, 1968, or 1971	95%	100%
API-ASME	95%	100%
U.S. Coast Guard	(As required by U.S.C.G. regulations)	
DOT	(As required by DOT regulations)	

*Note: A relief valve manufacturer's tolerance of plus 10% is permitted.*

Instructions are found below the table

<b>Table 7 Safety Relief Valve Rate of Discharge</b>							
Surface Area sq. ft.	Flow Rate CFM Air	Surface Area sq. ft.	Flow Rate CFM Air	Surface Area sq. ft.	Flow Rate CFM Air	Surface Area sq. ft.	Flow Rate CFM Air
20	258	145	1,310	340	2,640	1,350	8,160
25	310	150	1,350	350	2,700	1,400	8,410
30	360	155	1,390	360	2,760	1,450	8,650
35	408	160	1,420	370	2,830	1,500	8,900
40	455	165	1,460	380	2,890	1,550	9,140
45	501	170	1,500	390	2,950	1,600	9,380
50	547	175	1,530	400	3,010	1,650	9,620
55	310	180	1,570	450	3,320	1,700	9,860
60	360	185	1,600	500	3,620	1,750	10,090
65	408	190	1,640	550	3,910	1,800	10,330
70	455	195	1,670	600	4,200	1,850	10,560
75	762	200	1,710	650	4,480	1,900	10,800
80	804	210	1,780	700	4,760	1,950	11,030
85	845	220	1,850	750	5,040	2,000	11,260
90	885	230	1,920	800	5,300	2,050	11,490
95	925	240	1,980	850	5,590	2,100	11,720
100	965	250	2,050	900	5,850	2,150	11,950
105	1,010	260	2,120	950	6,120	2,200	12,180
110	1,050	270	2,180	1,000	6,380	2,250	12,400
115	1,090	280	2,250	1,050	6,640	2,300	12,630
120	1,120	290	2,320	1,100	6,900	2,350	12,850
125	1,160	300	2,380	1,150	7,160	2,400	13,080
130	1,200	310	2,450	1,200	7,410	2,450	13,300
135	1,240	320	2,510	1,250	7,660	2,500	13,520
140	1,280	330	2,570	1,300	7,910		

*Table instructions:*

1. *The surface area = the total outside surface area of the container in square feet.*
2. *When the surface area is not stamped on the name plate or the marking is not legible, calculate the area by using Table 8, Surface Area.*

<b>Table 8 Surface Area</b>	
<b>If you have:</b>	<b>Then calculate as follows:</b>
Cylindrical container with hemispherical heads	Area = overall length in feet times the outside diameter in feet times 3.1416
Cylindrical container with other than hemispherical heads	Area = (overall length in feet plus 0.3 outside diameter in feet) times outside diameter in feet times 3.1416
Spherical container	Area = outside diameter in feet squared times 3.1416

*Flow rate: CFM air = cubic feet per minute of air required at standard conditions, 60°F and atmospheric pressure (14.7 psia).*

1. *The rate of discharge may be altered for intermediate values of surface area.*
2. *For containers with total outside surface area greater than 2,500 sq. ft., the required flow rate can be calculated using the formula, flow rate CFM air = 22.11 A<sup>0.82</sup> where A = outside surface area of the container in square feet.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50005, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50005, filed 5/2/06, effective 9/1/06.]

## WAC 296-826-50010 Non-refrigerated stationary containers.

***Important:***

*In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.*

- (1) You must make sure all containers are equipped with all of the following:
  - (a) An approved vapor return valve;
  - (b) A fixed maximum liquid level gauge;
  - (c) A pressure gauge that is both:
    - (i) Graduated from zero to 400 psig; and
    - (ii) Designed for use in ammonia service.
- (2) You must provide one or more spring-loaded safety relief valves, or an equivalent type, on all containers.
- (3) You must make sure safety relief valves do all of the following:
  - (a) Discharge in the following ways:
    - (i) Away from the container in an upward, unobstructed manner into the atmosphere;
    - (ii) Not in or beneath a building.
  - (b) Have raincaps that allow free discharge of the vapor and prevent the entrance of water;
  - (c) Have a method for draining accumulated condensation;
  - (d) Have a start to discharge, related to the design pressure of the container, according to Table 6, Safety Valve Start to Discharge Rate;
  - (e) Are arranged to minimize the possibility of tampering;
  - (f) Are provided, when the pressure setting adjustment is external, with a means of sealing the adjustment;
  - (g) Have direct communication with the vapor space of the container.

