



*Merchant Gas Group
Safety & Training*

Liquid Natural Gas (LNG)

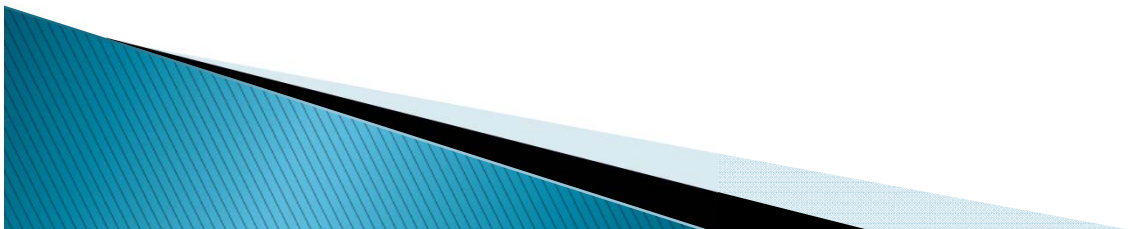
Merchant Gas Group
Safety and Training

Training Course # PB010

October 9, 2013

What is LNG?

- ▶ Natural gas that has been cooled to a liquid state at ambient pressure.
- ▶ Odorless, colorless, non-corrosive, non-toxic
- ▶ Methane content $\approx 95\%$ +
- ▶ Allows for transport over long distances
- ▶ Will freeze any tissue upon contact



LNG Trailer



Front of LNG Trailer



Located on Front of LNG Trailer

TEST DATE	NEXT TEST DUE	
7-11	7-16	P RESSURE RETEST
7-11	7-12	V (EXT) ISUAL



Pressure Building Coil



LNG Trailer – Left Rear & Operating Compartment



Located on Side of Trailer



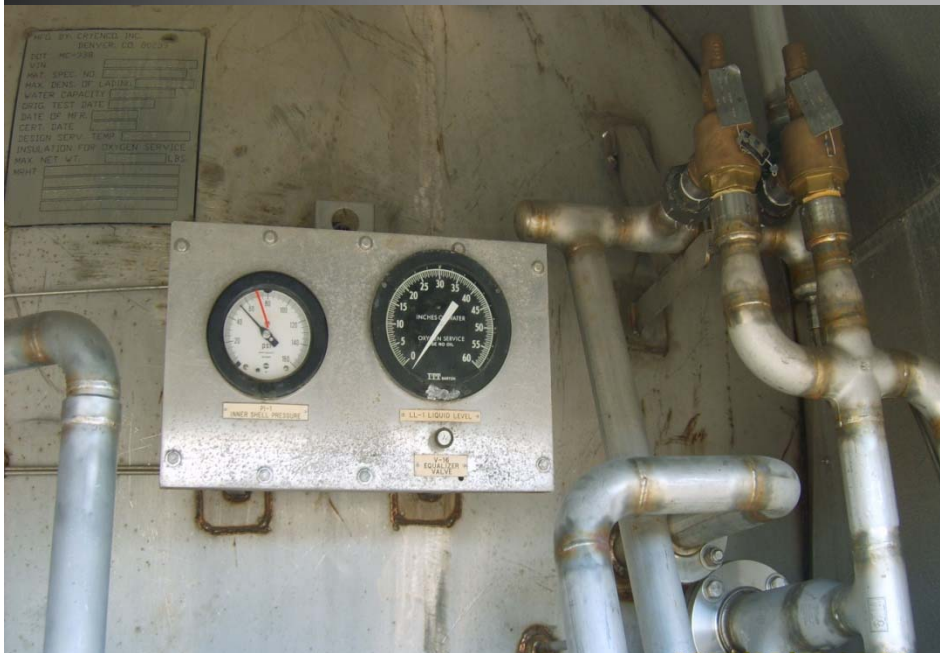
OWTT 636 Hrs METHANE/LNG REFRIGERATED LIQUID
OWTT 485 Hrs ETHYLENE REFRIGERATED LIQUID

(OWTT can be different for other products)

