




**Transportable LPG Tank**  
**Safety Overview and Operating Procedures**

<b>Revision</b>	<b>Date</b>	<b>Purpose</b>	<b>By</b>	<b>Approved</b>
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## I. Basis of Procedures

These procedures are based in part upon NFPA 58, 2011 Edition and API 2510.

## II. Important Disclaimer – Procedures not Sufficient

These safety considerations and procedures are designed to provide a supplement to a trained, knowledgeable, and competent operator in the prudent use of the portable LPG tank systems, **THESE PROCEDURES ARE NOT A SUBSTITUTE FOR AN ENGINEERING REVIEW OF YOUR PARTICULAR PROCESS OR PROPER KNOWLEDGE AND TRAINING OF OPERATORS.**

## III. Mobilization and System Set Up

### A. Tank Location Planning

#### 1. *Site Specific Plan*

For each deployment of equipment, the user is responsible to develop a sketch or drawing showing the approximate location of each tank, prior to mobilization of equipment. The site specific plan will include on the sketch or drawing:

- 1) The spacing between the Tank in feet compliant with NFPA 58 and the Spacing Guidelines below.
- 2) The orientation of each Component.
- 3) All system components.
- 4) An indication of the LPG loading or unloading truck location and pathway compliant with the Loading Area Guidelines below.
- 5) **SPECIAL NOTE: THE ONBOARD BULKHEAD AND “TRIPOD” DRY DISCONNECT VALVES HAVE BEEN DESIGNED FOR MAXIMUM SAFETY OF THE TANK, BUT THESE MAY NOT SATISFY LOCAL LAW REGARDING LPG BULKHEADS FOR TANK UNLOADING (OR SOMETIMES LOADING) (SUCH AS IN TEXAS). IT IS THE USER’S RESPONSIBILITY TO CHECK WITH THEIR LOCAL AUTHORITIES REGARDING LOCAL REGULATIONS.**
- 6) Location of the Emergency Stop stand for the Tank.
- 7) Other features of note on the site so as to allow proper arrangement of the equipment (such as buildings, entrance, piping runs, ground rod insertion points, etc.).

- 8) Approximate extent of improved surface and the location of any surface hazards that could affect placement of units (such as pits, soft spots, etc.). Also note any ditches, dikes, or low spots near Tank location. **SPECIAL NOTE: THE TANK LANDING GEAR PADS DO NOT HAVE SUFFICIENT SURFACE AREA FOR UNIMPROVED SURFACES OR FOR POORLY IMPROVED SURFACES. CONSULT A SOIL OR PAVEMENT ENGINEER. IT IS RECOMMENDED TO USE A STEEL PLATE AND RIG MAT OR STEEL PLATE AND 3 OR MORE RAIL ROAD TIES UNDER THE LANDING GEAR FOR POORLY OR UNIMPROVED SURFACES. The tanks are susceptible to sinking in to the dirt / scoria / caliche and have done so before. This shifting or sinking can stress, damage, or rupture LPG connections and pose a risk of the tank falling over. FIRE, EXPLOSION, AND SEVERE INJURY TO PERSONS AND OR PROPERTY, INCLUDING DEATH FROM THIS POTENTIALLY SUDDEN MOVEMENT CAN OCCUR.**
- 9) The site specific plan will also include notations for the location of fire suppression equipment to be located on the site as well as emergency contact information for fire, EMS, and hospitals.
- 10) Initiation of a Risk Management Plan (RMP), Process Safety Analysis (PSA) or related risk management or process safety program is the responsibility of the user. **SPECIAL NOTE: IN CRYOGENIC PROCESS OPERATIONS WHERE THERE IS THE POTENTIAL OF PRESSURES HIGHER THAN ORDINARY VAPOR PRESSURE OCCURRING IN THE TANK (SUCH AS DOWN STREAM FROM A COMPRESSOR OR OTHER HIGHER PRESSURE SOURCE) SECONDARY PRESSURE / VAPOR RELIEF MUST BE PROVIDED OR NEW RELIEF VALVES MUST BE INSTALLED TO SATISFY THE MDMT OF THE PARTICULAR TANK. CONSULT THE MANUFACTURER OR A METALLURGICAL ENGINEER. THE RELIEF VALVES DO NOT ADJUST THEIR PRESSURE WITH LOWER TEMPERATURE AND WILL NOT PROVIDE PROPER RELIEF AT LOW TEMPERATURES IF THERE IS A SOURCE OF PRESSURE OTHER THAN THE PRODUCT ITSELF ON THE TANK. THIS COULD RESULT IN CATASTROPHIC TANK FAILURE, PRODUCT RELEASE, EXPLOSION, SEVERE PROPERTY DAMAGE AND DEATH.**
- 11) Call before you dig - OneCall / 811 for all grounding or other ground penetrations needed for the equipment (OneCall clearances are good for 21 Days).
- 12) Evaluation and initiation of any permits related to the tanks are the responsibility of the user to obtain.
- 13) Most Tanks have “three-way” valves for maximum safety (high flow, thermal, and pneumatic). Plan for a source of pressure for the pneumatic valves. They must be under pressure to open. This pressure should be as labeled on the valve (40-60 psi), do not exceed 100 psi. If supplied by air, the supply should be regulated and dried to avoid moisture build up in the valve, which could damage the valve or freeze, potentially rendering the valve inoperative. Regulated nitrogen can also be used to open valves. For safety reasons, do not

