

## **Report on Inspection of Pail 275 (SiC #44) in F-308 Flask #22**

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**TRIUMF Work Permit:** C2024-09-26-10

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**Location:** Meson Hall Warm Cell

The following is a summary of TRIUMF's inspection of the pail/flask which CNL recently had issues with during the process of lowering into their hole and shipped back to TRIUMF for investigation. This was Pail 275 which contains target waste for SiC #44 target. The pail was shipped in F-308 Flask #22.

### **Inspection steps:**

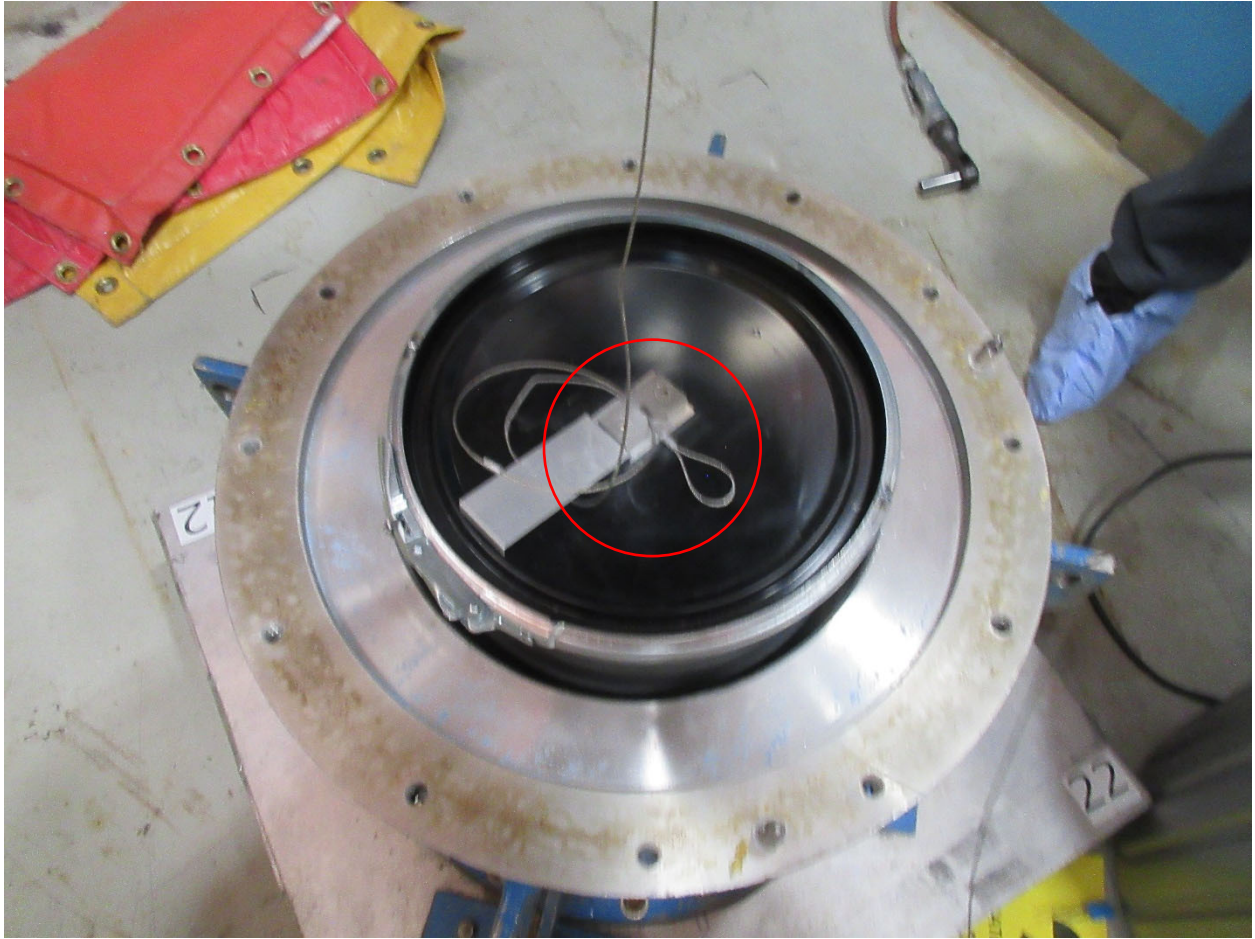
- First, the top cap of the F-308 was removed in order to check the cable coiled up in this location.
- Next, the entire flask lid was removed in order to observe the pail itself and the cable routing on top of the pail.

