



ENVIRONMENTAL HEALTH & SAFETY

SAFETY GUIDELINE Vacuum Systems

Vacuum systems are frequently used to aspirate liquid waste. **Aspiration traps connected to building/house vacuum lines must have an in-line HEPA or hydrophobic PTFE membrane filter (Figure 1) to protect central lines from contamination, corrosion, or moisture damage.** When a vacuum set-up is poorly designed or if its integrity has been compromised, users and persons who maintain vacuum lines are at an increased risk for injury or exposure to hazardous material via a leak, spill, splash, aerosolization, fire, implosion, or explosion.

Figure 1 (Right): In-line filters should be installed after flasks and before the house vacuum connection. Based on Institutional Policy and regulations set by OSHA, CDC, and NIH. Various filter options are available for purchase. Consider the following options: [MilliPore Sigma Filters](#) (SLFA05010, pictured), [Corning Filters](#) (CLS431227-12EA), [Midwest Scientific Filters](#) (RJF502210), or other comparable filters.



Substance and task-specific risk assessments should be used to determine the overall design, maintenance needs, and standard operating procedures for pressure and vacuum systems. What substances are involved? How will it be used? What are the hazards and associated consequences? How can risks be mitigated?

- **Equipment components and set-up design will vary for specific substances.**
 - Solvents, volatile liquids, biohazardous material, highly reactive, corrosive, or toxic gases, and the presence of particulates may all have different vacuum system design needs.
- **Materials should be compatible with reagents and disinfection or neutralization procedures.**
 - Varieties of traps (glass, plastic, opacity, etc.) and tubing (PVC, high- or low-density polyethylene, opacity, etc.) may degrade or react with certain chemicals or autoclaving.
- **Determine containment needs.** Housing the trap(s) *entirely* within a biosafety cabinet (BSC) or fume hood will significantly reduce the risk of exposure to potentially infectious aerosols and hazardous fumes, respectively. If traps are not housed in a BSC or fume hood, secondary containment (bin, bucket, tub) should be used to prevent the spread of spills and leaks if the trap were to tip over, crack, or break.
- **Standardize operating procedures.** Pressure and vacuum systems should be used as intended, and persons should be trained on proper procedures before attempting use on their own.
- **Wear personal protective equipment (PPE) to avoid potential injury or exposure.**
 - Goggles, face shields, gloves, lab coat/gown, etc. Eye protection is crucial when using reduced-pressure systems with an increased risk of implosion or explosion.
- **Inspect the set-up before each use.** Look for cracks, leaks, weakened tubing, loose connections, disinfectant needs, etc. and replace or repair any components that are found to be faulty. Routine and long-term exposure to UV light (such as in the BSC) may degrade the quality of containers or tubing. If this occurs, replace the item with a new one. Consider removing items before using the UV light.

Contact EHS if you need assistance with the risk assessment process. Contact information is below.