*Note: Vent pipes from 2 or more safety relief devices located on the same unit, or similar lines from 2 or more different units, may be run into a common header if the cross-sectional area of the header is at least equal to the sum of the cross sectional areas of the individual vent pipes.*

- (4) You must protect container appurtenances against physical damage and during transit of containers intended for underground installation.
- (5) You must make sure shut off valves are not installed between the safety relief valve and the container or system. A shut off valve may be used if arranged so that the required capacity flow is maintained.

***EXEMPTION:***

*You are exempt from the requirement not to install the shut off valve between the safety relief valve and the container or systems in the following situations:*

1. *A three-way valve installed under 2 safety relief valves, each with:*
  - a. *The required rate of discharge; and*
  - b. *Installed to allow either of the safety relief valves to be closed off but not at the same time.*
2. *Two separate relief valves are installed with individual shut off valves.*
3. *The 2 shut off valve stems must be mechanically interconnected to allow the full required flow of one safety relief valve at all times.*
4. *When a safety relief valve manifold that allows:*
  - a. *One valve of 2 or more to be closed off; and*
  - b. *The remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.*

- (6) You must make sure vapor and liquid connections have either of the following:
  - (a) An approved excess flow valve; or
  - (b) An approved quick-closing internal valve that remains closed except during operation.

<b>EXEMPTION:</b>
<p><i>The following do not need to be fitted with excess flow valves:</i></p> <ol style="list-style-type: none"> <li>1. <i>Safety relief valves</i></li> <li>2. <i>Liquid level gauging devices that require both the following:</i> <ol style="list-style-type: none"> <li>a. <i>Bleeding of the product into the atmosphere;</i></li> <li>b. <i>Construction so that outward flow will not exceed that passed by a No. 54 drill size opening. Those with openings from the containers or through fittings that are attached directly onto the container where pressure gauge connections are made as long as: The openings are not larger than a No. 54 drill size.</i></li> </ol> </li> </ol>

- (7) You must follow additional requirements found in Table 9, Appurtenances for Non-refrigerated Stationary Containers.

<b>Table 9 Appurtenances for Non-refrigerated Stationary Containers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Columnar-type gauges	<ol style="list-style-type: none"> <li>1. Are restricted to stationary storage installations.</li> <li>2. Are shielded against the direct rays of the sun.</li> <li>3. Are equipped with all of the following:                             <ol style="list-style-type: none"> <li>a. Shut off valves having metallic hand-wheels;</li> <li>b. Excess flow valves;</li> <li>c. Extra heavy glass that is adequately protected with a metal housing applied by the gauge manufacturer.</li> </ol> </li> </ol>
Main shut off valves	<p>Are kept closed and locked when the installation is unattended.</p> <p><b>Exemption:</b> <i>Valve locks are not required if the facility is protected against tampering by fencing or other suitable means.</i></p>
Filling connections	<p>Are provided with one of the following:</p> <ol style="list-style-type: none"> <li>1. Combination back-pressure check valve and excess flow valve.</li> <li>2. One double or 2 single back-pressure check valves.</li> <li>3. A positive shut off valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.</li> </ol>

<b>Table 9 Appurtenances for Non-refrigerated Stationary Containers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Underground installations with a probability of the manhole or housing becoming flooded	1. Have vent lines located above the high water level. 2. Have manholes or housings with ventilated louvers or their equivalent with the area of their openings equal or exceeding the combined discharge areas of the safety relief valves and vent lines which discharge their content into the manhole housing.
Hydrostatic relief valves	Are installed between each pair of valves in the liquid ammonia piping or hose.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50010, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50010, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-50015 Refrigerated tanks.**

***Important:***

*In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.*

- (1) You must protect container appurtenances against the following:
  - (a) Physical damage during transit of containers intended for underground installation;
  - (b) Damage from vehicles.
- (2) You must make sure safety relief devices have a total relieving capacity larger than either of the following:
  - (a) A possible refrigeration system upset such as a cooling water failure, power failure, instrument air or instrument failure, mechanical failure of any equipment, excessive pumping rates or changing atmospheric pressure; or
  - (b) The amount based on using either one of the following fire exposure formulas (see note below for codes):
    - (i) Valve manufacturers who use weight of vapors to be relieved as the classifying basis, use this formula:

$$W = \frac{34,500 F A (0.82)}{L}$$

- (ii) Valve manufacturers that classify valves based on air flows, use this formula:

$$Q_{(a)} = \frac{633,000 F AO.32}{LC}$$

- (3) You must make sure safety relief devices meet the following additional requirements:
- (a) Are set to start-to-discharge at a pressure not in excess of the design pressure of the tank;
  - (b) Have a total relieving capacity sufficient to prevent a maximum pressure in a tank of more than 120% of the design pressure.
- (4) You must provide shut off valves for all connections including plugs, safety valves, and thermometer wells. Locate them as close to the tank as is practical.