### **Observations:**

- No major obvious issues were observed in the portion of the cable that was coiled underneath the top cap. See Figure 1.
- The pail itself appeared to be undamaged upon visual inspection; no punctures were present and the lid was secured. There were no obvious issues with it.
- Upon removing the F-308 lid to expose the pail, it was observed that the cable was originally incorrectly routed such that it was exiting the lid of the pail improperly, and furthermore was caught underneath the sheet metal "cable keeper" part. In other words, it was routed "backwards" through the attachment block on the pail lid such that the crimped loop butt up against the cutout where the cable should exit, rather than the flat surface of the attachment block. See Figures 2 – 4.



Figure 1: Small lid cap removed from F-308 exposing coiled cable - no obvious issues observed



*Figure 2: View of top of pail, showing crimped loop on wrong side of attachment block, and cable routed underneath "coil keeper" part*

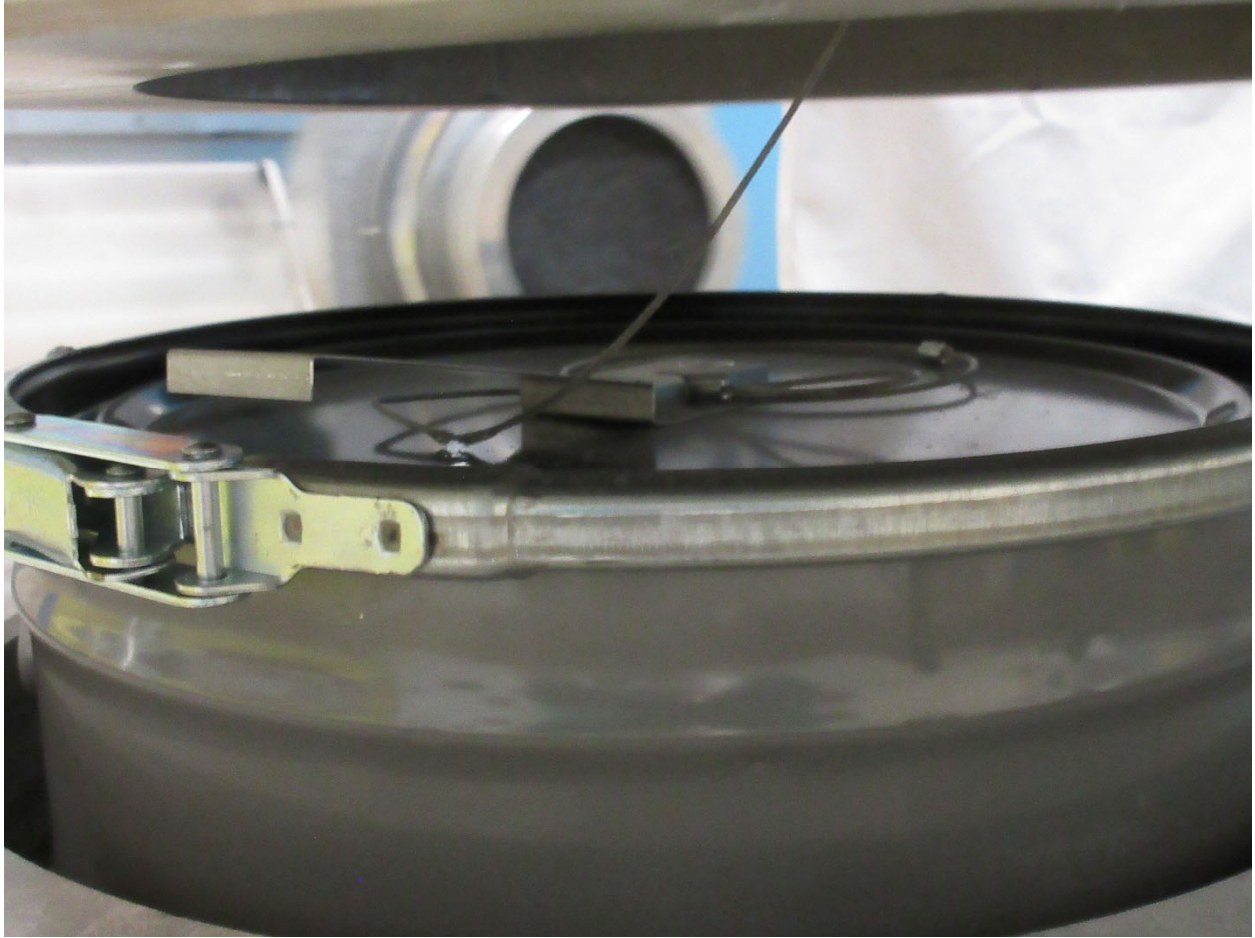


Figure 3: Side view of same items of interest as Figure 2





*Figure 4: Correct way for cable to be routed through attachment block (example image from TRI-DN-23-10 assembly instructions). For Pail 275, the cable was routed through the block the opposite way.*

## Conclusions:

- The improperly routed cable on top of the pail's lid is undoubtedly responsible for the issue observed by CNL (failed pull-test prior to emplacement).
- When the cable is incorrectly routed as described, it causes excessive lateral loading in the cable assembly. The result is that the cable does not enter through the hole in the underside of the F-308's lid correctly. Because of this, when the pull-test is attempted, it causes additional friction and a kink in the cable which prevents it from being fed smoothly through the hole, and therefore feels as if it is stuck.
- It is clear that the root cause of this issue was a pail assembly oversight. This error was an easy one to make and could have been made by an inexperienced person assembling the pail, or someone who was in a rush. Furthermore, the error is a very difficult one to catch because at first glance, it appears to be correctly routed, and because any personnel handling the pail directly are doing so with haste to reduce radiation dose.

