ATL® PETRO-FLEX®

USER GUIDE & SAFETY MANUAL
FOR RANGE EXTENSION FUEL BLADDERS

ATL SAFETY FUEL CELL DIVISION

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DS-548
5/04

"ATL" PETRO-FLEX® RANGE EXTENSION FUEL BLADDERS

I.) Petro-Flex Applications

Petro-Flex Range Extension Fuel Bladders Are Intended For:

a.) Ferrying unpressurized aircraft under permit and sanction of the F.A.A. or other jurisdictional body

b.) Carrying reserve fuel on the open deck of U.S.C.G.-compliant boats including commercial, defense and pleasure craft

c.) Extending the travel range of: off-road vehicles, construction equipment, open trucks and military equipment

d.) Providing a fuel supply for power generators, water pumps, air compressors, HVAC components, cement mixers and the like

II.) Petro-Flex Compatibility

Petro-Flex Bladder Tanks Should Be Used To Hold Hydrocarbon Fuels Only:

a.) Gasoline; to 40% aromatics (ASTM Fuel B)

b.) Diesel fuels; all

c.) Turbine fuels; JP4, 5, 8, 10, Jet A, etc.

d.) Heating oils; #2, #4

e.) Collected vapors and condensates of fossil fuels

f.) Kerosene, mineral spirits and isooctane

g.) Gasoline/alcohol hybrids up to 15% (vol.) methanol or ethanol

h.) Vegetable oil type bio-fuels and combustible plant extracts

III.) Petro-Flex Dynamic Restraint

All Petro-Flex Bladder Tanks Used In Mobile Applications Must Be Secured Or Restrained By One Of The Following Methods:

a.) Within a ventilated rigid container, compartment, locker or nacelle

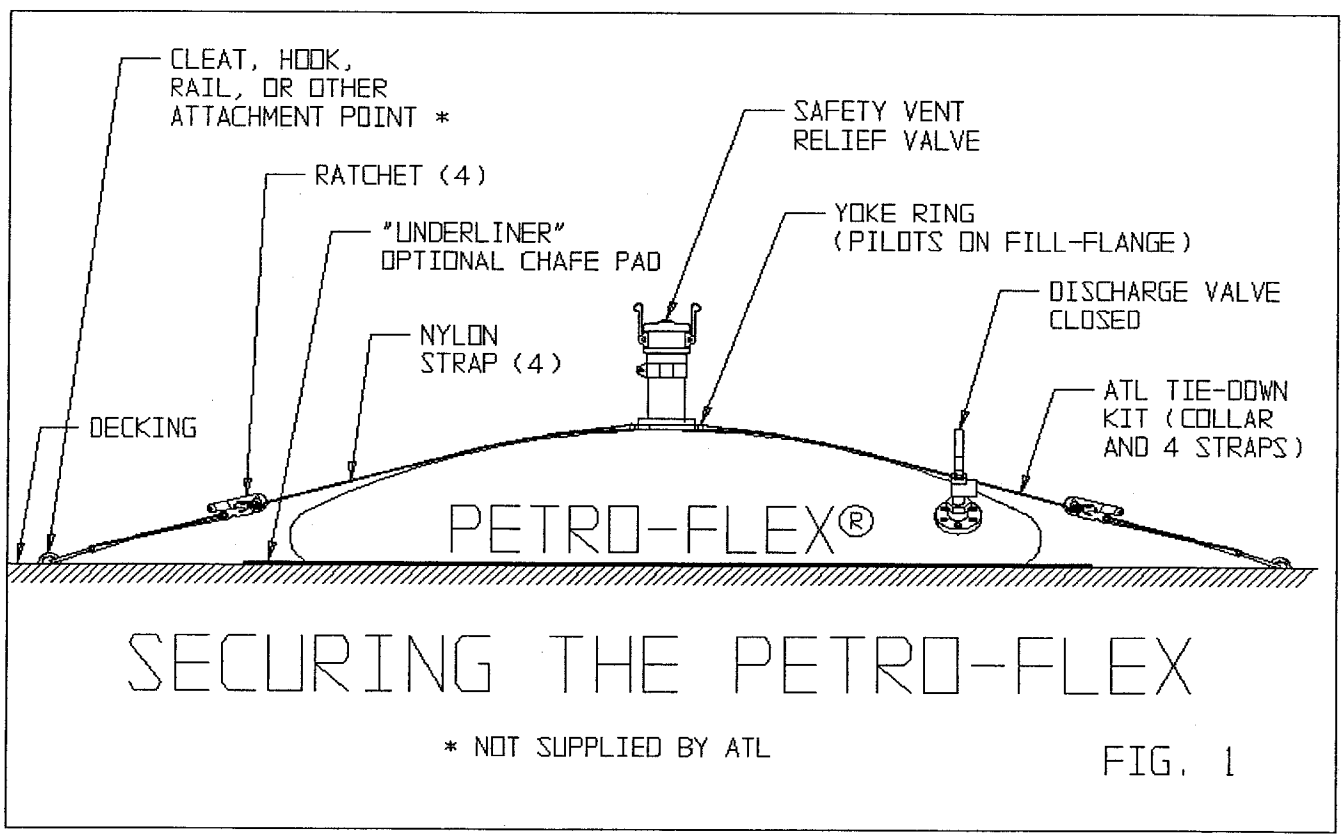
b.) Under a fastened cargo net or nylon web harness