***EXEMPTION:***

*Shut off valves do not need to be provided on connections with a No. 54 drill size restriction.*

*Note: Install, when operating conditions make it advisable, both of the following:*

- 1. A check valve on the fill connection;*
- 2. A remotely operated shut off valve on other connections located below the maximum liquid level.*

- (5) You must follow requirements found in Table 10, Refrigerated Tank Appurtenances.

<b>Table 10 Refrigerated Tank Appurtenances</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Shut off valves used as a means of lock out for inspection or repair	<ol style="list-style-type: none"> <li>1. Are of adequate flow capacity.</li> <li>2. Are arranged to be locked or sealed open and not closed except by an authorized person who does both of the following:                             <ol style="list-style-type: none"> <li>a. Remains there while the valve is closed;</li> <li>b. Locks or seals the valve open when leaving the station.</li> </ol> </li> </ol>
Discharge line and header	<ol style="list-style-type: none"> <li>1. Are designed to accommodate the maximum flow.</li> <li>2. Have a back pressure not greater than 10% of the design pressure of the storage container.</li> <li>3. Include the back pressure in the 120% of the maximum pressure of the design pressure.</li> <li>4. Do not have other containers or systems that exhaust into the discharge line or header.</li> <li>5. Have vent lines installed to prevent the accumulation of liquid in the lines.</li> </ol> <p><i>Note: Multiple safety relief valves on the same storage unit may be run through a common discharge header.</i></p>
Vacuum breakers	Are provided with atmospheric storage.
Stacks	Do both of the following: <ol style="list-style-type: none"> <li>1. Prevent any obstructions by rain, snow, ice, or condensation; and</li> <li>2. Have an outlet size not smaller than the size of the safety relief valve outlet connection.</li> </ol>

- (6) You must make sure appurtenances meet all of the requirements found in the following:
- (a) ANSI CGA C-7 2004;
  - (b) ANSI CGA G2.1 1999;
  - (c) API Standard 620 4th Edition, 2002;

- (d) ASHRAE 15 2004;
- (e) ASME 2001, Section VIII, Division 1;
- (f) ANSI B95.1 1977.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50015, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-50020 Systems mounted on trucks, semi-trailers and trailers.**

***Important:***

*In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.*

- (1) You must make sure each container has all of the following:
  - (a) Fixed maximum liquid level gauging devices;
  - (b) Pressure-indicator gauges with a dial graduated from zero to 400 psig;
  - (c) Either of the following:
    - (i) Equipped for spray-loading, which fills in vapor space; or
    - (ii) Has an approved vapor return valve of adequate capacity.
- (2) You must provide one or more spring-loaded safety relief valves, or an equivalent type, on all containers, that do all of the following:
  - (a) Discharges in the following ways:
    - (i) Away from the container in an upward, unobstructed manner into the atmosphere;
    - (ii) Not in or beneath a building.
  - (b) Has raincaps that allow free discharge of the vapor and prevent the entrance of water;
  - (c) Has a method for draining accumulated condensation;
  - (d) Has a start to discharge, related to the design pressure of the container, according to Table 6, Safety Valve Start to Discharge Rate;
  - (e) Are arranged to minimize the possibility of tampering;
  - (f) Provided, when the pressure setting adjustment is external, with a means of sealing the adjustment;
  - (g) Has direct communication with the vapor space of the container.

- (3) You must make sure shut off valves are not installed between the safety relief valve and the container or system. A shut off valve may be used if arranged so that the required capacity flow is maintained.

<b>EXEMPTION:</b>
<p><i>You are exempt from the requirement not to install the shut off valve between the safety relief valve and the container or systems in the following situations:</i></p> <ol style="list-style-type: none"> <li>1. <i>A three-way valve installed under 2 safety relief valves, each with:                             <ol style="list-style-type: none"> <li>a. <i>The required rate of discharge; and</i></li> <li>b. <i>Installed to allow either of the safety relief valves to be closed off but not at the same time.</i></li> </ol> </i></li> <li>2. <i>Two separate relief valves are installed with individual shut off valves.</i></li> <li>3. <i>The 2 shut off valve stems must be mechanically interconnected to allow the full required flow of one safety relief valve at all times.</i></li> <li>4. <i>When a safety relief valve manifold that allows:                             <ol style="list-style-type: none"> <li>a. <i>One valve of 2 or more to be closed off; and</i></li> <li>b. <i>The remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.</i></li> </ol> </i></li> </ol>

- (4) You must follow additional requirements found in Table 11, Appurtenances for Systems Mounted on Trucks, Semi-Trailers, and Trailers.