use stainless steel / metal lines for valve pressure. The lines should melt and rupture in the event of a fire, which will de-pressure and close the valves.

**Ensure that the authority having jurisdiction (the LPG regulator) is notified of the temporary installation per NFPA 58 4.3.2.1.**

Ensure that the appropriate emergency responders (EMS, fire, police, ambulance, etc.) are notified of the installation and special risks of the installation and (per NFPA 58 6.25.2) are given copies of:

1. This document
2. Site specific plan (including RMP, PSA or related requirements)
3. Appropriate NFPA or other training materials

Perform a fire safety analysis as part of the site specific plan per NFPA 58 6.25.3. Such a plan will clearly note the reliance on total product control and the inadequacy of fire suppression in the event of a fire. The safety analysis will also contain recommendations to first responders to not to attempt to suppress the fire similar to the emergency procedures outlined below.

Enduring Block's procedures should be added to the site emergency response plan.

Ensure that the approval of the authority having jurisdiction is obtained for the exposed steel support legs of the Tank per NFPA 58 6.6.5.4.

Do not enclose Tank, dike Tank, or provide spill containment for Tank. LPG and propane vapors are heavier than air and can collect in low areas in the event of a leak, creating an explosion hazard.

Valve locks for Tank access valves are recommended in areas where the public can access the Tank.

## **2. *Spacing Guidelines***

- 1) Stationary engines should be at least 50 feet from the Tank.
- 2) The Tank Shall be placed:
  - a) at least 25 feet from un-classified electrical devices.
  - b) at least 50 feet from any combustion equipment (engine driven compressors (such as GasJacks), generators, heater treaters, heaters, etc.).
  - c) at least 100 feet from any open flame or flare
  - d) the greater of 100 feet or one diameter of the larger tank away from oil or condensate storage tanks, but need not be more than 200 feet from any storage tank.
  - e) at least 100 feet from an occupied building, trailer, dog house, etc.

- f) at least 50 feet from any overhead power line, transformer, or substation, and the Tank shall not be placed where a break in power lines would allow the lines or exposed ends to contact the tank.
  - g) at least 100 feet from any navigable waterway, lake, ocean, dock, or pier
  - h) at least 10 feet from the edge of spill containment structures for flammable or combustible liquid (see also note on diking).
  - i) at least 7 feet from another Tank or other pressurized tanks, such as other propane / LPG Tanks.
  - j) Orient the Tank so that its longitudinal axis does not point at your facilities or the loading area, i.e, the ends are not facing facilities (in a failure the ends cause more damage). This requirement may be waived by the user due to the temporary nature of the installation.
  - k) Not near to ditches, dikes, or depressions that could allow heavier than air vapors to accumulate.
- 3) A barrier or physical notification of impending collision (such as a stake or bump) shall be placed between traffic zones and piping on the ground as well as near the Tank.
  - 4) Any flares or portable flare shall be at least 100 feet from the Tank or any customer tanks. These distances are based on less than 2 mmcf/d of flare volume. These must be recalculated using approved methods for higher volume flares. The flare should not be set where the prevailing wind or a switching wind would blow the flare toward the Tank. If this cannot be avoided, increase spacing to 150 feet. See Appendix A Flare Spacing for further information.
  - 5) Lighting shall be more than 15 feet from the Tank, if it is not Class I Div II, if it is, then lighting should be at least 5 feet from the MRU or Tank.