c.) Within (4) ratchet tie-down straps; (2) in either direction

d.) Using an ATL collar-type tie-down kit

e.) Or another active restraint means able to absorb 3 g. loadings along all axis

In rough weather and during hard maneuvers, the Petro-Flex tank might shift or roll without an adequate tie-down system. Do not take chances, secure the fuel load for all contingencies.



ATL Tie-Down Collar with ratchet straps at 4 equally spaced points.

Bladders can also be secured with cargo nets and harness webs. If a partial discharge of fuel is made, re-tighten the straps or cargo net to restrain the bladder.

IV.) Petro-Flex General Safety

1.) Petro-Flex bladder tanks generally contain flammable or combustible liquids and all relevant fire safety precautions apply.

2.) Keep the fuel bladder tightly restrained to prevent shifting or rolling. On abrasive surfaces, protect the Petro-Flex tank with a rubberized "Underliner".

3.) Keep flame, heat, spark and static charges away from all Petro-Flex tanks. A static ground strap from the outlet fitting to neutral earth is recommended.

4.) Before filling any bladder tank, check the entire installation for cuts, abrasions, leaks or other potential hazards.

5.) Transfer fuel only when the vehicle is at rest or in a thoroughly stable mode. Wear protective clothing as described in attached **Bulletin** #DS-370.

6.) It is recommended to carry the Petro-Flex either full or empty. Partial loads are more prone to surge, roll and shift and therefore require regular adjustment to the restraint straps.

7.) Transfer fuel by pump or siphon only in a well-ventilated area with non-sparking, explosion-proof equipment.

8.) Do not overfill the bladder tank, and be certain all seals and valves are leak tight.

9.) Always fill the bladder tank slowly; remove and replace the cap carefully; open the discharge valve gradually and tighten the tie-down straps uniformly. Abrupt and careless handling can cause fuel spillage and a potential fire hazard. Keep a Class B-C (Purple K) fire extinguisher handy in case of ignition.

10.) To protect the Petro-Flex's bottom surface, always position the bladder on a clean smooth surface or procure an ATL "Underliner" or "Ground Cloth" for chafe avoidance.

11.) When storing a Petro-Flex, drain all fuel; collapse the bladder flat to expel vapors; wrap padding around all fittings; fold up the bladder and wrap it in a polyethylene bag.

12.) For maximum bladder life, minimize the tank's exposure to intense sunlight, extreme heat and cold, pressurization, fungus, abrasion and high humidity. Avoid repeated folding along the same crease lines, as this practice may cause unnecessary wear.