<b>Table 11 Appurtenances for Systems Mounted on Trucks, Semi-Trailers, and Trailers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
All container connections	<p>Are provided with either of the following:</p> <ol style="list-style-type: none"> <li>1. Automatic excess flow valves; or</li> <li>2. Quick-closing internal valves that remain closed except during delivery operations.</li> </ol> <p><i>Note: If the control mechanism is provided with a secondary control remote from the delivery connection, then a fusible section (melting point 208°F to 220°F) is required to permit the internal valve to close automatically in case of fire.</i></p> <p><b>EXEMPTION:</b> <i>Filling connections, safety relief devices, and liquid level and pressure gauge connections are exempt from automatic excess flow valves and quick-closing internal valves.</i></p>

<b>Table 11 Appurtenances for Systems Mounted on Trucks, Semi-Trailers, and Trailers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Filling connections	<p>Prevent back-flow in the event the filling connection breaks with at least one of the following:</p> <ol style="list-style-type: none"> <li>1. Automatic back pressure check valves;</li> <li>2. Excess flow check valves;</li> <li>3. Quick closing internal valves.</li> </ol> <p><b>EXEMPTION:</b> <i>An automatic valve is not required if:</i></p> <ol style="list-style-type: none"> <li>1. <i>The filling and discharge connect to a common opening in the container shell; and</i></li> <li>2. <i>The opening is fitted with a quick-closing internal valve.</i></li> </ol>
Non-recessed container fittings and appurtenances	<p>Are protected against physical damage by one of the following methods:</p> <ol style="list-style-type: none"> <li>1. A protected location;</li> <li>2. The vehicle frame or bumper.</li> </ol> <p>A protective housing that meets the following:</p> <ol style="list-style-type: none"> <li>1. Is fabricated from material that is compatible with the containers design and construction requirements;</li> <li>2. Designed to withstand static loadings in any direction equal to twice the weight of the container and attachments when filled using a safety factor of not less than 4, based on the ultimate strength of the material used.</li> </ol> <p><i>Note: Protect non-recessed container fittings and appurtenances with a weather cover as needed for proper operation of valves and safety relief devices.</i></p>
Columnar-type gauges	<ol style="list-style-type: none"> <li>1. Are restricted to stationary storage installations.</li> <li>2. Are shielded against the direct rays of the sun.</li> <li>3. Are equipped with all of the following:                         <ol style="list-style-type: none"> <li>a. Shut off valves having metallic hand-wheels;</li> <li>b. Excess flow valves;</li> <li>c. Extra heavy glass that is adequately protected with a metal housing applied by the gauge manufacturer.</li> </ol> </li> </ol>

<b>Table 11 Appurtenances for Systems Mounted on Trucks, Semi-Trailers, and Trailers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Hydrostatic relief valves	Are installed between each pair of valves in the liquid ammonia piping or hose.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50020, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50020, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-50025 Systems mounted on farm trucks or trailers for transportation of ammonia.**

<b><i>Important:</i></b>
<i>This section applies to containers of 3,000 gallons capacity or less and pertinent equipment mounted on farm trucks or trailers used for the transportation of ammonia. In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.</i>

- (1) You must make sure all containers are equipped with a fixed maximum liquid level gauge.
- (2) You must make sure vapor and liquid connections have either of the following:
  - (a) An approved excess flow valve; or
  - (b) An approved quick-closing internal valve that remains closed except during operation.

<b><i>EXEMPTION:</i></b>
<i>The following do not need to be fitted with excess flow valves:</i>
<ul style="list-style-type: none"> <li>1. <i>Safety relief valves;</i></li> <li>2. <i>Those with openings from the containers or through fittings that are attached directly onto the container where pressure gauge connections are made as long as the openings are not larger than a No. 54 drill size.</i></li> </ul>

- (3) You must provide one or more spring-loaded safety relief valves, or an equivalent type, on all containers, that do all of the following:
  - (a) Discharges away from the container in an upward, unobstructed manner into the atmosphere;
  - (b) Has raincaps that allow free discharge of the vapor and prevent the entrance of water;
  - (c) Has a method for draining accumulated condensation;

- (d) Has a start to discharge, related to the design pressure of the container, according to Table 6, Safety Valve Start to Discharge Rate;
  - (e) Are arranged to minimize the possibility of tampering;
  - (f) Provided, when the pressure setting adjustment is external, with a means of sealing the adjustment;
  - (g) Has direct communication with the vapor space of the container.
- (4) You must make sure shut off valves are not installed between the safety relief valve and the container or system. A shut off valve may be used if arranged so that the required capacity flow is maintained.