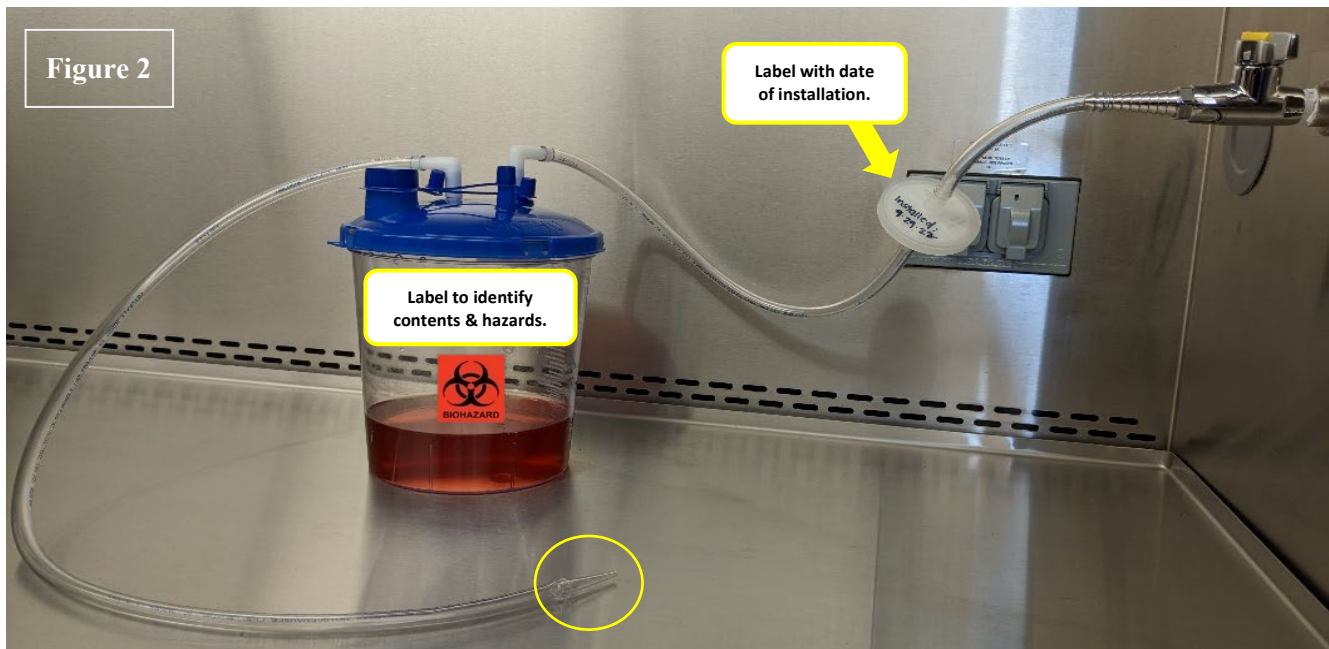


Figure 2 (Above): Recommendations for Aspiration/Vacuum Trap Set-up Involving Biohazardous Material. Many traps on campus are used for liquid, non-volatile, biohazardous materials. Use the following recommendations for these instances to reduce the risk of injury or exposure:

1. **Housing the entire set-up within a BSC is ideal if biohazardous materials are present.**
2. **Suction Canister, Cardinal Health™ 65651220**
 - Plastic is recommended over glass, as it is less likely to crack, chip, or shatter.
 - The lid has a float filter that can prevent overflow, eliminating the need for a two-flask set-up but not an in-line filter. The covered pour spout makes it easy to add disinfectant and empty.
 - The small footprint and squatty height easily fit inside a BSC and is not prone to tipping over. The secure lid also prevents leaks if the canister manages to tip over.
3. ***Labeled* in-line filter** (arrow in the figure). Label with the date of installation. Replace filters according to the manufacturer’s recommendations and if they become soiled.
4. **Material-compatible tubing.** To fit the ports on the suction canister, the tubing must be $\frac{5}{16}$ ” ID (inner diameter). Length should not be so long that excess tubing becomes hazardous.
5. **Canister clearly labeled to communicate contents and hazards.** Identify any aspirated material(s), disinfectant(s), and associated hazards (radioactive, biohazardous, corrosive, flammable, etc.).
6. **Avoid using glass Pasteur pipettes as aspiration tips, if possible.** Glass pipettes have been known to cause subcutaneous injury through cuts and punctures. Plastic pipettes, such as P1000s tips or Serological pipettes, are less likely to break and cause injury (circled in figure).
7. **Proper disposal procedures.** [UNMC Waste Handling Policy](#). [Sanitary Sewer Disposal Fact Sheet](#).

Various products and set-up configurations may also be suitable; having the necessary safeguards is key. More visuals can be seen on the next page. Complete and multicomponent kits are also available and adequate for use. Here are some of those options:

- [Agros Technologies, MiniVac Waste Aspiration System](#) (Figure 3)
- [VWR, Foxx Life Sciences, Vactrap Vacuum Trap System](#)
- [Scienceware Vacuum Aspirator Bottle with Trap](#)
- [Bel-Art SP Scienceware Pipet Vacuum Aspirator Collection System](#) (includes vacuum)

Contact EHS via phone at 402-559-6356 or via email at unmcehs@unmc.edu. This document and other Laboratory Safety Resources can be found at www.unmc.edu/ehs/safety/lab-safety/lab-safety-resources.html

Which image is more like your vacuum trap set-up? How can you make yours safer?



Figure 3 (Left):

- ✓ Plastic Flask
- ⊗ Unlabeled
- ✓ Plastic Aspiration Tip
- ✓ In-line Filter (circled)
- ✓ Housed Entirely in a BSC, Before Vacuum Line (liquid does not pass through the BSC)
- ✓ Stand/Secondary Container to Prevent Tipping



Figure 4 (Right):

- ⊗ Glass Flask
- ⊗ Unlabeled
- ⊗ Housed Outside of the BSC
- ⊗ No Secondary Containment
- ⊗ No Overflow Protection
- ⊗ No Tip/Fall Protection
- ✓ In-line Filter