### ***3. Loading / Offloading Area Guidelines***

- 1) A barrier shall be located at least 7 feet (so as to affect a 10' truck separation) from the Tank, when loading directly to or from the Tank.
- 2) A means of bonding loading / offloading trucks to the Tank shall be used.
- 3) Product lines not specifically protected for the purpose shall not be placed under the transit area.
- 4) The loading truck pathway should be more than 10 feet from the MRU.
- 5) It is a best practice to ensure a loading truck pathway that avoids backing of the truck, such that the truck can either drive through or U-turn after loading. Driving through is preferable to U-turning. If backing cannot be avoided, place a Barrier or Barriers where the reverse path of the trailer would be near to any equipment or piping.
- 6) The emergency shut-off valve shall be at least 25 feet, but not more than 100 feet from the loading point, along the path of egress (exit). The remote ESV shall be labeled with "NGL Liquid Tank Valve Emergency Shutoff", or similar legend.

- 7) If loading operations are anticipated in other than daylight hours, ensure that proper lighting is provided in the loading area. Ensure that such lighting (and its power source) are either (a) Class I Div II, if less than 15 feet from Tank or MRU, or (b) more than 15 feet from Tank.
- 8) Check with your supply or transport company with regard to proper hoses and fitting required for NGL product offloads.

## **B. Component Set Up**

### *1. Examine Site*

Ensure that the site reflects the conditions in the Site Specific Plan. If it does not, modify the plan prior to set up to reflect site conditions. **Do not set up equipment without a Site Specific Plan.**

### *2. Component Placement*

Set components according to the Site Specific Plan. Verify spacing measurements using a measuring device at the site. Verify orientation by referring to the Site Specific Plan. Verify all components have been placed (including E Stop).

### *3. Component Bedding*

Only deploy Tank on properly improved surfaces – SEE SPEICAL NOTE ABOVE. Do not deploy on loose or compactable soils or in areas prone to wash out. Use steel plates and rig mats / rail road ties under Tank landing gear. Ensure that the Tank is level. If it is not level, move the tank to a level location compliant with Spacing Guidelines. Only approved blocks and shims may be used to level units – move the unit first – only use blocks if unit cannot be relocated to a level area. Blocks and shims shall not exceed 6” in height.

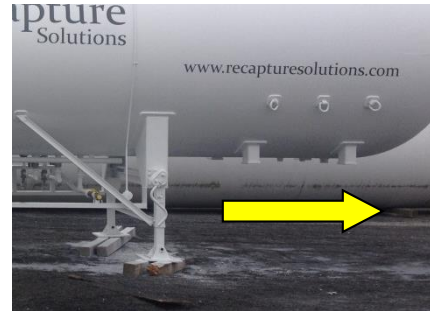
## **C. Component Hookup**

Notes on hookup:

- 1) Ensure Job Safety Analyses are completed PRIOR to conducting any work onsite. JSAs should be completed where needed on a daily basis for the duration of all installation work, as well as, any ongoing maintenance needed.



- 2) Remove wheel bogey set from Tank and move 15 feet away.



- 3) Hook up system for pressuring Tank liquid and vapor ESV valves (typically a small air compressor attached to the stabilizer skid)
- 4) Ensure support plates are placed under the landing gear PRIOR to lowering the legs. If the ground is soft and support plates aren't used, the landing gear may sink into the ground causing them to collapse.

#### **D. Site Safety Review**

- 1) Measure equipment spacing on ground and compare to Site Specific Plan.
- 2) Verify that Barrier placement does not allow transports to come closer than 10' to tank.
- 3) Verify that Tank Remote E-stop is placed at least 25' from loading point along path of egress, but not more than 100'.
- 4) Verify spacing of potential ignition sources to the Tank.
- 5) Ensure that the Tank is equipped with a fire extinguisher and that the extinguishers display "good" condition on gauges.
- 6) Ensure designated LPG transport firm has written procedures and training to attach ground wire and vent/vapor line when loading.
- 7) No smoking or open flames (including tools for hot work) are allowed within 100 feet of Enduring Block Tanks.
- 8) The public is not allowed on sites where Enduring Block Tanks are deployed. It is the responsibility of the user to control access to their site.