***EXEMPTION:***

*You are exempt from the requirement not to install the shut off valve between the safety relief valve and the container or systems in the following situations:*

- 1. A three-way valve installed under 2 safety relief valves, each with:
  - a. The required rate of discharge; and*
  - b. Installed to allow either of the safety relief valves to be closed off but not at the same time.**
- 2. Two separate relief valves are installed with individual shut off valves. The 2 shut off valve stems must be mechanically interconnected to allow the full required flow of one safety relief valve at all times.*
- 3. When a safety relief valve manifold that allows:
  - a. One valve of 2 or more to be closed off; and*
  - b. The remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.**

- (5) You must secure both ends of the hose while in transit.
- (6) You must make sure all containers with a capacity exceeding two hundred fifty gallons are equipped with both of the following:
- (a) A pressure gauge with a dial graduated from 0-400 psig; and
  - (b) A method for spray loading or with an approved vapor return valve.

- (7) You must follow additional requirements found in Table 12, Appurtenances for Systems Mounted on Farm Trucks or Trailers.

<b>Table 12 Appurtenances for Systems Mounted on Farm Trucks or Trailers</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
Filling connections	Are fitted with one of the following: 1. A combination back-pressure check valve and excess flow valve. 2. One double or 2 single back-pressure check valves. 3. A positive shut off valve used with either an: a. Internal back-pressure check valve; or b. Internal excess flow valve.
A fully enclosed guard	Have properly vented safety relief valves.
Fittings	Are protected from physical damage by a rigid guard designed: 1. To withstand static loading in any direction equal to twice the weight of the container and lading. 2. With a safety factor of 4 based on the maximum strength of the material used.
Liquid withdrawal lines installed in the bottom of the container	Have connections, including the hose that are not lower than the lowest horizontal edge of the truck axle.
Columnar-type gauges	1. Are shielded against the direct rays of the sun. 2. Are equipped with all of the following: a. Shut off valves having metallic hand-wheels; b. Excess flow valves; c. Extra heavy glass that is adequately protected with a metal housing applied by the gauge manufacturer.
Hydrostatic relief valves	Are installed between each pair of valves in the liquid ammonia piping or hose.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50025, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50025, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-50030 Systems mounted on farm equipment for ammonia application.**

***Important:***

1. *This section applies to systems mounted on farm equipment and used for the filed application of ammonia.*
2. *In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.*

- (1) You must make sure each container has a fixed maximum liquid-level gauge.
- (2) You must provide one or more spring-loaded safety relief valves, or an equivalent type, on all containers, that do all of the following:
  - (a) Discharges in the following ways:
    - (i) Away from the container in an upward, unobstructed manner into the atmosphere.
    - (ii) Not in or beneath a building.
  - (b) Has raincaps that allow free discharge of the vapor and prevent the entrance of water;
  - (c) Has a method for draining accumulated condensation;
  - (d) Has a start to discharge, related to the design pressure of the container, according to Table 6, Safety Valve Start to Discharge Rate;
  - (e) Are arranged to minimize the possibility of tampering;
  - (f) Provided, when the pressure setting adjustment is external, with a means of sealing the adjustment;
  - (g) Has direct communication with the vapor space of the container.
- (3) You must make sure shut off valves are not installed between the safety relief valve and the container or system. A shut off valve may be used if arranged so that the required capacity flow is maintained.

<b>EXEMPTION:</b>	
<p><i>You are exempt from the requirement not to install the shut off valve between the safety relief valve and the container or systems in the following situations:</i></p> <ol style="list-style-type: none"> <li>1. <i>A three-way valve installed under 2 safety relief valves, each with:                             <ol style="list-style-type: none"> <li>a. <i>The required rate of discharge; and</i></li> <li>b. <i>Installed to allow either of the safety relief valves to be closed off but not at the same time.</i></li> </ol> </i></li> <li>2. <i>Two separate relief valves are installed with individual shut off valves.</i></li> <li>3. <i>The 2 shut off valve stems must be mechanically interconnected to allow the full required flow of one safety relief valve at all times.</i></li> <li>4. <i>When a safety relief valve manifold that allows:                             <ol style="list-style-type: none"> <li>a. <i>One valve of 2 or more to be closed off; and</i></li> <li>b. <i>The remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.</i></li> </ol> </i></li> </ol>	

- (4) You must follow additional requirements found in Table 13, Appurtenances for Systems Mounted on Farm Equipment for Ammonia Application.

