Liquid Petroleum Gas (Propane)

1. Purpose / Background
Liquid Petroleum Gas (LPG) is a mixture of liquid hydrocarbons stored in pressurized cylinders and is used as a fuel in heating, cooking appliances, powered industrial trucks (e.g. forklifts,) automobiles and trucks. It is also used as a propellant in aerosol cans, replacing CFC’s. LPG is typically in the form of mixtures containing mostly propane, although there are butane mixtures available as well. Methyl Mercaptan is added as an odorant, giving the gas distinctive warning properties in the event of a leak.

Propane gas (the focus of this SOP) has a high specific gravity (heavier than air) and is a flammable. Releases/leaks will accumulate at low elevations, often far from the source. LPG expands rapidly; 1 liter of LPG will form 250 liters when released. Due to theses hazards, insurance carriers, federal, state and local authorities (Cambridge Fire Department) have specific requirements for the safe use and storage of propane gas. Propane uses at MIT are limited to Powered Industrial Vehicles, Special Events (barbeques) and Academic &/Laboratory Research work conducted in laboratories.

2. Scope
This SOP describes the procedures that have been developed, in accordance with MIT’s Environment, Health and Safety (EHS) Policy for the safe storage, handling and use of propane in portable cylinders/tanks.

3. Prerequisites
No pre-requisites are needed

4. Procedures
4.1 General guidelines & requirements
4.1.1 Propane cylinders shall be handled and stored in a manner that does not pose a risk to personnel or cause property damage.
4.1.2 The transport and use of propane in portable cylinders shall only be performed by personnel who have been trained in and are knowledgeable of the hazards of the gas and safety precautions. This includes safe work practices, any necessary protective equipment and emergency procedures, especially those involving a leak/release.
4.1.3 Do not accept delivery of propane cylinders which show signs of a leak, damage or those that lack labels and markings.
4.1.4 Prior to procuring an initial order of propane, users groups should conduct an assessment/review of propane use and handling. This should be performed as a joint effort with the EHS Office, the EHS Coordinator and the user group.
4.1.5 Only minimum quantities should be ordered; avoid storage of excess cylinders. Users shall only order the quantity of gas needed to conduct the work, as required, for the immediate future. Users should consider just in time (JIT) delivery. Order the smallest size cylinders appropriate for the use. Contact the MIT Procurement Department or the gas supplier for information about cylinder sizes and capacities.
4.1.6 Cylinders shall always be labeled PROPANE, marked as FLAMMABLE and tagged to indicate whether they are Full, In Service, or Empty.
4.1.7 If a leak is detected, attempt to shut off the supply at the source and evacuate the area. **Do not use phones or light switches** in the vicinity of the leak. Once away, call MIT Police (DIAL 100.)

4.1.8 Do not dispose of empty cylinders. Contact the MIT Procurement Office or the MIT EHS Office for assistance.

4.2 Storage of portable propane cylinders

4.2.1 Never store propane cylinders indoors, (laboratory-use is an exception) or in enclosed areas such as a shed, garage, basement or a tent. Propane cylinders shall be stored outdoors in vented/open sided cage-type storage cabinets available through most safety supply companies. Cabinets shall be locked at all times and posted: DANGER, NO SMOKING PROPANE GAS.

4.2.2 Propane cylinders shall not be stored near sources of heat such as stoves, open flames, or heaters (120 degrees or higher) The heat may cause the pressure to increase inside the tank, resulting in the pressure relief valve opening, releasing propane into the work area.

4.2.3 Do not smoke within 50 feet of propane storage locations.

4.2.4 Cylinders shall be stored in a manner that prevents tipping and should be strapped/secured to a sturdy location.

4.2.5 Propane cylinders shall always be stored in the upright position.

4.2.6 For cylinders designed to accept a valve cap, store with caps securely attached when not in use.

4.2.7 Store propane cylinders a minimum of 25 feet from oxygen cylinders or any other gas cylinder marked as an oxidizer.

4.2.8 Ensure that the storage location is not heavily trafficked or arranged such that mobile equipment (e.g. forklifts, bobcats etc) may inadvertently collide with the cylinders.

4.2.9 Store those propane cylinders not necessary for current laboratory operations outside of laboratory areas in a suitable area, not in a corridor.

4.2.10 Empty propane cylinders shall be stored separate from those that are full. Keep in mind that they may contain residual material, capable of causing fire or explosion.

