Facility Guidelines

Architectural Conservation Lab

2022-23

Weitzman
SCHOOL OF DESIGN
UNIVERSITY of PENNSYLVANIA

Architectural
Conservation
Laboratory

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Contents

Introduction

DESCRIPTION & HISTORY

The Architectural Conservation Lab is a facility of the Graduate Program in Historic Preservation dedicated to the examination, analysis, and treatment of historic and traditional architectural materials and the building arts. Founded in 1991, the laboratory serves as a graduate training and research center, providing the necessary facilities to support the curriculum of the Historic Preservation Program and research in architectural conservation. Activities include workshops, classes, theses work, and advanced research. The laboratory also houses a historic building materials collection.

To accommodate the diverse needs related to teaching and research, the following guidelines provide information on the organization of the ACL and rules governing its use for students and researchers.

SPACE ALLOCATION

The Architectural Conservation Laboratory is composed of a suite of rooms located on the ground floor of the Duhring Wing adjacent to the Fisher Fine Arts Library.

The Dry Lab is the principal teaching space for architectural conservation courses. Experiments and demonstrations are prepared weekly while courses are in session and students are assigned shared bench space each semester. All general supplies and equipment, including glassware, tools, balances, test equipment, chemicals, solvents, and proprietary materials are housed here. A small collection of conservation reference literature is located on the south shelves. Supplies and equipment are housed according to standard safety requirements, by type, and by use. Be sure to consult drawer labels and the online platform Quartzy for specific locations.

> **https://app.quartzy.com/groups/254147/**

A digital flat screen and a whiteboard are available for in-lab lectures. A laptop with a USB-C port is required.

An adjacent Wet Lab contains sinks; a fume hood for working with volatile, noxious, or toxic materials; a safety shower; an eyewash station; and a freeze-thaw chamber. A hallway houses desiccators, drying ovens and sample preparation equipment.

A separate Microscopy Room provides a dedicated dust-free environment for analytical microscopy and photomicrography that pertain to course work and research projects. A digital flat screen is available as well. Students and researchers must be proficient with the specialized microscopes and software before using them. Contact the Lab Manager to arrange training sessions.

ACCESS

Students registered in courses with laboratory sections and working on theses with laboratory-based components have priority. Access to the various rooms is determined on an as-needed basis. The Lab Manager maintains a list of authorized members.

Safety

Awareness of laboratory safety practices and procedures is an integral part of working in the lab. All questions, large or small, regarding laboratory safety should be directed at the TA(s) and Lab Manager. Various lab safety references are located on the south bookshelves. All lab members are required to attend a safety lecture given by Environmental Health and Radiation Safety (EHRS), scheduled as the first class of the Conservation Science (HSPV 555) course during the fall semester.

`http://ehrs.upenn.edu/`

Every effort should be made to work with a lab partner, but it is understood that this is not always an option. Familiarize yourself with safety procedures and do not work with hazardous materials during after-hours. Access to the lab may be rescinded if the above is not followed.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE is available in the Wet Lab.

① Eye Protection

Safety glasses must be worn while working in the Dry Lab. These protect your eyes from debris and fine particulates. Splash-proof goggles must be worn when mixing hazardous chemicals and must be conducted in the Wet Lab. Contact-lens wearers are advised to use eyeglasses when working with hazardous chemicals, such as organic solvents. Full face masks and counter shields are also available for special situations.

Footwear

It is advised to wear comfortable shoes, as lab members will often be standing while working. These must be closed toe. Open-toe footwear (sandals, flip-flops, etc.) are not allowed. You may use a locker in the hallway to store special footwear.

② Gloves

Gloves of the appropriate type should always be worn when working with acids, bases, solvents, and other toxic materials (see glove selection guide posted in the General Supplies

cabinet). Heat resistant and general work gloves are also available for reaching into the oven. Nitrile gloves are recommended for general use.

Hats & Hair

Hats or other non-safety headgear should not be worn inside the laboratory. These are a fire hazard and can impair sight and hearing. Long hair must be secured so as not to present a fire hazard. Precaution must be taken when working with hazardous chemicals or open flames.