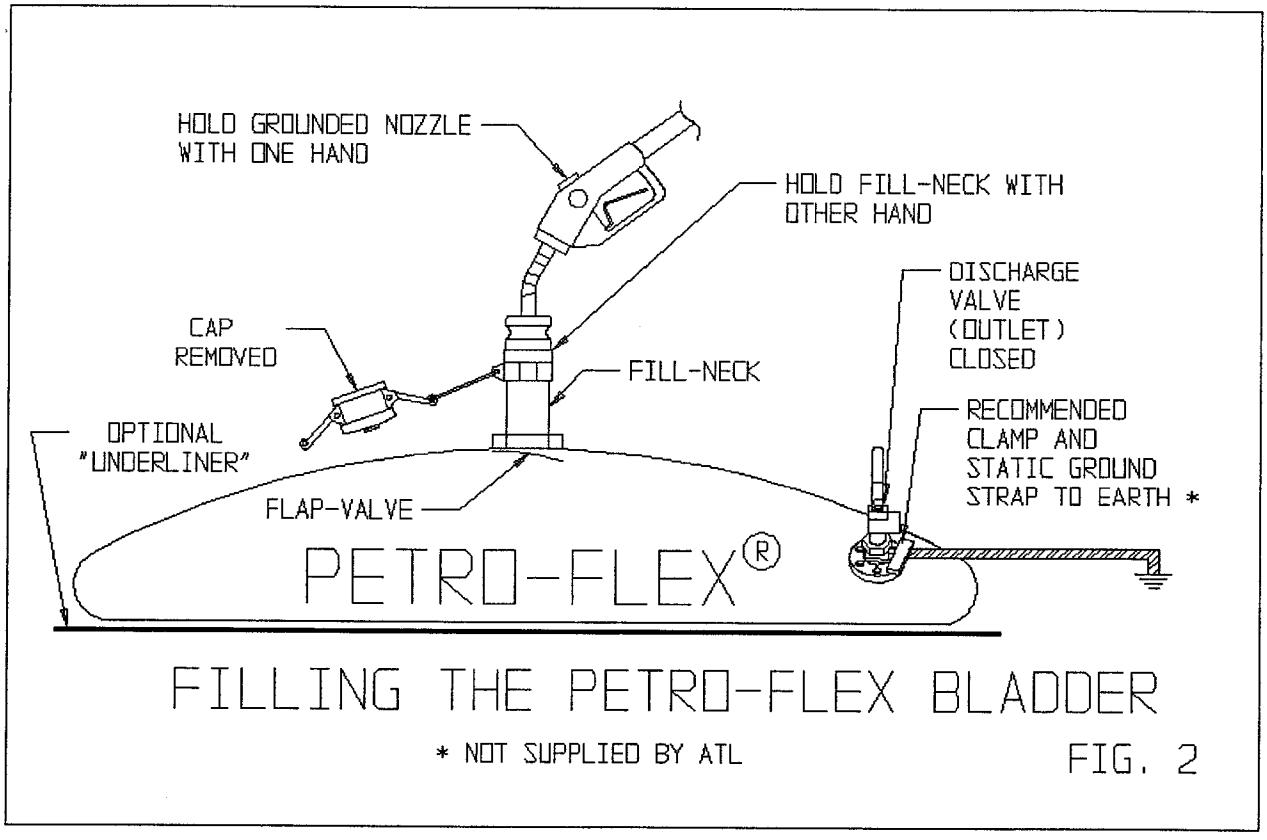
13.) Since fuel vapors are frequently flammable, Petro-Flex bladder tanks are to be used only in open, well-ventilated spaces. Immediately clean up any fuel spills, and preferably discharge fuel directly to the vehicle's main tanks. Use top quality hoses, pumps, valves and fittings when installing any Petro-Flex auxiliary fuel tank. Keep the Petro-Flex exterior clean and dry.

14.) The fill and outlet fittings (bosses) on Petro-Flex bladders are of composite plastic construction so as to be corrosion resistant, non-sparking and impact resistant. However, these threaded bosses are ***not*** intended to be connected to metallic pipe. Do ***not*** alter the fitting arrangements on a Petro-Flex, and if a replacement part is needed, use only threaded nylon and ***not*** metal.

