

TIP No. 026-0324

## Transporting Tissue Samples and Specimens Preserved in 10–24.9% Formaldehyde Solutions

---

**PURPOSE.** The purpose of this information paper is to explain the transportation requirements when shipping tissue samples and specimens in 10–24.9% formaldehyde solutions by continental U.S. highway and commercial air.

### REFERENCES.

International Air Transport Association (IATA). 2024. *Dangerous Goods Regulations*, 65<sup>th</sup> Edition. <https://www.iata.org/en/publications/dgr/>

*Code of Federal Regulations*, “Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans,” Title 49, Part 172.

*Code of Federal Regulations*, “Shippers—General Requirements for Shipments and Packagings,” Title 49, Part 173.

### POINTS OF MAJOR INTEREST AND FACTS.

#### Background

The Department of Transportation in its Code of Federal Regulations (CFR) Title 49 provides four entries for formaldehyde solutions in Section 172.101, Hazardous Materials Table that include:

- UN3334, Aviation regulated liquid, not otherwise specified (n.o.s.);
- UN1198, Formaldehyde solutions, flammable;
- UN2209, Formaldehyde solutions, with not less than 25% Formaldehyde; and
- NA3082, Other regulated substances, liquid, n.o.s.

For formaldehyde solutions (with no less than 10% and less than 25% formaldehyde), the Hazardous Materials Table in the 49 CFR 172.101 directs us to UN3334, Aviation regulated liquid, n.o.s. and NA3082, Other regulated substances, liquid, n.o.s. The UN3334 applies to transportation by air. Other regulated substances, liquid, n.o.s. applies to transportation by domestic highway. A formaldehyde solution (with no less than 10% and less than 25% formaldehyde) must be classified as a Hazard Class 9 material when being transported by both highway and air. For commercial air transport, always follow the requirements found in the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR). (Note: Formaldehyde solutions in concentrations of 10–24.9% are noxious and can cause extreme annoyance or discomfort to transporters in the event of a spill or leak.)

This TIP supersedes APHC (Prov) TIP No. 37-044-1215, dated December 2015.

---

Approved for public release; distribution is unlimited.

The mention of any non-federal entity and/or its products is for informational purposes only, and is not to be construed or interpreted, in any manner, as federal endorsement of that non-federal entity or its products.

## BASIC SHIPPING DESCRIPTION.

### Air Transport

The basic shipping description for 10–24.9% formaldehyde solutions shipped by air is "UN3334, Aviation regulated liquid, n.o.s. (formaldehyde), 9." (Note: If a 10–24.9% formaldehyde is being shipped in a multi-modal shipment with the potential to be transported by air, then this same description is required and must be entered on the shipping papers.)

### Domestic Highway Transport

The basic shipping description for 10–24.9% formaldehyde solutions shipped domestically by highway is "NA3082, Other regulated substances, liquid, n.o.s. (formaldehyde), 9, III."

### Formalin Solutions

The amount of formaldehyde in formalin solutions vary. Refer to the Safety Data Sheet (SDS) for the material being shipped to determine the actual percentage of formaldehyde in your formalin solution.

- Full strength formalin is 37% formaldehyde and must be shipped as "UN1198, Formaldehyde solution, flammable, 3, (8), PG III."
- Formalin solutions of 25% have approximately 10% formaldehyde and are normally classified as "UN3334, Aviation regulated liquid, n.o.s. (formaldehyde), 9, III" for transportation by air or "NA3082, Other regulated substances, liquid, n.o.s. (formaldehyde), 9, III" for transportation by domestic highway. All shipments of 10–24.9% formaldehyde solutions must adhere to the requirements outlined in this information paper.
- Formalin solutions of 10% contain 3–4% formaldehyde and are **not** regulated for transport by air or highway.

Although 10% formalin solutions contain 3–4% formaldehyde and are **not** regulated for transport by air or highway, it is recommended that tissue samples and specimens preserved in this solution follow the guidance found in the provisions outlined in Chapter 3.6.2.2.3.8 of the IATA DGR. These tissue samples and specimens should be shipped as patient specimens, packed in a packaging to prevent leakage, and marked with the words "Exempt human specimen" or "Exempt patient specimen," as appropriate. The packaging must meet the following conditions: the packaging must consist of three components (a leak-proof primary receptacle(s); a leak-proof secondary packaging; and an outer packaging of adequate strength for its capacity, mass, and intended use), and it must have at least one surface with a minimum dimension of 100 millimeters (mm) X 100 mm.

