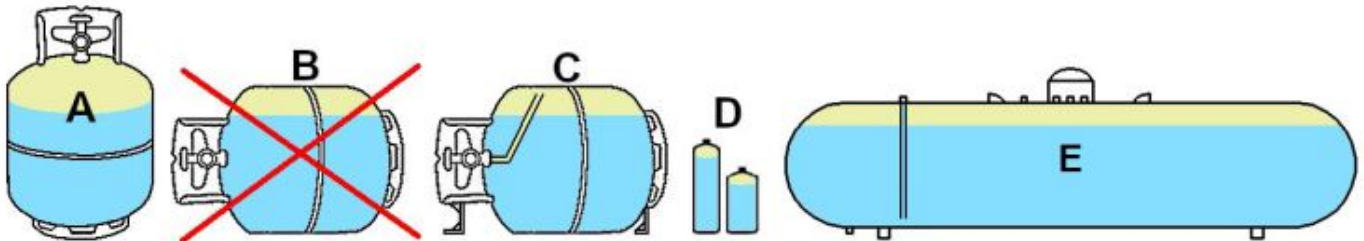


## PROPANE TANKS GENERAL INFORMATION

- Propane tanks can only be safely filled to 80%, the other 20% allows for pressure fluctuation with temperature change
- Propane is always stored under pressure as a liquid and boils at  $-44^{\circ}$
- Above  $-44^{\circ}$  the upper portion of the tank will be vapor, the lower portion will settle as a liquid
- Tank design determines if the valve draws liquid or vapor
- Tank pressure unregulated will average 30-250psi (dependent on temperature)
- You can not accurately measure how much propane is in a tank by pressure, you have to measure the liquid propane level via float gauge, sonar or by weight.
- Tank orientation is very important for vapor AND liquid tanks

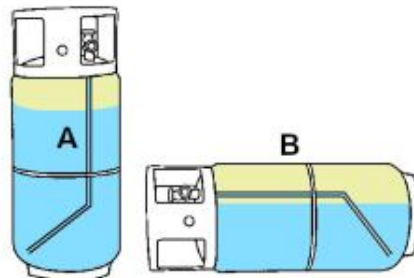
## VAPOR TANKS

Vapor tanks are designed to draw the boiling vapor from the surface of liquid in the tank. Vapor tanks will have a 1-5/16" acme or female POL connection. Sizes can range from 1lb to 100lb, bulk tanks that sit outside of a home and will also include RV tanks. **Figure A** shows a common 20lb grill tank. The yellow color represents vapor propane. Appliances, torches, small engines and other applications use vapor propane and will NOT work with liquid propane. **Figure B** shows a 20lb tank that has been set horizontally, you can see that the tank will now draw liquid which is not safe and will not work with vapor applications. **Figure C** shows a purpose built horizontal vapor tank, brackets welded on for horizontal mounting and an internal tube that draws vapor in a horizontal application. **Figure D** shows standard 1lb (disposable) tanks, these also draw vapor. Finally **figure E** shows a bulk tank that would sit outside of a home. These tanks also draw vapor and usually have a regulator under the lid to bring the pressure down before going to the house. Some tanks also have an optional liquid draw valve (tube shown on the left going to the bottom of the tank to draw liquid)



## LIQUID TANKS

Liquid tanks are designed to draw liquid propane at all times. Liquid tanks normally have a 1-1/4" acme connection but will sometimes have different connections depending on the application. Liquid tank sizes are commonly 33.5lb and 43.5lb used with forklift and industrial applications but can come in smaller and larger sizes, usually there is a clear marker near the service valve that will say LIQUID. Another example of a liquid draw tank would be an autogas tank found on automotive applications that run on propane. **Figure A** shows a forklift tank standing vertically. The tank has a tube welded internally that goes to the bottom of the tank to draw liquid standing vertically. **Figure B** shows the same tank laying on its side, positioned correctly the tank will still draw liquid.



## Propane

### Table 3 – Second Stage or Integral Twin Stage Pipe Sizing

11 Inches Water Column Inlet with a 1/2 Inch Water Column Drop  
Maximum capacity of pipe or tubing in thousands of BTU/hr of LP-Gas

Size of Pipe or Copper Tubing, Inches		Length of Pipe or Tubing, Feet									
		10	20	30	40	50	60	70	80	90	100
Copper Tubing (O.D.)	3/8"	49	34	27	23	20	19	-	16	-	14
	1/2"	110	76	61	52	46	42	38	36	33	32
	5/8"	206	141	114	97	86	78	71	67	62	59
	3/4"	348	239	192	164	146	132	120	113	105	100
	7/8"	536	368	296	253	224	203	185	174	161	154
Pipe Size	1/2"	291	200	161	137	122	110	102	94	87	84
	3/4"	608	418	336	287	255	231	212	198	185	175
	1"	1146	788	632	541	480	435	400	372	349	330
	1 1/4"	2353	1617	1299	1111	985	892	821	764	717	677
	1 1/2"	3525	2423	1946	1665	1476	1337	1230	1144	1074	1014
2"	6789	4666	3747	3207	2842	2575	2369	2204	2068	1954	

