Nonradioactive Target Material Shipping Procedure

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Revision

Revision Date	September 15, 2023
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Author	Muhammad Farooq
Changes in this revision	1. Changed the title to specify Nonradioactive target material 2. Specified where the holes are on the target bottle 3. Added Dennis McAuliff to the notification list
Changes in previous revision	Edit the procedure according to the recommendation. 1. Edited spells correction in the Note Section.

Introduction:

This procedure is for shipping target material CH2/CD2 or NH3/ND3 (30 grams or less for ammonia). The material is stored in a dry LN2 dewar (Model: **TW-CX100**) (See Figure 1) which holds 4.1 liters of liquid nitrogen completely absorbed with no free liquid. A safety data sheets must be included for anhydrous ammonia and liquid nitrogen inside the shipper case (**TW-CXS-1**) (Refer Figure 2). Fermilab will only allow delivery from a DOT-certified shipper with official training for hazardous material transportation in commerce, according to 49 CFR 171.2.

If the dry shipper only contains LN2 (absorbent), it qualifies for an exemption under 49 CFR 173.320, thus exempting it from 49 CFR 171.2. Then the steps 8, 9, and 10 are not applicable.

Note:

Target material must be packed and shipped by trained University of Virginia (UVA) personnel. Only ship up to 30g or less of ammonia in a single dewar using this procedure. For manufacturer's instructions and details on preparing the shipping dewar please see (**DocDB# 10645**).

Condition:

Only trained and qualified personnel should perform this preparation. Trained by the UVA polarized target leader.

PPE:

Cryogenic gloves, Chemical goggles, face shield, Tyvek or Apron.

Procedure:

1. Send an email to "Katie Swanson" <kswanson@fnal.gov>, "Lisa M. Reger" <reger@fnal.gov>, "Evan Niner" <edniner@fnal.gov>, "James L Cyko" <jcyko@fnal.gov> and "Kevin A Burkett" <burkett@fnal.gov> with a high-level summary of the shipping plan/procedure including the amount (of target material) to be sent and the dates.

Note: Target Material should be shipped so that it arrives at Fermilab during regular working hours M-F 7:00AM-3:00PM Central Standard Time. To ensure that the shipment is delivered to an approved storage location on the same day its received at Fermilab contact Hubert Kimmons-Mosby (hmosby@fnal.gov) and Jerel Brown (jtbrown@fnal.gov) more than 24 hours prior to the expected shipment delivery time. You will need to check to determine what time you would need it delivered by to guarantee same day delivery to NM4. Once you have confirmed this time pass this information on to FedEx and request that the delivery is made prior to this time. Generally, if the delivery is received in the early afternoon there should be no problem receiving the shipment at NM4 before 4:30PM. Once received at NM4 immediately transfer the sample to the approved storage area.

Preparing for shipping (step 2-8 should be performed 24 hours before shipping):

2. Don cryogenics gloves, chemical goggles, face shield, Tyvek or Apron.
3. Work in well-ventilated areas, as concentrated LN2 can lead to suffocation.
4. Slowly fill the dry shipper with LN2, stopping when the liquid reaches the neck. Put on the dewar cap to prevent moisture condensation and allow absorbent saturation. Be cautious around the vacuum plug (do not pour LN2 on the vacuum port).
5. Repeat steps until the liquid level no longer drops on standing. This may require as many as 15 repetitions over 24 hours.

6. Hold the dry shipper upside down over a tub to capture the LN2 until the LN2 stops flowing.

7. Repeat step 6 as many times as necessary to remove any remaining LN2.

Load the target material in the Dry Shipper:

8. The target material is stored in Nalgene sterile plastic bottles (Specifically prepared by UVA Polarized Target Group to have holes on the bottom to let LN2 flow in/out), which hold no more than 10 g of ammonia or HDPE. Ship no more than 30g (three bottles). Each bottle must have one strip of Kapton tape affixed from one side of the bottle over the top screw cap of the bottle and over to the other side of the bottle, to secure the cap.

9. Load up to 3 of the material-filled Nalgene bottles into the dewar canister and pack the rest of the empty canister with folder paper towels, to ensure the bottles are fixed even if the dewar were turned upside-down.

10. Place the material-filled canister into the already cold dry shipper dewar (Model: **TW-CX100**) (See Figure 1), which is designed to hold only 1 canister.

11. Document the contents of the canister into the SpinQuest dewar online inventory (**Target Material Inventory @ FNAL**) and print out the contents of the dewar and place this packing slip in the top of the shipper case.

12. Carefully place the dewar in the shipping box (Dry Shipper with Shipping Case, Model: **TW-CXS-1**) that has dry shipper inside (See Figure 2).

13. Check that the dewar shipping box has the appropriate sticker affixed to the outside:

    "This package conforms to 49CFR 173.4 for domestic highway or rail transport only".

14. Close the latches on the shipping box (Specialized MiTeGen Shipping box).

15. Contact the FedEx ourselves to make a shipment to FNAL.

16. Once the FedEx pickup has been made, email "James L Cyko" jcyko@fnal.gov and Shipping/Receiving Supervisor "Dennis McAuliff" dmcauliff@fnal.gov with the expected arrival date, carrier and shipping tracking information.

17. Once received at NM4, move the shipping box to the designated LN2 handling areas, carefully remove the LN2 dewar, and place it in NW NM4 target preparation area.

Figure 1: Target Material Dewar

Figure 2: Shipping box with target material Dewar