V.) Petro-Flex Operation

a.) Fuel Filling

A Petro-Flex range extension bladder will accommodate standard gas station nozzles. Slowly remove the cam-lock type fill cap to relieve pressure and then fill the bladder slowly with fuel. When the bladder is taut, and the fuel is 1 inch (2-3 cm) high in the fill neck, stop filling and secure the cap with both levers carefully latched. **See Figure # 2**



It is a good idea to **mark** the bladder with its intended fuel type so as not to mix diesel, leaded gas, unleaded gas or other fuels.

b.) Fuel Storage

When fuel is stored in a Petro-Flex bladder tank, be certain the fill cap is affixed tightly; the outlet valve is closed; and the bladder is well secured. No venting is required as the bladder can "grow" slightly to accommodate normal vapors and fuel expansion. If internal pressure becomes extreme, a safety relief valve in the fill cap is designed to exhaust this over-pressure.

It is always best to keep the bladder in a well-ventilated area away from intense sun light or other heat sources. However, should the fill cap be removed from a bladder with internal vapor pressure, an automatic flapper valve will help prevent rapid backflow of fuel up the fill neck. A small relief passage will generally permit the slow bleed-off of pressure, again automatically.

Do not store any fuel for longer than 90 days, as petroleum products can polymerize and become "sour". Deteriorated fuels may be harmful to the Petro-Flex as well as to fuel systems and engines.

Do not mix any additives with the fuel in a Petro-Flex tank. Some fuel additives may be harmful to the bladder and its fittings or to fuel transfer hose.

All rubberized materials experience a small amount of vapor transmission or "diffusion" when they separate two fluids or gasses; in this case a hydrocarbon fuel and air. This "permeation" effect is usually unnoticed, but in cases of over-pressurization, abuse, or over-filling there may be a fuel odor detectable. Again, Petro-Flex bladder tanks should be located in a well-ventilated area and inspected regularly.

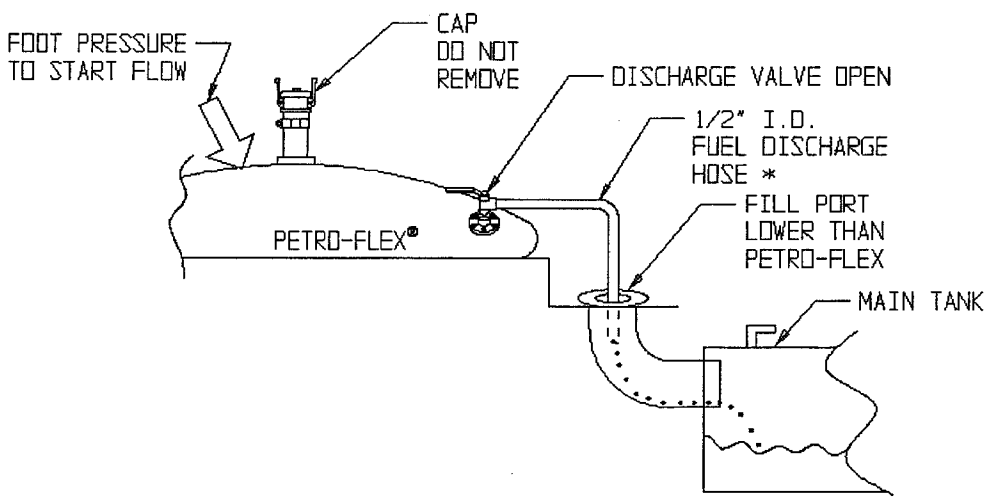
Do ***not*** use a direct connection hook-up for any diesel engine or for any other engine employing a fuel return line back to the tank. Petro-Flex is ***not*** equipped to accommodate a return fuel line unless specially fitted at the ATL factory.

c.) Fuel Discharge by Gravity

When draining fuel to a lower main tank from a Petro-Flex bladder, simple "down-hill" gravity flow is very convenient.

Insert a ½ inch inside diameter (i.d.) hose into the vehicle's fuel fill port and slowly open the Petro-Flex discharge valve. If needed, step lightly on the bladder to initiate fuel flow.