4.3 Transporting portable propane cylinders

4.3.1 Propane cylinders should be transported in a secure upright position using carts or other device designed for this purpose.

4.3.2 Ensure that the cylinder valve is tightly closed.

4.3.3 Never transport a cylinder inside of a vehicle trunk, especially in hot weather.

4.3.4 Avoid rolling cylinders more than a few feet in order to get them into proper position for use.

4.3.5 Secure cylinders in a basket or similar device if moving them using a hoist or crane. Do not use slings, ropes or magnets to lift cylinders.

4.3.6 Do not allow cylinders to be dropped or to strike each other.

4.3.7 Federal and State regulations strictly govern the transport of propane cylinders over the road. Department and/or Laboratory personnel who intend to ship or convey cylinders over the road must contact the MIT EHS Office for shipping, packaging and labeling and marking instructions.
5. Special Events (cooking, heating or lighting) Use

5.1 General Information:

5.1.1 The use of propane gas at MIT special events is generally prohibited. Use approval is at the discretion of the Cambridge Fire Department (the authority having jurisdiction) on a case-by-case basis.

5.1.2 The use of propane gas at special events for cooking, heating or lighting (if approved) requires advanced planning. In addition, event Registration is required by MIT. Go to [http://web.mit.edu/eventguide/](http://web.mit.edu/eventguide/) or see the Guidebook to Planning Events at MIT.

5.1.3 The Cambridge Fire Department requires that an “application for storage and use permit” be submitted for propane gas at Special Events when the storage cylinders are greater than or equal to 42 lbs. (10 gallons.) Please contact the EHS Program Manager for Division of Student Life or the EHS Office for a copy of the application and guidance on the permitting process. See section 5.3.1 below.

5.1.4 No spare cylinders are allowed and no cylinder changes are allowed during an event. Full cylinders shall be kept a minimum of 5 feet from the cooking appliance.

5.1.5 Each cooking unit must have a minimum of one 20BC rated portable fire extinguisher available. A current inspection tag must be attached.

5.2 Lighting / Space Heating

5.2.1 Propane use at Special Events in equipment for lighting, heating and refrigeration is subject to the approval of the Cambridge Fire Department. Keep in mind that the use of propane is highly regulated in the city of Cambridge and approval may not be granted.

Propane heaters are prohibited from being located inside public tents. Only indirect heaters shall be used.

5.3 City of Cambridge – Permit for use and storage

5.3.1 A Cambridge Fire Department Permit is required for storage and use of any quantity of propane gas. The permit application form is available at [www.cambridgefire.org](http://www.cambridgefire.org) and is subject to a $50.00 application fee. Contact the MIT EHS Office for assistance with permitting requirements.

5.4 General Requirements

5.4.1 Propane cylinders and cooking appliances shall be located outdoors. If there is a need for protection from inclement weather, an open-sided canopy shelter (open sided, fire retardant material, minimum 12 feet in height) is recommended to ensure adequate ventilation for cooking fumes and products of combustion. Tanks should NOT be staged under the cooking tent.

5.4.2 Stage propane cylinders in secure areas remote from stoves, grills, exits, passageways and building intakes.

5.4.3 Equipment using propane shall bear the approval of Underwriters Laboratories or Factory Mutual.

5.4.4 Equipment shall be equipped with LPG approved supply hoses and flow restrictors. All cylinders must be equipped with quickdisconnects and overfill protection devices (OPD.) Screw-on hoses are prohibited (use quick disconnect only.) Cylinders shall have undergone a current hydrostatic test.

An official hardcopy of this document exists in the EHS Office or on the EHS website.

See Legal Disclaimer at: [http://ehs.mit.edu/site/content/legal-disclaimer](http://ehs.mit.edu/site/content/legal-disclaimer)
5.4.5 Equipment used for area lighting, radiant heating or power for refrigeration shall be reviewed by both the MIT EHS Office and the Department of Facilities.

5.5 Safe use of Propane Cooking Equipment/Gas Grills

5.5.1 Always use barbeque grills outdoors in a well-ventilated area. Do not use or store grills or propane cylinders indoors or in an enclosed space.

5.5.2 Inspect supply hoses for cracking, brittleness, holes and leaks. Make sure there are no sharp bends in the hose or tubing. All supply hoses shall be marked “LP-Gas” or “LPG.”