<b>Table 13 Appurtenances for Systems Mounted on Farm Equipment for Ammonia Application</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
<p>Filling connections</p>	<p>Are fitted with one of the following:</p> <ol style="list-style-type: none"> <li>1. A combination back-pressure check valve and excess flow valve.</li> <li>2. One double or 2 single back-pressure check valves.</li> <li>3. A positive shut off valve used with either an:                             <ol style="list-style-type: none"> <li>a. Internal back-pressure check valve; or</li> <li>b. Internal excess flow valve.</li> </ol> </li> </ol> <p><b>Exemption:</b> <i>An excess-flow valve is not required in either of the following:</i></p> <ol style="list-style-type: none"> <li>1. <i>Vapor connection providing you meet both of the following:</i> <ol style="list-style-type: none"> <li>a. <i>The controlling orifice is not in excess of 7/16 of an inch in diameter, and</i></li> <li>b. <i>The valve is hand-operated (attached hand-wheel or equivalent) shut off valve; or</i></li> </ol> </li> <li>2. <i>In the liquid withdrawal line if the controlling opening between the</i></li> </ol>

<b>Table 13 Appurtenances for Systems Mounted on Farm Equipment for Ammonia Application</b>	
<b>If you have:</b>	<b>Then make sure they:</b>
	<p><i>contents of the container and the outlet of the shut off valve do not exceed 7/16 inch in diameter.</i></p> <p><i>Note: To assist in filling applicator tanks, you are allowed to bleed vapors into the open air if you meet the above requirements.</i></p>
Columnar-type gauges	<ol style="list-style-type: none"> <li>1. Are shielded against the direct rays of the sun.</li> <li>2. Are equipped with all of the following:                             <ol style="list-style-type: none"> <li>a. Shut off valves having metallic hand-wheels;</li> <li>b. Excess flow valves;</li> <li>c. Extra heavy glass that is adequately protected with a metal housing applied by the gauge manufacturer.</li> </ol> </li> </ol>
<p>An applicator tank that is both of the following:</p> <ol style="list-style-type: none"> <li>1. Trailed; and</li> <li>2. The metering device is remotely mounted (for example on a tractor tool bar)</li> </ol>	<p>Use an automatic break-away type, self-closing, coupling.</p> <p>Note:</p> <ol style="list-style-type: none"> <li>1. Metering devices may be connected directly to the tank withdrawal valve.</li> <li>2. A union type connection is acceptable between the tank valve and metering device.</li> </ol>
Hydrostatic relief valves	Are installed between each pair of valves in the liquid ammonia piping or hose.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50030, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50030, filed 5/2/06, effective 9/1/06.]

## WAC 296-826-50035 Portable DOT containers.

***Important:***

*This section applies to systems that use cylinders, portable tanks (DOT-51), or ton containers (DOT-106A, DOT-110A).  
In addition to this section, you need to follow the Appurtenances requirements for all systems, WAC 296-826-50005.*

- (1) You must make sure safety relief devices meet DOT specifications.
- (2) You must provide the following protection:
  - (a) To valves and pressure regulating equipment from tampering once installed for use.
  - (b) To containers:
    - (i) From heat sources such as radiant flame and steam pipes. Do not apply heat directly to containers to raise the pressure.
    - (ii) From moving vehicles or external damage while being stored.
    - (iii) From ignitable debris and to prevent external corrosion while being stored. Storage can be indoors or outdoors.
- (3) You must protect container valves while in transit, in storage, and while being moved into final use by doing either of the following:
  - (a) Setting them into the recess of the container; or
  - (b) By fastening a ventilated cap or collar to the container that can withstand a blow from any direction equivalent to a 30 pound weight being dropped 4 feet. Construction should be such that a blow will not be transmitted to the valves or other connections.
- (4) You must keep outlet valves tightly closed when containers are not connected for service on all empty or loaded containers.
- (5) You must secure the valve protection cap, if the container is designed for one, when the container is not in service.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-50035, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-50035, filed 5/2/06, effective 9/1/06.]

## WAC 296-826-600 Operations.

### Summary

**Your responsibility:** To protect employees while transporting, transferring, loading and unloading anhydrous ammonia.

Requirements for this topic...	Begin in this section:
Mounting and loading containers	<a href="#">WAC 296-826-60005</a>
Transferring liquids	<a href="#">WAC 296-826-60020</a>
Filling densities	<a href="#">WAC 296-826-60030</a>

### Mounting and Loading Containers

<i>You must meet the requirements</i>	<i>in this section</i>
Mounting containers on trucks, semi-trailers and trailers	<a href="#">WAC 296-826-60005</a>
Mounting containers on farm trucks or trailers for transporting ammonia	<a href="#">WAC 296-826-60010</a>
Tank car loading or unloading	<a href="#">WAC 296-826-60015</a>

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-600, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-600, filed 5/2/06, effective 9/1/06.]