For liquids, absorbent material in sufficient quantity must be placed between the primary receptacle(s) and the secondary packaging to absorb the entire contents; therefore, this will ensure any release or leak of a liquid substance during transport will not reach the outer

## TIP No. 026-0324

packaging and will not compromise the integrity of the cushioning material. When multiple fragile primary receptacles are placed in a single secondary outer packaging, they must either be individually wrapped or separated to prevent contact between them. (Note: Ensure that the flashpoint and percentage for formaldehyde are taken into consideration when you are shipping formalin.)

### **Samples with Tissue**

Generally, tissue samples and specimens being preserved in formalin, which do not have a high probability of containing infectious agents, are managed and described according to the type and amount of formaldehyde/formalin used in the sample. (Note: Infectious samples are usually managed under Division 6.2 as either an Infectious substance, Category A or a Biological substance, Category B depending upon the risk they pose to healthy humans or animals if exposure to them occurs. These infectious samples may contain 30 milliliters (mL) or 30 grams of stabilization fluid without the transporter having to declare the fluid.)

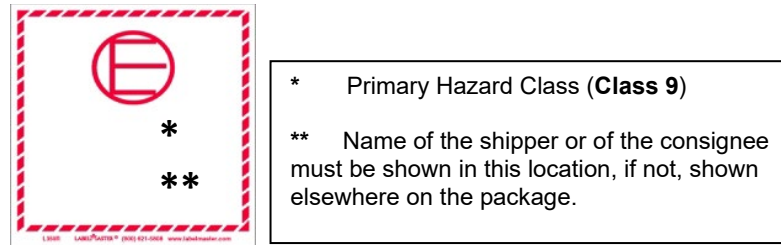
## **SHIPPING SPECIFICATIONS.**

### **Commercial Air Shipments**

Formalin solutions classified as UN3334, Aviation regulated liquid, n.o.s. may be shipped by commercial air as an excepted quantity, limited quantity, or non-bulk shipment.

### **Excepted Quantity Shipments**

Excepted quantity shipments are those shipments which contain small amounts of a hazardous material. These shipments do not pose a significant risk to human health and the environment and are therefore “excepted” from compliance with most of the hazardous material regulations. When an excepted quantity amount is identified and verified as an “exception,” then the transporter need only follow the excepted quantity provisions outlined in Chapter 2.6 of the IATA DGR for shipments by air. In the IATA DGR, the Excepted Quantity Code for formaldehyde solutions and Aviation regulated liquid, n.o.s. is E1, which means the maximum net quantity allowed per inner packaging must not exceed 30 mL, and the maximum net quantity per outer packaging must not exceed 1 liter (L) for these materials to qualify as “excepted” quantities. When these materials qualify as “excepted” quantities, then the shipper need only affix the **“Excepted Quantity Package Mark”** to the outside of the package (see Figure 1). (Note: No other markings, labels, or Shipper’s Declaration for Dangerous Goods are required. However, if an air waybill or bill of lading is used, the “Nature and Quantity of Goods” box must be marked with the statement “Dangerous Goods in Excepted Quantities” and indicate the number of packages.)



**Figure 1. Excepted Quantity Package Mark**

Note: Federal Express requests the placement of the UN identification (ID) Number and the proper shipping name in the “Nature and Quantity of Goods” box of the Air Waybill.

### **Limited Quantity Shipments**

Limited quantity shipments are “limited amounts” of hazardous materials, which pose a “reduced risk” during transport and can be safely transported in good quality packaging that normally is not subjected to UN performance tests. Limited amounts of Aviation regulated liquid, n.o.s. may qualify as a “limited quantity.” (Note: Shippers must refer to the “List of Dangerous Goods” found in the IATA DGR to determine the maximum allowable amounts, which qualify as limited quantities based on the nature of the material. Shippers must then follow the appropriate Packing Instruction for the material being shipped and conform to the packaging requirements identified in that instruction.) [Example: Aviation regulated liquid, n.o.s. directs you to Packing Instruction Y964 for limited quantity shipments. For combination packagings, the net quantity allowed per inner packaging is 5.0 L and the outer packaging gross weight must not exceed 30 kilograms (kg) (66 pounds (lb)).]

