



ADMINISTRATIVE RULES OF MONTANA



4.12.743 TABLES

(1) Table A - Rate of Discharge.

TABLE A - RATE OF DISCHARGE

Minimum required rate of discharge in cubic feet per minute (CFM) of air for safety relief valves. Discharge measured at 60 degrees F and atmospheric pressure (14.7 pounds per square inch) .

Surface		Surface		Surface	
Area	CFM	Area	CFM	Area	CFM
Sq. Ft.		Sq. Ft.		Sq. Ft.	
20	258	185	1,600	900	5,850
25	310	190	1,640	950	6,120
30	360	195	1,670	1,000	6,380
35	408	200	1,710	1,050	6,640
40	455	210	1,780	1,100	6,900
45	501	220	1,850	1,150	7,160
50	547	230	1,920	1,200	7,410
55	591	240	1,980	1,250	7,660
60	635	250	2,050	1,300	7,910
65	678	260	2,120	1,350	8,160
70	720	270	2,180	1,400	8,410
75	762	280	2,250	1,450	8,650
80	804	290	2,320	1,500	8,900
85	845	300	2,380	1,550	9,140

90	885	310	2,450	1,600	9,380
95	925	320	2,510	1,650	9,620
100	965	330	2,570	1,700	9,860
105	1,010	340	2,640	1,750	10,090
110	1,050	350	2,700	1,800	10,330
115	1,090	360	2,760	1,850	10,560
120	1,120	370	2,830	1,900	10,800
125	1,160	380	2,890	1,950	11,030
130	1,200	390	2,950	2,000	11,260
135	1,240	400	3,010	2,050	11,490
140	1,280	450	3,320	2,100	11,720
145	1,310	500	3,620	2,150	11,950
150	1,350	550	3,910	2,200	12,180
155	1,390	600	4,200	2,250	12,400
160	1,420	650	4,480	2,300	12,630
165	1,460	700	4,760	2,350	12,850
170	1,500	750	5,040	2,400	13,080
175	1,530	800	5,300	2,450	13,300
180	1,570	850	5,590	2,500	13,520

Surface area = Total outside surface area of container in square feet. When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

- (a) Cylindrical container with hemispherical heads area = (overall length in feet times outside diameter in feet times 3.1416).
- (b) Cylindrical container with semi-ellipsoidal heads. Area = (overall length in feet plus 0.3 outside diameter in feet) times diameter in feet times 3.1416.
- (c) Spherical Container. Area = Outside diameter in

Flow Rate SCFM Air = Cubic feet per minute of air required at standard conditions, 60 degrees F and atmospheric pressure (14.7 psia).

The rate of discharge may be interpolated for intermediate values of surface area. For container with total outside surface area greater than 2,000 sq. ft., the required flow rate can be calculated using the formula, Flow Rate SCFM Air = 22.11A degrees .82, where A = Outside surface area of the container in square feet.

(2) Table B - Guide for Selection of Materials for Refrigerated Ammonia Storage Tanks.

TABLE B - GUIDE FOR SELECTION OF MATERIALS
FOR REFRIGERATED AMMONIA STORAGE TANKS

- (a) Materials for shell and bottom for tanks of all design pressures shall have ductility at low temperatures equal to or superior to those listed in Table C.
- (b) When austenitic steels or non-ferrous materials are used, the code shall be used as a guide for temperature requirements.
- (c) Materials for nozzles, attached flanges, structural members which are in tension, and other such critical elements shall be selected for the design temperature. This selection shall be based on impact test requirements, or on probabilities such as used for the plate materials listed in Table C.

(3) Table C - Minimum Material Requirements for Shells and Bottoms of Refrigerated Storage Tanks for Various Temperatures and Thicknesses.