### WAC 296-826-60005 Mounting containers on trucks, semi-trailers and trailers.

- (1) You must make sure the method for attaching any container to the cradle, frame, or chassis of a vehicle is based on both of the following:
  - (a) Two “g” loading in either direction;
  - (b) Using a safety factor of at least four based on the maximum strength of the material used.

*Note: Two “g” is either of the following:*

1. *For load support it is equivalent to three times the static weight of the supported articles.*
2. *For loading and bending, acceleration, and torsion it is equivalent to twice the static weight support applied horizontally at the road surface.*

- (2) You must secure both ends of the hose during transit.
- (3) You must follow the requirements in Table 14, Additional Container Mounting Requirements.

<b>Table 14 Additional Container Mounting Requirements</b>	
<b>If you have:</b>	<b>Then:</b>
“Hold-down” devices	<ol style="list-style-type: none"> <li>1. Anchor the container to the cradle, frame, or chassis so there is no area of unnecessary stress.</li> <li>2. Lock the container down tightly.</li> <li>3. Provide stops or anchors to minimize movement between the container and the framing.</li> </ol> <p><i>Note: Movement could be the result of stopping, starting or changing direction.</i></p>
Vehicles with cargo tanks designed with stress members instead of a frame	<ol style="list-style-type: none"> <li>1. Support the tank with external cradles suspended at least 120° of the shell circumference.</li> <li>2. The design calculation needs to include all of the following stressors:                             <ol style="list-style-type: none"> <li>a. Beam;</li> <li>b. Shear;</li> <li>c. Torsion;</li> <li>d. Bending moment;</li> <li>e. Acceleration;</li> <li>f. Any other stresses covered by the code of the cargo tank design.</li> </ol> </li> </ol>
A liquid withdrawal line installed in the bottom of a container	Make sure the connections to the container, including the hose, are not lower than the lowest horizontal edge of the trailer axle.
A cradle and container that are not welded together	Use suitable material between them to eliminate metal-to-metal friction.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60005, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60005, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-60010 Mounting containers on farm trucks or trailers for transporting ammonia.**

- (1) You must make sure tanks mounted on farm trucks and trailers meet all of the following:
  - (a) Are securely attached using drawbars and safety chains;
  - (b) Follow behind the towing vehicle without swerving;
  - (c) Have at least 5 gallons of readily available clean water.
- (2) You must do all of the following when mounting containers on farm trucks:
  - (a) Use suitable material between the cradle and the container to eliminate metal-to-metal friction. This is not necessary if the cradle and container are welded together.
  - (b) Use stops and hold down devices to prevent displacement.
- (3) You must distribute the container's weight, when mounted on 4 wheel farm trucks or trailers, evenly over both axles.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60010, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60010, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-60015 Tank car loading or unloading.**

- (1) You must establish a location for tank car loading and unloading operations.
- (2) You must assign employees and instruct them in the unloading of tank cars.
- (3) You must make sure, when unloading cars, to set the brake and block the wheels.
- (4) You must make sure the track of tank siding is level.
- (5) You must place caution signs on the track or car to warn approaching persons of loading and unloading operations that are kept in place until the car is unloaded and disconnected from discharge connections.
- (6) You must make sure these caution signs meet all of the following:
  - (a) Are made of metal or other suitable material.
  - (b) Are at least 12 to 15 inches in size.
  - (c) Read either "STOP-Tank Car Connected" or "STOP-Men at Work" meeting the following criteria:
    - (i) "STOP" at least 4 inches high;
    - (ii) All other words at least 2 inches high;
    - (iii) All with white letters on a blue background.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60015, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60015, filed 5/2/06, effective 9/1/06.]