### **Marking and Labeling Limited Quantities**

According to the IATA DGR, mark the proper shipping name (with technical name), UN ID number, and net quantity of dangerous goods contained in the package on the outer packaging, near the shipper and receiver’s full name and address. Affix the **Limited Quantities Mark** (shown in Figure 2) and a hazard warning label for the material (e.g., a “Hazard Class 9 - Miscellaneous” label for Aviation regulated liquid, n.o.s.) to the outer packaging. Place these on the same surface as the proper shipping name, near the shipper and receiver’s name and address. If the package contains a liquid, ensure the package is marked with “Package Orientation” markings. **Both a “Shipper’s Declaration for Dangerous Goods” and an Air Waybill are required.**



**Figure 2. Limited Quantities Mark**

## Domestic Highway Shipments

Formalin solutions classified as "NA3082, Other regulated substances, liquid, n.o.s. (formaldehyde), 9, III" may be shipped domestically by highway as a small quantity, limited quantity, or non-bulk shipment.

## Small Quantity Shipments

Small quantity shipments are those shipments which contain small amounts of a hazardous material. These shipments do not pose a significant risk to human health and the environment and are therefore "excepted" from compliance with most of the hazardous material regulations. When a small quantity amount is identified and verified as such in 49 CFR 173.4, the transporter need only follow the requirements outlined in this section.

Small quantities of Class 9 Miscellaneous hazardous materials can be shipped by highway using the small quantity exception described in 49 CFR 173.4 if the following provisions are met:

- **Packaging:** Each inner receptacle must be secured with wire, tape, or other positive means to prevent leakage. Outer packaging must be capable of sustaining the multiple drops from a height of 1.8 meters, as described in 49 CFR 173.4 (a)(6). The total outer packaging weight must not exceed 29 kg (64 lb).
- **Cushioning and Absorbance:** The inner receptacles must be securely packed in cushioning and absorbent material. Sufficient, compatible (non-reactive) absorbent material must be used to absorb the entire contents of the inner receptacles in the event of leakage.
- **Marking and Labeling:** By ground transport (domestic highway), the outer package must be marked with the statement, "This package conforms to Title 49 CFR Section 173.4 for domestic highway or rail transport only." Hazard labels are not required.
- **Shipping Papers:** Shipping papers are not required.

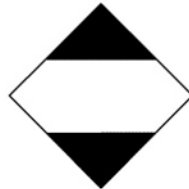
## Limited Quantity Shipments

The 49 CFR 172.101, Hazardous Materials Table, Column 8A (Exceptions) directs you to the appropriate section located in Part 173 that contains exceptions from some of the requirements of the 49 CFR. Section 173.155 is identified within the "Other regulated substances, liquid, n.o.s." on the Hazardous Materials Table, Column 8A (Exceptions), which contains the limited quantity requirements for Hazard Class 9 hazardous materials.

- **Packaging:** Limited quantity shipments must be packaged in combination packagings. Inner packaging must not exceed 5.0 L (1.3 gallons) net capacity each and must be packed in a strong outer packaging. Each package must conform to the packaging requirements of Subpart B of 49 CFR 173 and may not exceed 30-kg (66 lb) gross weight.

**TIP No. 026-0324**

- Marking and Labeling: The proper shipping name with the technical name [Other regulated substances, liquid, n.o.s. (formaldehyde)] and ID number [NA3072] are not required to be marked on the package, provided it is marked with the square-on-point limited quantity marking (Figure 3) (49 CFR 172.315). Hazard labels are not required.



**Figure 3. Square-on-Point Limited Quantities Mark**

- Shipping Papers: A hazardous material shipping paper (49 CFR 172.200(b)(3) and 173.155(b)); an emergency response number (49 CFR 172.604(d)(1)), and placarding (49 CFR 172.155(b)) are not required.

**Prepared by:** Defense Centers for Public Health – Aberdeen, Environmental Health Sciences Division, Waste Management Program

**Dated:** March 2024