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## Flammable Gas

Flammable gas samples may be collected from operations such as landfills or biogas digesters, among other sources. For example, landfill gas with concentrations of methane in the flammable range (5-15%) would be considered flammable.

## Shipment of Flammable Gas Samples

Flammable air and vapor samples are considered Hazardous Materials or Dangerous Goods. In order to legally transport flammable gas samples by air or ground, the shipper must be certified to ship hazardous materials and dangerous goods. The transportation of such materials is governed by the Hazardous Materials Regulations, which are found in Title 49 of the Code of Federal Regulations (CFR), 171 - 180. Specific training requirements are explained in Subpart H of Title 49, CFR172.700 - 172.704.

## General Steps for Shipping Flammable Gas Samples

Typically, a flammable air or vapor sample that is collected in a Tedlar or other inert bag would be defined under Title 49, CFR172 as a "Gas sample, non-pressurized, flammable, n.o.s., not refrigerated liquid". It would carry the shipping designation of UN3167 and up to 1L of it may be shipped via aircraft. Columbia Analytical offers exemption shipping kits that accommodate Tedlar bags up to 1L.

UN	Proper Shipping Name	Class, Division, and Hazard	Quantity and type of packaging	Packing Inst.	Authorization
UN 3167	Gas Sample non-pressurized, flammable, n.o.s.	2.1	1 Fiberboard box X 1L	206	

Figure 1 - Declaration Form Example

For those who have completed the D.O.T. certification process for shipping hazardous materials, following are general steps to prepare samples for shipping. Every shipping service has its own protocols and forms for shipping dangerous goods.

1. Order all packing material and required forms several weeks in advance to ensure that all of the necessary supplies are acquired prior to the sampling or shipping dates. The Dangerous Goods shipping form must be typed and printed on specific red striped paper in advance. Most shipping locations do not have the ability to print this out onsite for customers. Also, they do not have the Dangerous Goods (flammable gas) labels onsite. The labels typically must be ordered independently from companies specializing in shipping/transportation.
2. After collecting the samples, place the filled sample bags in the UN-approved metal can that was provided in the exemption kit. Do not compress the bags.
3. Place the lid on the can and seal firmly. Add the safety seal by applying the plastic ring provided with the can. You may need a soft mallet or other implement to apply the ring. Place the can in the fiberboard box in accordance with the general instructions included with the box.
4. Apply the appropriate label to the outside of the box. Consult with your shipping service to determine appropriate labels. Labels often include the following: "FLAMMABLE GAS", "UN3167", and "DANGER: DO NOT LOAD IN PASSENGER AIRCRAFT". Parts of the same label may not appear on different faces of the package.

5. Complete a “Shipper’s Declaration for Dangerous Goods” form (see Figure 1 for an example). Print four full-color copies of this form and sign each one. Keep one copy and provide the shipping company with the remaining three. The declaration often requires information such as:

- *Proper Shipping Name:* Gas Samples, non-pressurized, flammable, n.o.s.
- *Class or Division:* 2.1
- *UN or ID Number:* UN3167
- *Shipment Type:* Non-Radioactive
- *Additional Information:* your Company’s emergency response telephone number
- *Limitations:* Cargo Aircraft Only

Figure 2 - Outer Packaging



## Inner Packaging Requirements

Metal cans, tins, or tubes (other than aluminum): Containers with a capacity of not more than 1L each should be packed into one fiberboard box.

## Outer Packaging Marking and Labeling Requirements

The outside of the package must include all required labels in accordance with current regulations and shipping company policies. Package orientation labels must be applied on two opposite vertical sides. The Class 2 D.O.T. labels and UN Packaging Specifications must also be applied to each package (Figure 2).

## Dangerous Goods Shipping Certification

Federal D.O.T. regulations require training and retraining of all employees who perform work functions covered by the Hazardous Materials Regulation (Title 49, CFR172.700). Any employee who works in a shipping, receiving, or material handling area or who may be involved in preparing or transporting hazardous materials is required to have this training. If you sign the documents, you are the sender. It is the employer’s responsibility to fully comply with the training requirements. Certification for employees is available through shipping companies such as FedEx, DHL, and UPS. Failure to train employees may result in civil and/or criminal penalties.

The shipper is ultimately responsible for the safe and legal shipment of samples in compliance with the most recent applicable local, state, and international shipping regulations.

Columbia Analytical assumes no liability resulting from the improper packaging and shipment of samples and makes no guarantees regarding the validity of the information presented here.

For more information, visit  
<http://www.caslab.com/Air-Testing/>

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