Size of Pipe or Copper Tubing, Inches		Length of Pipe or Tubing, Feet									
		125	150	175	200	225	250	275	300	350	400
Copper Tubing (O.D.)	3/8"	12	11	-	10	-	9	-	8	7	7
	1/2"	28	26	-	22	-	19	-	18	16	15
	5/8"	52	48	-	41	-	36	-	33	30	28
	3/4"	89	80	-	69	-	61	-	55	51	47
	7/8"	137	124	-	106	-	94	-	85	78	73
Pipe Size	1/2"	74	67	62	58	54	51	48	46	43	40
	3/4"	155	141	129	120	113	107	101	97	89	83
	1"	292	265	244	227	213	201	191	182	167	156
	1 1/4"	600	544	500	465	437	412	392	374	344	320
	1 1/2"	899	815	749	697	654	618	587	560	515	479
2"	1731	1569	1443	1343	1260	1190	1130	1078	992	923	

## Natural gas

### Capacity of Schedule 40 Metallic Pipe in Cubic Feet of Natural Gas Per Hour (based on .60 specific gravity, 0.30" w.c. pressure drop)

Pipe Size (Inches)	Length of Pipe in Straight Feet													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/2	131	90	72	62	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/4	273	188	151	129	114	104	95	89	83	79	70	63	58	N/A
1	514	353	284	243	215	195	179	167	157	148	131	119	109	102
1 1/4	1,060	726	583	499	442	400	368	343	322	304	269	244	224	209
1 1/2	1,580	1,090	873	747	662	600	552	514	482	455	403	366	336	313
2	3,050	2,090	1,680	1,440	1,280	1,160	1,060	989	928	877	777	704	648	602
2 1/2	4,860	3,340	2,680	2,290	2,030	1,840	1,690	1,580	1,480	1,400	1,240	1,120	1,030	960
3	8,580	5,900	4,740	4,050	3,590	3,260	3,000	2,790	2,610	2,470	2,190	1,980	1,820	1,700
4	17,500	12,000	9,660	8,270	7,330	6,640	6,110	5,680	5,330	5,040	4,460	4,050	3,720	3,460

## Vaporization Rate - 100 Lb. Propane Cylinders (Approximate)

Lbs. of Propane In Cyl.	Maximum Continuous Draw In BTU Per Hour At Various Temperatures In Degrees F.				
	0°F	20°F	40°F	60°F	70°F
100	113,000	167,000	214,000	277,000	300,000
90	104,000	152,000	200,000	247,000	277,000
80	94,000	137,000	180,000	214,000	236,000
70	83,000	122,000	160,000	199,000	214,000
60	75,000	109,000	140,000	176,000	192,000
50	64,000	94,000	125,000	154,000	167,000
40	55,000	79,000	105,000	131,000	141,000
30	45,000	66,000	85,000	107,000	118,000
20	36,000	51,000	68,000	83,000	92,000
10	28,000	38,000	49,000	60,000	66,000

This chart shows the vaporization rate of containers in terms of the temperature of the liquid and the wet surface area of the container. When the temperature is lower or if the container has less liquid in it, the vaporization rate of the container is a lower value.

The chart below is a reference guide to help determine the correct pipe size if teeing in at the outlet side of the meter. (Note: This is a guide only. Qualified personnel should calculate exact requirements.)

Pipe size (inches) Based on Distance in feet from Meter

Generator Wattage	Engine HP	10	20	30	40	50	60	70	80	90	100	125
1000	2.2	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
2800 3000	5.5	.5	.5	.5	.5	.5	.5	.5	.5	.75	.75	.75
4000	8.5	.5	.5	.5	.5	.75	.75	.75	.75	.75	.75	1
5200	10	.5	.5	.75	.75	.75	.75	.75	.75	.75	1	1
6600	12	.5	.5	.75	.75	.75	.75	.75	.75	1	1	1.25
12000	22	.75	.75	1	1	1	1	1	1	1	1.25	1.25

Though a generator may need 3/4" or larger pipe to the generator, a 1/2" hook-up hose is usually sufficient if kept short.

## TABLE 7 GENERATOR FUEL CONSUMPTION

Generator kW Rating		Fuel Consumption at 100% BTU/HR			Fuel Consumption at 50% BTU/HR		
LP Vapor	Nat. Gas	LP Vapor		Nat. Gas	LP Vapor		Nat. Gas
		BTU/HR	GAL/HR	BTU/HR	BTU/HR	GAL/HR	BTU/HR
7	5	115,000	1.26	117,000	90,000	1	85,000
9	7	125,000	1.37	121,000	79,000	0.87	90,000
11	9	179,000	1.97	159,000	107,000	1.18	111,000
15	13	261,000	2.87	281,000	120,000	1.32	134,000
16	14	267,000	2.94	309,000	229,000	2.52	218,000