LNG – Rear Operating Compartment



Gauges & Safety Valves



Brake Interlock Switch

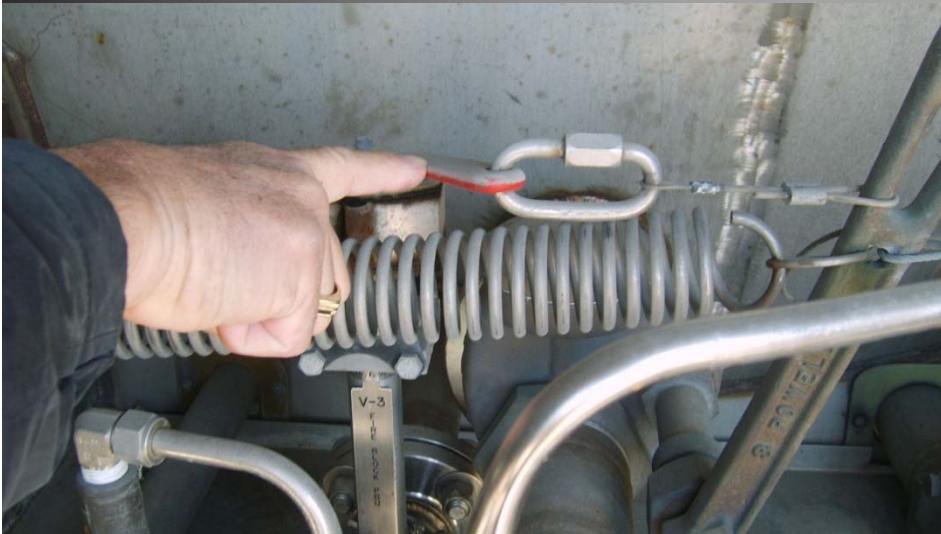


Inside of Rear Operating Compartment

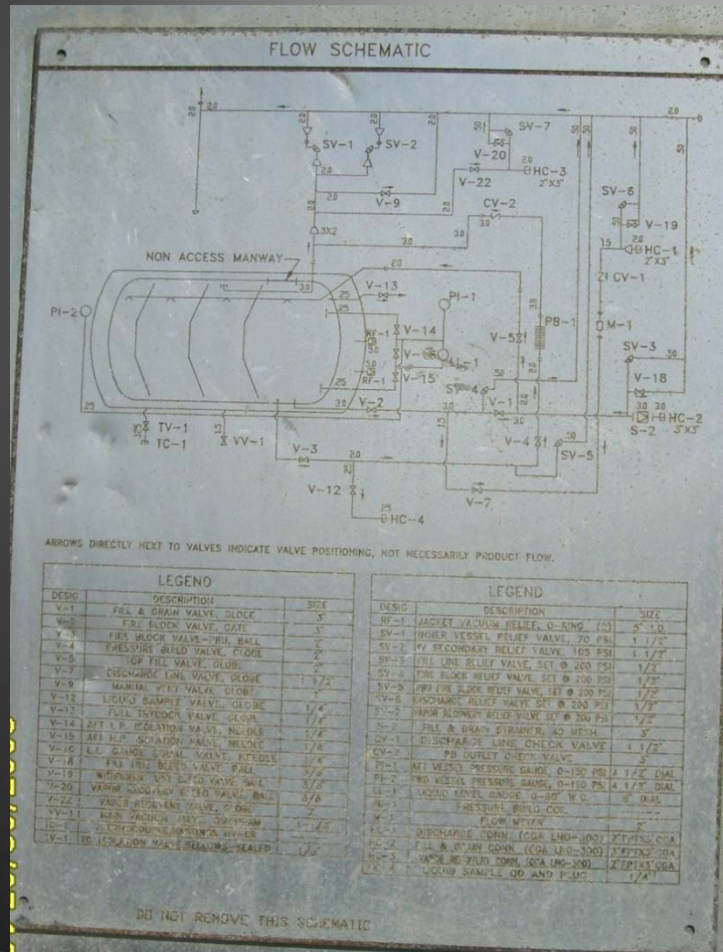


LNG – Emergency Shutdown

(Sometimes referred to as a Fire Block Valve)