### **IV. System Operations and Maintenance**

#### **A. Daily Checks - Perform daily checks of the Tank**

#### **B. Loading and Unloading**

Any contractor loading or unloading from Enduring Block Equipment must have written loading and unloading procedures meeting the requirements of NFPA 58. Personnel conducting unloading or loading operations must be qualified to do so and be properly trained.

### **1. Tank Venting or Purging**

- 1) The Tank shall not be purposely vented or purged on a site with an open flame or active flare.
- 2) The Tank shall not be vented or purged on a site with active combustion equipment (such as compressors or generators) or open flames.
- 3) The Tank should only be vented on a site where the prevailing wind (and the forecast for the duration of the purge) is away from equipment, buildings, and personnel and at least 5 knots.
- 4) It is a preferred method to flare the contents of the Tank using a portable flare with spacing per the Spacing Guidelines. Ensure the flare has a liquid knock out drum of sufficient capacity. Be aware that the ESV valves in the Tank will shut if they detect excess flow, therefore the flow during flaring must be controlled.

### **2. Tank High Level**

- 1) The Tank should not be filled above 85% when the product temperature is above 0°F, or 82% when the product temperature is below 0°F, but above -35°F. Below -35°F, 80% should be the maximum fill level. Refer to the Tank gauge documentation to determine if the gauge is temperature correcting or not.
- 2) If the Tank is filled above this level, arrange for immediate transport pickup of Tank contents.
- 3) Some Tanks are equipped with high level indicator switches. Do not rely solely on these to control tank levels.

## **C. System Maintenance Guidelines**

Follow manufacturer's maintenance schedules for Tanks as detailed in manufacturer's maintenance manuals. Document all maintenance activities. All maintenance records should be maintained for the life of the equipment.

### **1. Daily Maintenance**

General guidelines in the absence of manufacturer recommendations:

- 1) Visually note weeds, grass, wood or other combustible materials around or under Tank. These must be kept 10 feet from container.
- 2) Check pneumatic valve supply pressure.
- 3) Ensure position of remote E-stop.

### **2. Periodic Maintenance**

- 1) Inspect any LPG hose prior to attachment between Tank and other equipment.
- 2) Follow an appropriate Fire Protection & Extinguisher Program. Refer to your program for full details. Inspect any fire extinguishers to ensure:
  - a) The extinguisher is physically present and mounted.

- b) The extinguisher is fully charged (that is, the arrow, if a gauge is attached, is in the green zone).
  - c) The tamper seal is unbroken.
  - d) The extinguisher appears undamaged.
  - e) The extinguisher is accessible.
  - f) The inspection tag is less than a year old.
  - g) Repair, service, or replace any extinguishers not meeting the above requirements.
- 3) Inspect the outside of the Tank upon each deployment. If there is any denting, bulging, or gouging, or there is excess corrosion, the container shall not be placed in service without a service review by an ASME certified (stamp) shop. The Tank shall be maintained with paint to prevent corrosion.

### **3. *Annual Maintenance***

- 1) Inspect any and all hoses connecting with Tank. Inspect for the following conditions:
  - a) Damage to the outer cover that exposes reinforcement.
  - b) Kinked or flattened hose.
  - c) Soft spots or bulges in hose.
  - d) Couplings that have slipped on the hose, are damaged, have missing parts, or have loose bolts.
  - e) Leakage other than permeability leakage.

If any of the above conditions are present, discontinue use of the assembly, and replace with a new assembly. If the issues are with the body of the hose, cut the hose up and dispose of it properly. If the issues are with hose hardware, the hardware may be repaired or replaced by an appropriate, authorized repair facility.

Flex hoses shall have permanent markings for the date of installation. Flex hoses shall be replaced at least every 10 years. Each year, note the age of the hose. Also, the flex hose shall be replaced if the associated (if any) Tank is re-piped, or re-tanking is performed.

