



GROUND GLASS AND GLASSWARE SAFETY

Introduction

Glassware is one of the most commonly used kinds of equipment in laboratories due to the versatility, durability, and broad chemical resistance of glass. Ground glass is glass whose surface has been ground to produce a flat but rough surface. It is commonly found on glass equipment used in laboratories (e.g., flasks, stoppers, valves).

Broken glass is one of the most common causes of laboratory injuries, typically from the mishandling or misuse of glassware. Precautions must be taken so as to not compromise the integrity of glass equipment and potentially risking breakage or injury. Any abrasion reduces the strength of glass, making it more susceptible to breakage under impact, pressure, and/or thermal shock (i.e., a sudden temperature change). Serious injuries could result if breakage occurs while glass is pressurized or holds heated and/or corrosive contents. To avoid accidents and injury, review and implement the following recommendations for safely using and cleaning glassware.

General Precautions

- Borosilicate glassware is recommended for all laboratory glassware except for special applications that use UV or other light sources.
- Careful handling and storage procedures should be used to avoid damaging glassware.
- Consideration should be given to the compatibility of glassware with the chemicals or process it will be used for. Some chemicals react with glass or can damage it, if the process would involve changes in temperature or pressure ensure the glassware can withstand the changes.
- Proper instruction should be provided in the use of glass equipment designed for specialized tasks, which can represent unusual risks for the first-time user.
- Inspect the glassware before each use and discard if scratched on inner surfaces, chipped, cracked, or damaged in any way.
- Use heavy gloves to protect the hands when inserting glass tubing into rubber stoppers/corks or when placing rubber tubing on glass hose connections. Tubing should be fire polished or rounded and lubricated, and hands should be held close together to limit movement of glass should fracture occur. The use of plastic or metal connectors should be considered.
- Glass-blowing operations should not be attempted unless proper annealing facilities are available.
- Vacuum jacketed glassware should be handled with extreme care to prevent implosions. Equipment such as Dewar flasks should be taped or shielded. Only glassware designed for vacuum work should be used for that purpose.

- Tongs, a dustpan, and a broom are the best tools for cleaning up broken glass. If hands are used to pick up glass, only handle large pieces of glass and wear heavy duty gloves to protect the hands.
- Disposal of both broken and intact glass as ordinary refuse is not acceptable. UNL custodial staff do not handle the disposal of glass, this is the responsibility of the person(s) generating the glass. Proper disposal requires consideration for the previous use of the glass as well as its condition. See EHS SOP, ***Glass Disposal – Intact or Broken***.

Ground-Glass Surfaces

- Ground-glass joints and stopcocks should be lubricated to prevent them from sticking and breakage. Clean the surface prior to lubrication to remove dust, dirt and particulate matter that may score the surface or cause leakage.
- Different lubricants are used for various operating conditions:
 - Silicone grease – for high temperature and high vacuum.
 - Glycerin – for long term reflux or extraction.
 - Hydrocarbon grease – for general laboratory use.
- Lubricate only the upper part of the inner joint. A properly lubricated joint appears clear, without striations.
- Spread two circular bands of grease around the stopcock plug. Insert the plug into the barrel and twist several times until the assembly is completely transparent. Be careful not to use too much lubricant or the bore will become plugged.

Proper Cleaning Procedures

- Wear heavy, water-resistant rubber gloves during glassware cleaning operations. Gloves with textured or slip-resistant palms are recommended. Also wear protective eyewear to prevent cleaning agents or glass shards from entering the eyes.
- Washing machines may be used. Support racks on the washer must be well maintained. The support pins should be coated with a non-abrasive material to prevent metal to glass contact and scratching.
- For manual washing, use only plastic core brushes that have soft non-abrasive bristles or soft, clean sponges/rags. Use brushes to clean inside of deep glassware. Do not reach inside of glassware while cleaning to prevent cuts should the glassware break.
- Use rubber sink and counter mats can help reduce the chance of breakage and injury.
- Do not overload sinks, dishwashers, or soaking bins.
- Store glassware carefully during drying operations. Do not place round or oddly shaped glassware on countertops or other flat surfaces where they might roll off and break. Drying racks are the best option for most glassware, however, ensure that the glassware is adequately supported on the rack.
- Many commercial glass cleaners are available. Follow the manufacturer's directions for the use of these products since some are corrosive and can damage glass. Organic solvents are acceptable cleaning agents when conditions warrant their use.



- **Never use strong alkaline products, hydrofluoric acid or hot phosphoric acid as cleaning agents.** These materials dissolve glass, leading to damage and eventual breakage.
- Do not use any abrasive cleansers, including soft cleansers (e.g., Ajax, Comet, Old Dutch, Soft Scrub, etc.), as these will scratch the glass and cause eventual breakage and possible injury. Scotch Brite and similar scouring pads will also scratch glass and should not be used.
- Do not place metal or other hard objects, such as spatulas, glass stirring rods, or brushes with metal parts, inside the glassware. This will scratch the glass and cause eventual breakage and injury.
- Do not place hands inside glassware while wearing jewelry, particularly diamond rings, as these will score the inside of the glassware and eventually cause breakage and injury.
- Do not use heat as a method to remove carbon residues. Heating glassware to temperatures $>800^{\circ}\text{F}$ will cause permanent stresses in the glass and eventual breakage.
- **AVOID IMPACT** – Glass will break as a result of impact. Use care when handling to avoid impacting hard objects, such as spigots, other glassware, counter tops, etc.