Flow Schematic & Liquid Level Chart



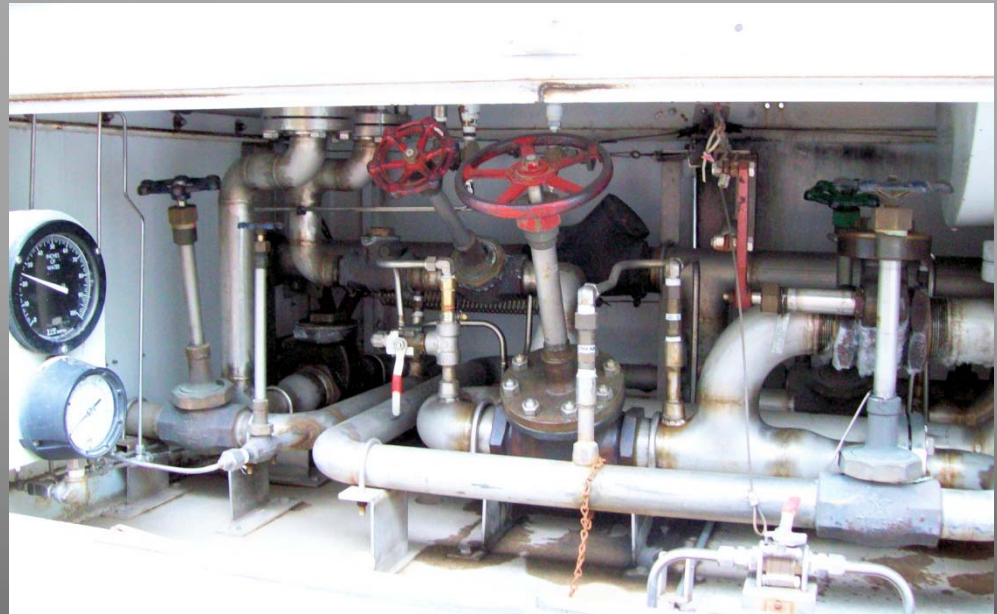
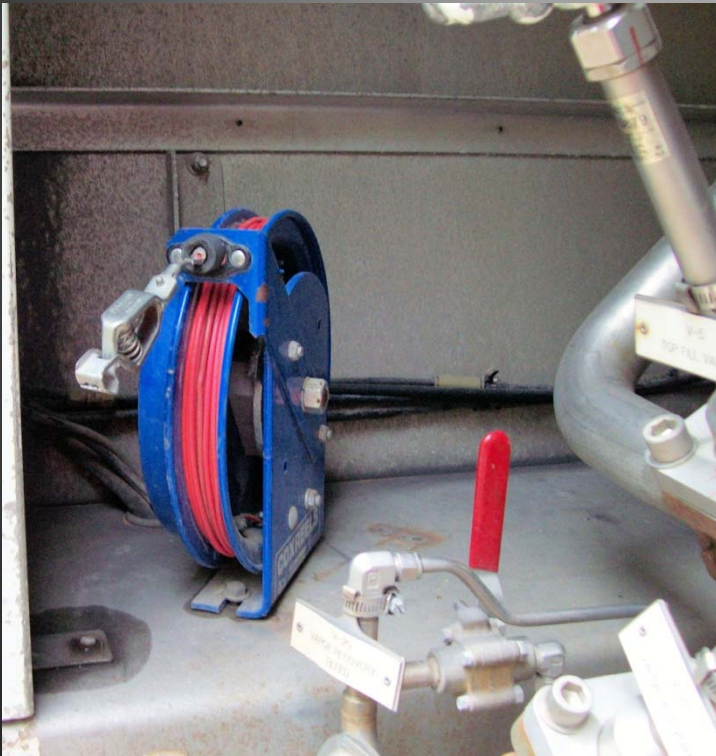
LIQUID LEVEL CONVERSION CHART
Model TRA-117/0 @ 1.2% Slope Liquefied Natural Gas @ 0.0 psig

IN H2O	GAL	POUNDS	MSCF	IN H2O	GAL	POUNDS	MSCF
5	3	9	2	24.0	8,272	29,259	690.9
1.0	15	51	1.2	24.5	8,489	30,026	709.0
1.5	40	141	3.3	25.0	8,704	30,787	727.0
2.0	82	289	6.8	25.5	8,918	31,542	744.8
2.5	142	503	11.9	26.0	9,129	32,289	762.4
3.0	222	785	18.5	26.5	9,338	33,028	779.9
3.5	316	1,117	26.4	27.0	9,545	33,759	797.2
4.0	421	1,490	35.2	27.5	9,749	34,480	814.2
4.5	537	1,899	44.8	28.0	9,950	35,191	831.0
5.0	661	2,340	55.2	28.5	10,147	35,891	847.5
5.5	794	2,810	66.3	29.0	10,342	36,579	863.7
6.0	935	3,306	78.1	29.5	10,533	37,254	879.7
6.5	1,082	3,828	90.4	30.0	10,720	37,915	895.3
7.0	1,236	4,372	103.2	30.5	10,902	38,562	910.6
7.5	1,396	4,937	116.6	31.0	11,081	39,192	925.4
8.0	1,561	5,522	130.4	31.5	11,254	39,806	939.9
8.5	1,732	6,125	144.6	*32.0	11,423	40,401	954.0
9.0	1,907	6,746	159.3	32.5	11,585	40,977	967.6
9.5	2,087	7,382	174.3	33.0	11,742	41,532	980.7
10.0	2,271	8,034	189.2	33.5	11,893	42,064	993.3
10.5	2,460	8,700	205.4	34.0	12,036	42,572	1,005.3
11.0	2,652	9,379	221.5	34.5	12,172	43,053	1,016.6
11.5	2,847	10,071	237.8	35.0	12,300	43,506	1,027.3
12.0	3,046	10,774	254.4	35.5	12,419	43,925	1,037.2
12.5	3,248	11,488	271.3	36.0	12,527	44,309	1,046.3
13.0	3,452	12,211	288.3	36.5	12,624	44,651	1,054.4
13.5	3,660	12,944	305.6	37.0	12,707	44,944	1,061.3
14.0	3,869	13,685	323.2				
14.5	4,081	14,434	340.8				
15.0	4,295	15,190	358.7				
15.5	4,510	15,953	376.7				
16.0	4,727	16,721	394.8				
16.5	4,946	17,494	413.1				
17.0	5,166	18,271	431.4				
17.5	5,387	19,052	449.9				
18.0	5,608	19,836	468.4				
18.5	5,831	20,623	487.0				
19.0	6,054	21,411	505.6				
19.5	6,277	22,201	524.2				
20.0	6,500	22,991	542.9				
20.5	6,724	23,782	561.6				
21.0	6,947	24,571	580.2				
21.5	7,170	25,359	598.8				
22.0	7,392	26,146	617.4				
22.5	7,614	26,929	635.9				
23.0	7,834	27,710	654.3				
23.5	8,054	28,487	672.7				