TABLE C - MINIMUM MATERIAL REQUIREMENTS FOR SHELLS AND BOTTOMS OF REFRIGERATED STORAGE TANKS FOR VARIOUS TEMPERATURES AND THICKNESSES

Design Temperature	Thickness	Material Spec.	Qualifications to be Added to the Basic Specification
65 F to 25 F, Incl. (See Note 1)	Up to 1/2", Incl.	Any approved steel with specified min.T.S. not exceeding 60,000 psi	None
	Over 1/2" to 1", Incl.	A-131B (or C)	None
		Case 1256	None
		A-201 A & B	FGP (Fine Grain Practice)

	Over 1" to 1 3/8", Incl.	A-131C, Case 1256	None
		A-201 A&B	None
			FGP
	Over 1 3/8"	A-131C	Normalized
		Case 1256	Normalized
		A-201 A & B	FGP, Normalized
Below 25 F to 5 F, Incl. (See Note 2)	Up to 1/2", Incl.	Case 1256	None
	Over 1/2" to 1 3/8", Incl.	A-201 A & B	None
		A-131B (to 1" max)	FGP
		A-131C	FGP
		Case 1256	FGP
		A-201 A & B (to 1" max)	FGP, High Mang.*
		A-201 A & B (over 1")	FGP, High Mang., Normalized
	Over 1 3/8"	A-131C	Normalized
		Case 1256	Normalized
		A-201 A & B	FGP, High Mang., Normalized
Below -5F to -30F (See note 3)	Up to 1/2" Incl.	Case 1256	FGP
	Over 1/2" to 1 3/8" Incl.	A-201 A & B	FGP, High Mang.
		A-131B (to 1" max)	FGP, Normalized
		A-131C	Normalized
		Case 1256	FGP, Normalized
		A-201 A & B	FGP, High Mang., Normalized
	Over 1 3/8"	A-300 Class 1	A-201 A & B Only

*Manganese content of 0.70% to 1.0% is preferred in lieu of usual content of 0.80% maximum.

Note 1: The design temperature shall be taken as the lower of the following:

- (a) The minimum temperature to which the tank contents will be refrigerated.
- (b) The minimum estimated tank shell temperature due to atmospheric temperatures, considering effectiveness of the insulation in keeping shell temperatures above expected minimum atmospheric temperature (if expected to be below the refrigerated temperature) .

Note 2: For the thickness, temperature category approved steels include all of those listed in the API 12-C and API 620. Materials for vessels must comply with the requirements of the code and any additional requirements of the code and any additional requirements of this table. A-131 steel is not approved by ASME and some code cases have not been approved by local jurisdictions. All specific materials listed in table are satisfactory for all designs based on API 12-C or API 620.

Note 3: For vessels constructed under the code with a design temperature below -20F., the impact requirements shall comply with Table B.

(4) Table D - Repair Welding.

TABLE D - REPAIR WELDING

- (a) All containers, piping and appurtenances which have contained or have been in direct contact with nitrogen fertilizer solutions containing ammonium nitrate must be thoroughly cleaned and washed with water (or steam) to eliminate all solid ammonium nitrate before welding or torch cutting may be attempted: Extreme caution should be taken before attempting to weld or torch cut any container when ammonium nitrate could be trapped, for example, in the area between tank shell and a reinforcing plate.
- (b) All containers, piping, and appurtenances which have contained aqua ammonia (ammonium hydroxide) must be thoroughly vented and thoroughly washed with large quantities of water. After washing, they shall be filled with water to a level higher than area to be welded or repaired.
- (c) All containers shall be welded in accordance with the code.

(5) Table E - Safety Pressure Relief Valves.

TABLE E - SAFETY PRESSURE RELIEF VALVES

- (a) The rate of discharge shall be stamped on the safety relief valve in cubic feet of air per minute at:
- (1) 60 degrees F,
 - (2) 14.7 pounds per square inch absolute, and
 - (3) 120 percent of the stamped start-to-discharge setting.
- (b) Safety pressure relief valves in systems utilizing air compressors for the transfer of nitrogen fertilizer solutions shall have a minimum rate of discharge in cubic feet per minute of air of 120 percent of the compressor manufacturer's maximum rated capacity.
- (c) Safety pressure relief valves in systems utilizing pumps for transfer of nitrogen fertilizer solutions shall have a minimum rate of discharge of 120 percent of the liquid inflow rate. This can be computed as follows: Liquid pump maximum rated capacity in GPM times 0.16 equals vapor flow in CFM.

Authorizing statute(s): 80-10-503, MCA

Implementing statute(s): 80-10-503, MCA

History: NEW, 1986 MAR p. 1820. Eff. 10/31/86; AMD, 2024 MAR p. 128, Eff. 1/27/24.