5.5.3 Ensure that gas supply hoses are kept away from hot surfaces and dripping grease.

5.5.4 Propane gas cylinders shall be stored in the upright position.

5.5.5 Spare propane gas cylinders shall be stored at least 25 feet from the grill.

5.5.6 Never store or use flammable liquids, such as gasoline, near a grill.

5.5.7 Recently filled propane cylinders shall not be stored inside of a hot vehicle or trunk. Heat will cause the gas pressure to increase, which may open the relief valve and allow gas to escape.

5.6 MIT Leak Inspection

5.6.1 Users of propane fueled grills at Special Events shall coordinate an inspection by an MIT Plumber to check the propane cylinders, connections and supply hoses for leaks prior to use, as well as after any tank changes. Contact the MIT Department of Facilities to schedule an MIT Plumber for this service.

5.7 Cambridge Fire Department Inspection & Details

5.7.1 A Cambridge Fire Department detail may be required for Special Events where the use of propane-fired cooking equipment has been approved.

5.7.2 Storage of propane cylinders exceeding the event-use is prohibited. If a caterer is used (or rental company,) ensure that the cooking equipment is removed immediately at the conclusion of the event.

5.7.3 Portable fire extinguishers shall be available for use during the Special Event in the event of a fire. Caterers (or rental company) shall provide portable fire extinguishers. Do not remove portable fire extinguishers from MIT buildings for use at Special Events.

5.7.4 In the event of an emergency related to the use of propane, call the Cambridge Fire Department and MIT Campus Police (DIAL 100.) Leave the area.

6. Academic and/or Research Use

6.1 General Information

6.1.1 Propane gas for academic and/or research work in laboratories requires the use of approved equipment; a storage and use permit for Flammable Liquids and Gases as well as a Chemical Hygiene Plan.

6.1.2 Use of “Laboratory Torches” (usually butane) for soldering or making specialized glassware should be conducted inside a laboratory fume hood, if possible. The user shall ensure that all flammable liquids and combustible materials have been removed from the area. Minimize the size of the propane gas cylinders and the total amount stored.

6.1.3 A License issued by the City of Cambridge License Commission may be required for the storage and use of flammable gases (in addition to a permit.) The user shall contact the MIT...
EHS Office to ensure that the building or facility where the propane is to be used and/or stored has the appropriate license. The Massachusetts Building Code allows a maximum of 508 pounds of liquefied gas storage on the first floor of buildings (LPG is 4.24 pounds per gallon.)

6.2 General Requirements:

6.2.1 Locate propane cylinders and equipment in a secure area away from flammable liquids and combustibles. Do not locate equipment near exits or doorways.

6.2.2 Each laboratory shall be equipped with at least one portable fire extinguisher.

6.2.3 Equipment using propane gas shall be marked from a Nationally Recognized Testing Laboratory (NRTL) such as UL or FM. Ensure that the equipment is routinely inspected for leaks and that hoses and/or lines are not damaged from heat, cuts or breaks.

6.2.4 Equipment using propane gas designed or modified for or by MIT personnel must meet NFPA #58 (Liquefied Petroleum Gas Code) and be inspected by an MIT Plumber for leaks. The equipment installation shall be reviewed by the MIT EHS Office and FM Global Insurance.

6.2.5 All Propane gas shall be obtained through the MIT Procurement Department.

6.2.6 Storage of propane cylinders shall be in a well-ventilated area, which is equipped with sprinkler protection.

6.2.7 Newly constructed or renovated laboratories shall be equipped with sprinklered gas cabinets for the storage of propane gas cylinders.

6.2.8 The Massachusetts Building Code sets strict limits on the quantities of flammable gases stored per floor. Users shall contact the MIT EHS Office for assistance to determine if the storage quantities are in compliance with these limits.

6.2.9 The Chemical Hygiene Plan shall include measures for the safe use, handling and storage of propane gas cylinders including leak checks, instructions on the safe use of the propane fired equipment, emergency procedures, the location of fire alarm pull stations, portable fire extinguishers and emergency gas shut offs. (Some of this information may also be included in Emergency Preparedness Plans.)

6.2.10 In the event of an emergency related to the use of propane gas, the user shall contact MIT Campus Police (DIAL 100) outside of the leak area. Do not try to address the emergency if you have not been trained.

7. Powered Industrial Vehicle Use (Forklifts, Zamboni)

7.1 General Information

7.1.1 A License issued by the City of Cambridge License Commission may be required for the use and storage of flammable gases. The user shall contact the MIT EHS Office to ensure that the building or facility where the propane is to be used and/or stored has the appropriate license in place.