* Maximum Payload

A251072

Grounding Connector - rear compartment



Product Transfer



Make sure you connect ground cable

Customer's Site Procedures

1. Check in with guard at gate.
2. Go to tank and position truck.
3. Put out cones and chock truck.
4. Go to Maintenance Office and check in with Manager.
5. Maintenance Manager must check readings with you.
6. Connect ground cable.
7. Hook up hose.
8. Open fill and drain valve on trailer.
9. Open purge valve (21) at customer and purge hose.
10. Open pressure build valve on trailer and build pressure to 55.
11. Close purge valve (21) at customer.
12. Open fill valve to pump (V2).
13. Open air valve (27) pump return.
14. Purge Pump
15. Select tank 1 or 2 on panel switch (bottom left).
16. When pump is purged close air valve (27).
17. Push start button (top right)
18. Green cool down light will come on.
19. Do not hit start button again. Pump will start in about 15 to 30 seconds.
20. Watch pump gauge to catch prime (Bottom left).
21. Pump will shut off automatically when tank is full or hit stop if you loose prime.
22. Close fill valve to pump (V2).
23. Open hose purge valve (21).
24. When hose is purged disconnect hose.
25. Make sure all valves that you touched are closed on trailer and customer and switch is off.
26. Get final readings.
27. Have Maintenance Manager sign ticket (He will also make a copy of the weight ticket).

1. Weigh in and out at same scale. (West scale 0700-0800)(East scale 0800-1700)
2. Unload only at East window.
3. Get Tank readings from West window.
4. Hook up ground strap.
5. Hook up hose.
6. Open drain and fill valve on trailer.
7. Open hose purge valve at customer (555).
8. Build pressure in trailer 50-55.
9. When purge line is frosted close hose purge valve (555).
10. Open pump inlet valve (556) and pump return valve (554) at customer.
11. Purge pump.
12. Turn offload switch to Auto.
13. Push start button when liquid comes out of stack and close pump return valve (554).
14. Watch pump gauge to catch prime.
15. Pump will shut off when tank is full.
16. Close fill and drain on trailer.
17. Close pump inlet valve (556) at customer.
18. Open hose purge valve (555).
19. Unhook hose when drained.
20. Make sure all valves are closed.
21. Weigh out at same scale.

Minor Differences – use it

Steps May Vary – follow each

Customer Facilities – Product Delivery



DELIVERY INSTRUCTIONS

1. Pull in on West driveway.
2. Fill is on south side of tank.
3. Set Cones and Chocks and Check in at office.
4. Get readings and hook up ground strap.
5. Hook up liquid fill hose to Trailer. {Dedicated Hose}
6. Hook up vapor return hose to trailer and customer.
7. Open both hose purge valves at customer.
8. When liquid purge line is frosted close valve.
9. Open pump inlet valve and pump vapor return valve at customer.
10. Turn switch to tank 1 only.
11. When pump is purged hit start button and watch pump discharge gauge.
12. Close vapor return valve when pump catches prime.
13. VAPOR VALVE LEAKS BACK THROUGH (DO NOT DISCONNECT HOSE UNTIL FILL IS DONE.)
14. Once fill is done purge vapor hose and unhook.
15. Purge liquid hose and unhook at trailer only.
16. Check that all valves are closed.
17. Go to _____ office to sign paperwork.

Hazards – Vapor Clouds



- ▶ LNG vapor/air mix temperature results in condensation on outer edges of vapor cloud
- ▶ Visible area looks like steam/fog
- ▶ **CAUTION** vapor hazards go beyond the visible cloud

LNG – *the end*