- 2) Check action of ESVs and check valves on Tank. Document test and results.
- 3) Refer to manufacturer for other periodic maintenance.
- 4) Check to ensure that the temperature sensitive portion of the ESV has not been painted.
- 5) Check condition and presence of rain caps for pressure relief valves. Replace or repair if missing.

### **4. *Long Term & Other Maintenance.***

- 1) Test pressure relief valves on Tank every 10 years.
- 2) If Tank is involved in a fire, the Tank must be re-certified by an ASME shop.
- 3) Gaskets:

- a) If a flange is opened, the gasket shall be replaced.
- b) All gaskets shall be made of metal or other material confined in metal having a melting point over 1500°F or 816°C, or shall be protected against fire exposure.
- c) Aluminum O-rings and spiral-wound metal gaskets shall be permitted.
- d) Gaskets shall also be resistant to the action of LP gas.
- 4) If any maintenance is performed on the Tank, or a new Tank is procured, ensure that it has the following:
  - a) Internal spring type, flush type full internal pressure relief valve.
  - b) A fixed maximum liquid level gauge.
  - c) A float gauge, rotary gauge, slip tube gauge, or a combination of these.
  - d) A pressure gauge.
  - e) A temperature gauge.

## V. Emergency Procedures

### A. System leaking or emitting small amounts of gas or liquid hydrocarbons.

- 1) Shut down all sources of ignition, including vehicles and other engines as well as non-classified electrical systems.
- 2) If vapor coming from Tank, flip valve shut lever on Tank.
- 3) Survey area for presence of vapors or liquids. **DANGER: Some LPG component vapors are heavier than air and will collect in low lying areas and inside containment walls. They may explode in the presence of an ignition source.**
- 4) Wait 30 minutes before starting any vehicles or equipment.
- 5) Determine cause of leaks and remedy before attempting to restart equipment.

### B. Major emission of LPG vapor or hydrocarbons.

- 1) A large emission would be 10 gallons of liquid or a visible vapor cloud along the ground.
- 2) **DANGER: If vapors are visible or suspected near the generator or client combustion equipment (vehicles, engine driven compressors, heater treaters, flares, etc.) especially if engines are revving up or over-speeding – VACATE THE AREA - an explosion may be imminent. Do not attempt to start any vehicles. Do not activate E-stops unless they are in your path of exit.**
- 3) If (2) above is not the case, activate the E-stops on any equipment that could produce ignition and the Tank.
- 4) Wait for vapors to dissipate for 2 hours (if low wind condition) after stopping the source of vapors. **DANGER: Not all LPG vapors will be visible. Tunnels, culverts, ditches, or depressions may hold LPG vapors, especially if it is a calm day. In these cases, 2 hours may not be sufficient to dissipate all vapors. If you are unsure, avoid machinery in**

these areas, and test with a “sniffer”. Never test for vapors with a match or lighter or other flame.

- 5) Determine the cause of leaks and remedy before attempting to restart equipment. Warn others and allow waiting period to pass before restarting client equipment.

## C. Fire.

### 1. General LPG / NGL fed fire.

**DANGER: Do not extinguish a LPG or NGL gas or liquid fed fire without stopping the source of the gas.** If extinguished, heavier than air vapors can collect and be re-ignited by hot components, resulting in a fireball or explosion.

### 2. Fire touching or near to tank.

- 1) **DANGER: The tank may explode in as little as 5 MINUTES depending on liquid level in the tank. Tank will explode without warning (no buckling, popping, etc.). The Safe Distance is ½ mile for the Tank. If fire is touching tank, and has not immediately started (i.e., you did not witness ignition), do not attempt to fight fire, retreat immediately to safe distance and observe tank from side of tank (not ends). If you see fire start, you have 5 minutes to extinguish fire AND reach safe distance. If the fire is hydrocarbon fed, evacuate to safe distance, do not attempt to fight fire. If fire is other (brush, trash, etc.) take immediate action and leave within 5 minutes. Your truck (even a fire truck) is not adequate protection – You must make safe distance. Even after fire is extinguished, the tank may be weakened and could rupture. Consult experts prior to approaching tank after a fire. Note: The normal operation of the pressure relief valves will not prevent tank explosion, which is typically caused by heat weakened steel, not necessarily over-pressure. The lower the liquid level in the tank, the more likely it is that the tank will explode.**
- 2) Call fire department or 911.