**WAC 296-826-60020 General specifications.**

<i><b>You must meet the requirements</b></i>	<i><b>in this section</b></i>
General specifications	<a href="#">WAC 296-826-60020</a>
Additional requirements for systems mounted on trucks, semi-trailers, and trailers for transporting ammonia	<a href="#">WAC 296-826-60025</a>

- (1) You must get owner authorization to use transfer containers.
- (2) You must make sure transfer containers are gauged and filled in either:
  - (a) Open atmospheres; or
  - (b) Buildings approved for that purpose.
- (3) You must make sure pumps used to transfer ammonia meet all of the following:
  - (a) Have a manufacturer's label for ammonia service.
  - (b) Are designed for at least 250 psig working pressure.
  - (c) Have a constant differential relief valve discharging into the suction port that:
    - (i) Is installed on positive displacement pumps; and
    - (ii) Meets the pump manufacturer's recommendation for the settings and installation.
  - (d) Have a pressure gauge graduated zero to 400 psig installed on the discharge side before the relief valve line.
- (4) You must make sure plant pipes with shut off valves are located as close as possible to the pump connections.
- (5) You must make sure meters used for measuring liquid anhydrous ammonia:
  - (a) Are recommended and labeled for ammonia service by the manufacturer.
  - (b) Are designed for a minimum working pressure of 250 psig.
  - (c) Incorporate devices that prevent unintended measurement of vapor.
- (6) You must do the following when transferring ammonia:
  - (a) Maintain ammonia at a temperature suitable for the receiving container.
  - (b) Have at least one attendant supervise the transfer from the time connections are made to when disconnection occurs.

- (c) Do NOT use flammable gases or gases that will react with ammonia, such as air to unload tank cars or transport trucks.
- (7) You must make sure compressors used for transferring ammonia meet all of the following:
  - (a) Have a working pressure of at least 250 psig when transferring ammonia. If crank cases of compressors are not designed to withstand system pressure, then provide protection with a suitable safety relief valve.
  - (b) Are connected to plant piping with shut off valves located as close as practical to compressor connections.
  - (c) Have a safety relief valve that is both:
    - (i) Large enough to discharge the full capacity of the compressor; and
    - (ii) Connected to the discharge before any shut off valve.
  - (d) Have an oil separator on the discharge side, where necessary to prevent contamination.
  - (e) Have a drainable liquid trap or other adequate method on the compressor suction to minimize the entry of liquids into the compressor.
  - (f) Pressure gauges on the suction and discharge ends graduated to at least one and one-half times the maximum pressure that can develop.
- (8) You must protect loading and unloading systems in the event of hose severance by suitable devices where necessary, such as:
  - (a) Backflow check valves; or
  - (b) Properly sized excess flow valves.

*Note: If such valves are not practical, remotely operated shut off valves may be installed.*

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60020, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60020, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-60025 Additional requirements for systems mounted on trucks, semi-trailers, and trailers for transporting ammonia.**

- (1) You must make sure the content of vehicle containers is determined by one of the following:
  - (a) Weight;
  - (b) Liquid-level gauging devices;

- (c) Meters; or
- (d) Other approved methods.
- (2) You must use a thermometer well when the content of a container is determined by liquid-level measurement.
- (3) You must make sure the volume, when converted to weight, does not exceed the DOT filling density requirement.
- (4) You must protect pumps and compressors against physical damage when mounted on trucks or trailers.
- (5) You must unload tank motor vehicles with a water capacity greater than 3500 gallons at approved locations.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60025, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60025, filed 5/2/06, effective 9/1/06.]

**WAC 296-826-60030 Non-refrigerated containers.**

<i>You must meet the requirements...</i>	<i>in this section:</i>
Non-refrigerated containers	<a href="#">WAC 296-826-60030</a>
Refrigerated tanks	<a href="#">WAC 296-826-60035</a>
Welding	<a href="#">WAC 296-826-60040</a>

You must make sure filling densities for non-refrigerated containers are below or equal to the requirements in Table 15, Filling Densities.

<b>Containers</b>	<b>Aboveground Containers</b>	<b>Underground Containers</b>
Uninsulated	56%	58%
Insulated	57%	----

*Note: For uninsulated, aboveground containers, the 56% corresponds to:*

1. 82% by volume at -28°F.
2. 85% by volume at 5°F
3. 87.5% by volume at 30°F
4. 90.6% by volume at 60°F.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60030, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60030, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-60035 Refrigerated tanks.**

You must make sure refrigerated tanks are not liquid full at a liquid temperature so that the vapor pressure is below the “start-to-discharge” pressure setting of the safety relief valve.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60035, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60035, filed 5/2/06, effective 9/1/06.]

### **WAC 296-826-60040 Welding.**

You must permit welding only on the saddle plates, lugs, or brackets attached to the container by the manufacturer.

[Statutory Authority: RCW 49.17.010, .040, and .050. 15-23-086 (Order 14-16), § 296-826-60040, filed 11/17/15, effective 12/17/15. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. 06-10-067, § 296-826-60040, filed 5/2/06, effective 9/1/06.]