Watch the vehicle's fuel level gauge and, when near full, close the discharge valve, remove the hose slowly and re-cap the vehicle's main fuel tank. **See Figure # 3**



GRAVITY DISCHARGE

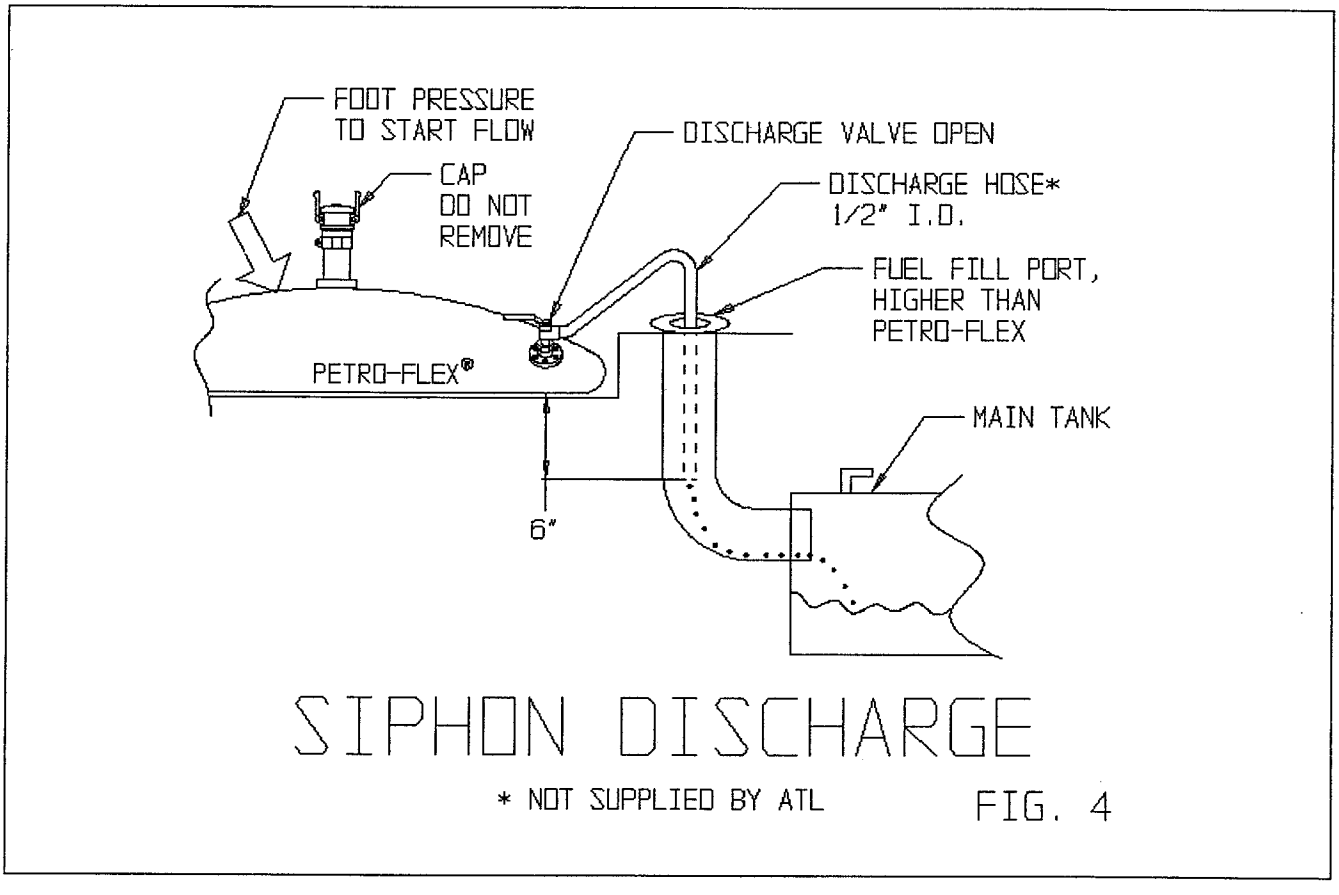
* NOT SUPPLIED BY ATL

FIG. 3

d.) Fuel Discharge By Siphon

When transferring to a **lower** tank, but through a higher fill port, the siphon technique is helpful.