## D. Tank is leaning or listing

- 1) Note: If list or lean is greater than 10° (slight), do not attempt to shut Tank valves while performing Total System Shut Down. Stay well clear of Tank.
- 2) Perform Total System Shut Down, noting 1 above.
- 3) Call out transport to unload or re-level Tank (do not attempt to unload without leveling support equipment if list or lean is greater than 10° (slight)).
- 4) Do not re-start system until Tank has been examined / re-leveled.

## VI. System De-Mobilization

### A. Disconnection

- 1) Be very aware of stored energy hazards / pressures check gauges, use drains or purge valves / lines to reduce pressure.
- 2) Hoses can whip causing severe injury even at moderate pressures. **Never bleed pressure by loosening a hose connection.**
- 3) Be aware that Liquid NGLs / propane will boil and re-pressurize de-pressurized containers.
- 4) Ensure that hoses and pipes do not get dirt and debris in them when disconnecting.
- 5) Shut all skid / tank system valves prior to transport.
- 6) Be aware of grounding rods and grounding wires which could present a transport and loading hazard.

### B. Transport

- 1) The Tank may not be moved with more than 900 gallons (5% of its volume) of liquids in the tank. If the Tank contains more liquid, remove the liquid with a transport prior to moving.
- 2) Do not raise landing gear or stabilizer legs until transports are on site and in position and ready to load equipment.
- 3) Do not transport Tank if there are any product leaks.

\*\*\*\*\*

Acknowledgement:

I have received, read, and understand the above procedures. Any questions regarding these procedures have been answered to my satisfaction. I and my organization agree to abide by these procedures and promptly notify Enduring Block, LLC of any violation of these procedures by our employees or others, flaws found in the procedures, or unsafe events caused by these procedures or omissions in these procedures.

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## VII. Appendix A – Flare Spacing

<b>Flare Radiation Table</b>						
Flare Height:	25	feet				
Fuel Energy Content (LHV, or net):	1,504	btu/scf				
Equipment Distance:	75	feet				
Rate (mcf/d):	<b>250</b>	<b>350</b>	<b>500</b>	<b>1,000</b>	<b>1,250</b>	<b>2,000</b>
Radiant Energy per day (btu/d) ( $\tau=1.0, K=0.3$ ):	112,824,031	157,953,643	225,648,062	451,296,123	564,120,154	902,592,247
Energy per hour (btu/hr):	4,701,001	6,581,402	9,402,003	18,804,005	23,505,006	37,608,010
Surface area of sphere impinging on ground, at base ( $4\pi r^2$ ):	7,854	7,854	7,854	7,854	7,854	7,854
Thermal Load (btu/(ft <sup>2</sup> *hr)) at grade level, base of flare	599	838	1,197	2,394	2,993	4,788
Personnel Condition:	2-3 minutes	2-3 minutes	2-3 minutes	Evacuation only	Evacuation only	Not Allowed
Surface area of sphere impinging on ground, at 50' from base	39,270	39,270	39,270	39,270	39,270	39,270
Thermal Load (btu/(ft <sup>2</sup> *hr)) at grade level	120	168	239	479	599	958
Personnel Condition:	Unlimited	Unlimited	Unlimited	Unlimited	2-3 minutes	2-3 minutes
Surface area of sphere impinging on ground, at 100' from base	133,518	133,518	133,518	133,518	133,518	133,518
Thermal Load (btu/(ft <sup>2</sup> *hr)) at grade level	35	49	70	141	176	282
Personnel Condition:	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Surface area of sphere impinging on ground, at Equipment of 75' from base	78,540	78,540	78,540	78,540	78,540	78,540
Thermal Load (btu/(ft <sup>2</sup> *hr)) at grade level	60	84	120	239	299	479
Personnel Condition:	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Note: Calculations exclude solar radiation, which is 330 btu/(ft <sup>2</sup> *hr) maximum (1.04kW/m <sup>2</sup> )						
Note: Calculations assume flame center at tip, which is generally conservative.						
Note: Calculations assume F factor of 0.3, which is conservative (range of 0.1 to 0.3)						