7.1.2 Propane gas use for Powered Industrial Vehicles (e.g. Forklifts) requires a storage and use permit issued by the Cambridge Fire Department. Contact the MIT EHS Office.

7.2 General Requirements

7.2.1 Propane cylinders shall be stored outside in an area secure from damage and in a locked cage. Do not locate storage cages near exits or doorways. Minimize the quantity stored.
7.2.3 Propane-fueled Powered Industrial Vehicles shall not be used indoors. “Zamboni” ice rink machines are conditionally approved for indoor use; subject to specific air monitoring requirements for carbon monoxide emissions.

7.2.4 At least one portable fire extinguisher shall be in the work area for each propane powered industrial vehicle.

7.2.5 The propane cylinder valve shall be shut during any Powered Industrial Vehicle servicing activity. Propane cylinder changes shall be done outside or in well-ventilated areas.

7.2.6 Propane-fueled Powered Industrial Vehicles shall not be left unattended when in the vicinity of sources of heat (furnaces/heaters etc.)

7.2.7 Users shall have a safety plan, which includes the safe use and storage of propane safety inspections, leak checks, emergency procedures, location of fire alarm pull stations and portable fire extinguishers.

7.2.8 In the event of an emergency (leak or fire) related to the use of propane; notify MIT Campus Police (DIAL 100.) Do not try to address the emergency if you have not been trained.

8. Roles & Responsibilities

8.1 Departments Laboratories and Centers (DLC)
DLC’s shall ensure that propane storage cylinders are handled stored and use in accordance with the requirements in this SOP and are responsible for ensuring that lab-specific chemical hygiene or work area safety plan training is provided to employees. Special Event sponsors (and their caterer’s) shall develop a safety plan for all events and obtain approval from the Cambridge Fire Department for the use and storage of propane.

8.2 MIT EHS Office
Shall provide General Chemical Hygiene and OSHA HAZCOM training to DLC personnel. Support and assistance for DLC’s to review new equipment installations involving the use of propane, as well as review of safety plans for “special events” where propane may be used.

8.3 Department of Facilities
Shall provide assistance to the MIT EHS Office and DLC’s to review equipment installations where propane gas will be used. This includes providing resources upon request for leak inspections of equipment and associated hoses, connections and fittings.

9. Training

9.1 Contact the EHS Office for information on General Chemical Hygiene Plan and HAZCOM training.

10. Monitoring Requirements
DLC’s shall ensure that periodic inspection of cylinders, tanks hoses and equipment(s) has been completed. Maximum storage quantities of propane gas shall be periodically submitted to the EHS Office (upon request) per SARA reporting requirements.

11. Record Management
Records of inspections shall be maintained by the DLC. Written records of weekly inspections (Level 1) are optional, but recommended.
12. References

12.1 Standards/codes/local requirements
12.1.2 NFPA Standard 58, Liquefied Petroleum Gas
12.1.3 NFPA Standard 55, Storage, Use and Handling of Compressed and Liquefied Gases in Portable Cylinders.
12.1.4 Factory Mutual Global-Data Sheet #7-55/12-28 Liquefied Petroleum Gas
12.1.5 Massachusetts Building Code 780 CMR
12.1.6 Cambridge Fire Department - Condition of Approval & Regulations for the use of charcoal and gas fired grills, generators, heaters and other misc. cooking equipment at public events.

12.2 MIT Standard Operating Procedures
12.2.1 MIT EHS SOP, SARA Reporting
12.2.2 MIT EHS Special Event Guideline
12.2.3 MIT EHS Standard Operating Procedure- Powered Industrial Trucks
12.2.4 MIT EHS SOP, Compressed Gases
12.2.5 MIT EHS SOP, Johnson Ice Rink IAQ Sampling
12.2.6 MIT EHS SOP, Hazardous Material Use and Storage Permitting and Licensing.

13. Definitions

13.1 LPG
Liquid Petroleum Gas (LPG) is a mixture of liquid hydrocarbons stored in pressurized cylinders and is used as a fuel in heating, industrial powered vehicles, cooking appliances and automobiles. It can contain propane as well as butane.

13.2 Flammable Gas
A gas mixture of 13% or less (by volume) with air that is ignited at 14.7 psia or has a flammable range with air of at least 12% regardless of the lower limit. The National Fire Protection Association flammability rating = 4.

13.3 Specific Gravity
The density of a gas relative to air. A specific gravity > 1 is heavier than air, a specific gravity <1 is lighter than air.