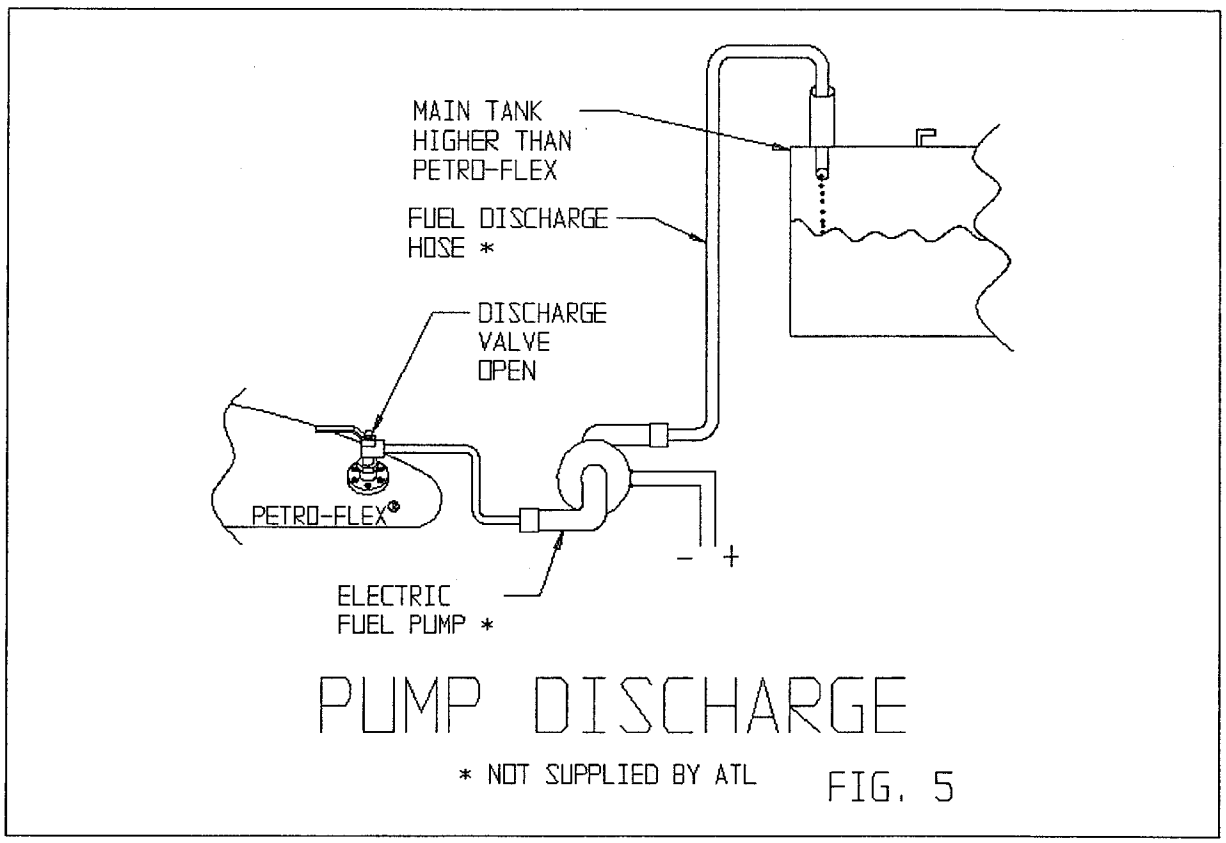
Run a siphon hose (½ inch i.d.) into the vehicle's fuel fill port extending below the bottom of the bladder at least 6 inches as shown. Open the Petro-Flex discharge (outlet) valve and step on the bladder to initiate flow. Fuel will siphon to the main tank. To remove all residual bladder fuel, roll up the nearly-empty bladder toward its discharge fitting, squeezing fuel out. Watch the vehicle's level gauge, and when the main tank is near full, close the bladder discharge valve. Gradually extract the siphon hose and close the vehicle's fuel fill port.
See Figure # 4



e.) Fuel Discharge By Pump

When gravity or siphon flow is not practical, an electric or manual fuel pump may be employed to lift and discharge fuel to a main tank "above" the bladder.

