

Standard Operating Procedure

Task: Shipping Chemical Samples

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Date: 02/06/2020

Revision Date:

Background

- Occasionally, we generate chemical samples that need to be sent to other locations. Reasons for shipping chemicals include elemental analysis as well as sending samples to collaborators.
- Most samples we need to ship are considered “Dangerous Goods” by the Department of Transportation. Dangerous goods can be shipped through mail carriers such as FedEx or UPS as long as they are in “excepted quantities” – that is, they do not exceed the maximum amount that can be shipped in a single package.
- Dangerous goods are separated into nine classifications. Relevant classifications for our purposes are: flammable and combustible liquids (class 3), flammable solids (class 4), oxidizers and organic peroxides (class 5), toxic and infectious substances (class 6), and corrosives (class 8). Within these classifications, dangerous goods are also divided into three packing groups: low hazard (III), moderate hazard (II), and high hazard (I)

Training Requirements:

- Lab safety training
- Shipping training
- Ampule sealing training (if shipping air-sensitive samples)

Potential Hazards:

- Chemical spills, broken glass, fires/explosions en-route
- Fines (>\$40,000!!!) and other legal consequences of improperly-shipped samples
- Hazards associated with ampule-sealing

Special PPE Requirements:

- Gloves, safety glasses, lab coat when handling chemicals

Materials Needed:

- Chemical sample
- Packaging materials: vials, caps, ampule, mailing tube, mason jar, box, pigmat, paper towels, and/or bubble wrap
- SDS of relevant chemical(s)
- Analysis request form (for EA)
- EHS excepted quantities package label
- EHS excepted quantities test form

- FedEx shipping label

Procedure:

Determining Hazards of Materials

- For commercial/known chemicals:
 - Look up SDS of chemical. Section 14 of the SDS will contain the DOT specifications for hazard class and packing group. If the chemical is listed as “not dangerous goods” (i.e. NaCl), then no special provisions (i.e. no special documentation or labels) are required to ship the package.
 - Look up the chemical on the Dangerous Goods List: <https://unece.org/fileadmin/DAM/trans/danger/publi/unrec/English/part3.pdf>. Determine the hazards from the table in the document. The relevant columns in the table are:
 - 3: hazard class
 - 4: subsidiary hazard class (if the chemical falls under more than one hazard)
 - 5: packing group
 - 7: excepted quantity (per inner package – see below). If this box says “none” then the chemical cannot be shipped by us in any quantity – contact EHS
- For synthesized chemicals (aka anything without an SDS)
 - Unless the chemical can be *definitively proven* to be non-hazardous, it must be treated as a dangerous good for shipping purposes
 - The default classification for most chemicals we ship from lab is **6.1 – Toxic**. If you have reason to believe that your chemical also falls under an additional classification, you may also label your shipment as such.
 - Excepted quantities for relevant classifications are as follows:

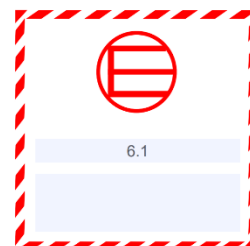
Name	Class	Inner package*	Outer Package*
Toxic Solid, Inorganic, n.o.s	6.1	30 g	1 kg
Toxic Solid, Organic, n.o.s	6.1	30 g	1 kg
Toxic Liquid, Inorganic, n.o.s	6.1	30 g	1 kg
Toxic Liquid, Organic, n.o.s	6.1	30 g	1 kg
Toxic Solid, Oxidizing, n.o.s	6.1 & 5.1	30 g	500 g
Toxic Solid, Water-Reactive, n.o.s	6.1 & 4.3	30 g	500 g

*defined in next section

- Although the classification of your chemical might be “n.o.s” (not otherwise specified), for the purposes of labeling and documentation, use the actual name of your compound

Packaging Chemicals for Shipment

- All dangerous goods must be triple-packaged, and include a primary container, secondary container, and outer container, as well as cushioning between each layer. Examples of each type are included below:
 - Primary: vial, ampule, small mason jar. This constitutes the “inner package” for excepted quantities
 - Secondary: mason jar, cardboard mailing tube, sealed plastic bag or container
 - Outer: Box, sealable metal can. This constitutes the “outer package” for excepted quantities
 - Cushioning: pigmat, paper towels, kimwipes, bubble wrap, packing peanuts
- If the sample is a liquid, both the primary and secondary containers must be leak-proof, and the cushioning must be absorbent
- The SDS for all relevant chemicals must be included in the package. For synthesized chemicals without an SDS, instead include the SDS for either a similar, known compound, or for the precursors to the compound
- Perform the Drop Test and Load Test as instructed on the following EHS form: (https://ehs.unc.edu/files/2019/02/eq_test_form.pdf). Fill out the form and keep it for our lab records for at least 2 years.
 - Note: these tests do not have to be performed on your actual sample. Instead, you can package up an empty vial in the same way as your package and perform the tests on that.



Shipping Chemicals

- Print out the EHS excepted quantities label (preferably in color): <https://ehs.unc.edu/files/2019/02/excepted.pdf> and write the hazard class in the box (i.e. **6.1** for Toxic). Tape to outside of outer package with clear tape
- Print out a FedEx shipping label:
- Be sure to cover/deface any other shipping labels or barcodes on the box to ensure FedEx will deliver the package.
- Take package to a FedEx drop-box before the pick-up time associated with that drop-box.

References and Related SOPs:

- Elemental Analysis