## Recommendations:

- **Prevention of this issue in the future:**
  - This pail was originally fabricated in the summer of 2022. At that time, documentation on pail assembly, including quality control checks, was deficient. Based on recent requests from CNL, TRIUMF has authored a design note (TRI-DN-23-10) which contains a formalized procedure for assembly and quality control checks for the lifting-related aspects of the pail. It is expected that this improved documentation, which includes an updated assembly drawing and step-by-step photos, will reduce the probability of such an error.
  - Remote Handling and Waste Management group workers can check for such a mistake at multiple points during assembly and operation:
    - During initial assembly (as per aforementioned procedural documentation... this is the easiest point to rectify the issue)
    - During initial waste packaging in hot cell (last chance to catch this error before intervention results in dose to personnel)
    - During remote craning from the hot cell to the storage vault
    - During remote craning from main storage vault to mini storage vault where pails are staged for waste packaging
    - During waste packaging job to insert pails into F-308 flasks (last chance to catch the issue prior to leaving TRIUMF site... at this point, intervention results in dose to personnel)

It is recommended to update procedures related to the above tasks to include a check for this issue, as well as a general check to ensure there are no other obvious problems with the pail assembly (i.e. fasteners appear present and tightened, cable is not kinked, etc.).

- **Dealing with the existing waste (contents of Pail 275):**
  - The contents of the pail shall be re-packaged into a new pail due to both the concern associated with the distance this pail will have traveled in total during multiple shipping events, as well as the need for the lifting cable attached to the lid to be re-fabricated.

- TRIUMF will perform the pail re-packaging into another pail in the near future, and then place this pail into a different F-308 as the existing one's certification will have expired this time.
- TRIUMF will advise CNL on the new pail number, and it will most likely be shipped back to CNL in the next batch that is shipped. Note: this new pail will have a 30 ft long cable as recently requested by CNL.