Ascertain that the pump is an explosion proof variety designed for the type of fuel and flow rate required. Watch the vehicle's fuel level gauge, and when the main tank is near full, turn off the pump and close the Petro-Flex discharge valve. **See Figure # 5**



VI.) Contact Us

ATL is available by mail, phone, fax and e-Mail to answer questions, lend advice and supply accessories for its Petro-Flex bladder tanks. Feel free to contact the factory:

ATL Fuel Cells, USA
Aero Tec Laboratories, Inc.
Spear Road Industrial Park
Ramsey, NJ 07446-1251 USA
Tel: (201) 825-1400
Fax: (201) 825-1962
e-Mail: atl@atlinc.com

ATL Fuel Cells, UK
Aero Tec Laboratories Ltd.
1 Patriot Drive
Rooksley Park, Milton Keynes
MK13 8PU England
Tel: 44 0 1908 351700
Fax: 44 0 1908 351750
e-Mail: atl@atlltd.com

Thank you for choosing ATL

ATL

PRODUCT SAFETY BULLETIN #DS-370

IMPORTANT PRECAUTIONS IN USING ATL FLEXIBLE TANKS, BLADDERS, DRUMS, PLUGS, VALVES, LINERS AND AIR CELLS

1.) Compatibility: Be certain your ATL product is designed to handle the temperature and fluid in question. When in doubt, contact ATL to discuss specific model numbers and material types. **Never** subject any item to Ketones, Chlorinated Solvents, Concentrated Acids, Alkalies, Pure Aromatics or temperatures over 140°F unless specifically designed for that service and approved by ATL.

2.) Personnel Protection: Be prepared for the unexpected. All personnel handling fuels and hazardous chemicals must wear **full protective clothing** and equipment of an impervious, non-static and flame-resistant type. Specific information should be sought from your fuel/chemical vendors, industry associations and producers of personnel protection systems.

3.) Multiple Uses: Some ATL tanks can be sufficiently cleaned to store or transport several different, but similar, liquids without contamination. However, **never** take this factor for granted. Field and laboratory testing are **always** required before suitability can be assured. ATL can frequently provide material samples and scale models to assist in your analysis. **Never** switch a fuel or chemical container to a comestibles use.

4.) Pressure: Most ATL products are designed for use at ambient pressure. Unless specifically designated, **Do Not** subject any container, valve or connection to pressure differential. **Do Not** restrict venting; **Do Not** overfill or exceed maximum height; **Do Not** exceed normal flow rates during filling or discharging; and **Do Not** pressurize any inflatable unless **fully** restrained and enclosed. Always allow a 10% volume factor (ullage) to compensate for vapor expansion, thermal expansion and overfill. Those products designed for pressurization should be fully contained or restrained in a rigid structure before filling.

5.) Fire & Explosion: **Always** exercise the utmost care in containing, transferring, venting or processing flammable materials. Keep away from fire, flame, heat, spark, static charge, oxygen, lightning, focusing lenses, friction, turbulence or any combustible materials that could spontaneously ignite. Refer to your industry specialists and publications such as The National Fire Prevention Association Code for proper avoidance of fire and explosion hazards.

6.) Accessories: Fittings, flanges, piping, hoses, valves, vents, meters, pumps etc. used in **conjunction** with ATL products must be designed, selected and maintained for leak-tightness, galvanic compatibility, chemical compatibility, thread and seal compatibility, as well as appropriate grounding, electrical bonding, vibration tolerance, tamper-resistance, flexibility, flow capacity and mounting methods. Get professional assistance to assure **total** system functionality and safety.

7.) Personnel Training: ATL products are of a technical nature and are frequently used in conjunction with hazardous materials. All operating and support personnel must be **trained** in the user's specific application of these ATL items. A full familiarity with the important **safety** precautions and procedures is essential before any such devices are placed in service. Each user must establish his own **training program** geared to his particular industry and specific application.

8.) Environmental Considerations: ATL products are engineered so as not to endanger the water, air and land environments. Many ATL devices are, in fact, employed specifically for pollution abatement purposes. Nevertheless, wherever fuels and potentially hazardous substances are stored, ATL recommends the simultaneous use of its **secondary containment** products such as:

1.) Permanent Berm Liners
2.) Inflatable Berm and Liner Systems
3.) Pit and Pond Liners
4.) Tank "Envelopes"
5.) Portable Dikes
6.) 2-ply Flex Tanks

9.) Weathering: Undue exposure to the natural elements may adversely affect ATL products. **Minimize** exposure to sunlight (ultraviolet), ozone, severe hail, ice loading, freeze-thaw cycling, water immersion and extremes of temperature. ATL offers these protective accessories to help guard against adverse weathering effects:

1.) Sun-Shield Covers
2.) Ground Cloths & Geotextiles
3.) Metal Container
4.) Fire-Shield Covers

This equipment, in conjunction with reasonable care and maintenance, will significantly improve the retention of physical properties and hence product longevity.

10.) Flex Fatigue: Like most materials, the polymers, laminates and flexible composites used in most ATL products can **weaken** from severe pinching, creasing, folding, and flex-cycling. Normal collapsing and extending produce no ill effects, but compaction, inversion and crushing will decrease physical properties. Some materials comprised of high performance filaments are especially susceptible to flex-fatigue and require diligent care to avoid abuse during packing, operating, storing and unfolding.

11.) Set Up and Installation: ATL provides **User Manuals** and/or installation instructions for most standard products. However, specialty items and custom made products require the user to formulate his own procedures or draw on established standards such as ASTM, ASME, SAE, ISO etc.

12.) Cleaning and Storing: All products should be periodically **cleaned**, especially if they are to be stored for extended periods. Follow the User Manual procedures or contact ATL for assistance.

13.) Leak Testing: Prior to use, all tank and container type products should be leak tested. This procedure can **generally** be done with 1/8 psi air pressure and a standard bubble-type leak detector solution. Follow the **User Manual** procedure or **contact ATL** for help. Always rinse and dry the surface after testing.

14.) Intended Purpose: Never use an ATL product for an application other than that intended unless specifically authorized. For example, don't use a static storage tank for dynamic operations, don't use an air inflatable to contain nitric acid or a berm liner as a field cover. Be methodical; order precisely what you need, and avoid "adaptations".

15.) Abrasion: Plastics, rubber and fabrics can **deteriorate** from excessive abrasion or chafing. ATL's compounds minimize this wearing effect, but all efforts should be made to **avoid** dragging, rubbing, cutting and scuffing of flexible materials. Poly slip-sheets, talc, light oil and "doubler" patches frequently help ward off abrasion, but the best protection is reasonable care in handling and use.

16.) Repairs: All repairs to ATL products should be performed at the **factory**. When this is not practicable, and where field repairs are authorized, a reasonably skilled technician can patch and seal most ATL flexible containers. Be certain to use only the appropriate ATL repair kit, and perform the repair in a clean, well-equipped facility, following the repair instructions precisely. Remember, not all damage is repairable. **Do Not** attempt to repair a tank, drum, air cell etc. that has been broadly weakened by chemical attack, ozone effect, UV exposure etc.

17.) When in Doubt: Do Not take chances. **Please** contact ATL for assistance. We can help either directly or by referral to a source of safety information for your particular problem. Here are 6 ways to reach ATL for technical help:

ATL Main Phones	201-825-1400
ATL Toll Free	800-526-5330
ATL Fax	201-825-1962
ATL Mail	Aero Tec Laboratories Inc. Spear Road, Ramsey, N.J. 07446-1251 USA
e-Mail	atl@atlinc.com
ATL-UK Phones	44 - (0) - 1908-351700
ATL-UK Fax	44 - (0) - 1908-351750