Aprons

Aprons must be worn while working in the laboratory. Aprons are available for limited use to current students provided that the lab coat fits properly and that it is returned in good condition at the end of the semester. They must be labeled with the student's last name. For those who wish to purchase a new lab coat, be sure to acquire a 100% cotton garment for fire safety precautions and long-term use. New or used lab coats can be purchased from any medical or uniform supply company online.

Particle Masks

Particle masks must be worn when using powders such as fumed silica, sands, lime, etc. Lead dust masks should be worn when handling lead. Organic vapor masks with the appropriate canister type filters should be used for volatile solvents. If you require the use of a canister type respirators, please consult the TA(s) or Lab Manager to arrange for a required fit test and training provided by EHRS.

FUME HOOD

The fume hood is dedicated for short term storage of regularly used chemicals. It should not be used for long term storage. The fume hood also contains a waste container labeled "BioPlastic Trash" used in cross section sample preparation in the Finishes course (HSPV 740). The sash of the fume hood must be operated between the minimum height of 6 inches and the posted height.

Reagents and solutions should be prepared in the fume hood to minimize possible contamination of the rest of the room. Only projects cleared with the Lab Manager may be allowed to occupy space in the fume hood. A signup sheet above the fume hood window should be used to log any experiments using the hood.

In the scenario that air flow is not detected, check the breaker switch on the top left of the hood window. If that does not re-start the air flow, contact the Lab Manager or WSOD Operations as soon as possible.

CHEMICAL HANDLING

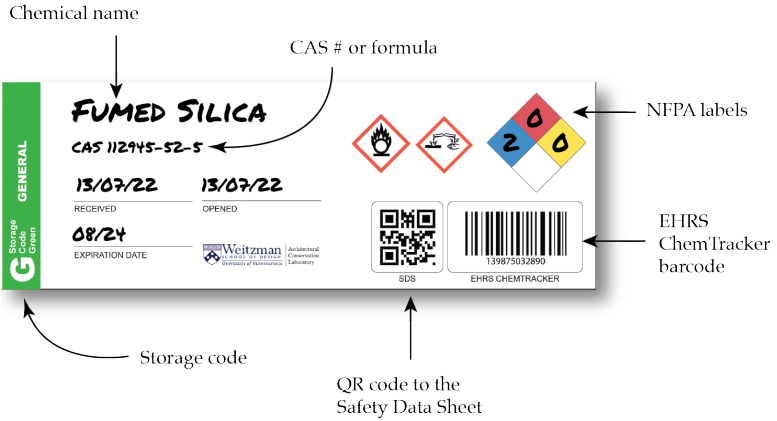
Chemicals should only be handled after reading the Safety Data Sheet (SDS) and training has been completed. They should never be left unattended in the lab. Exceptions are granted to small bottles of reagents for use on the bench or in the Microscopy Room. Questions regarding chemical compatibility and storage should be brought to the Lab Manager, instructors, and TA(s). Compressed gases are not described here as they are not used in the ACL; EHRS should be consulted if this policy changes in the future.

③ Labeling

All chemicals must be properly labeled and stored closed and upright in their original containers.

When a container arrives, the Lab Manager will log into UPenn's ChemTracker platform. A chemical-resistant label with the corresponding storage group must be added with information on the date it was received, the CAS number, the NFPA designation, and the corresponding OSHA pictograms added (figure below). The Lab Manager will provide an EHRS ChemTracker barcode and a QR code label that links to a PDF version of the Safety Data Sheet.

Unless there is a compression hazard, the appropriate color plastic tape should be used to seal the reagent container. Some chemicals must be stored inside a secondary container, in a desiccant, or refrigerated. Please consult the relevant SDS. Containers should only be picked up from the sides and bottom or by an integral handle (if provided). To prevent accidental spills, containers should never be handled from the cap. Try to work within secondary containment for hazardous materials.



When dispensing chemicals, use an appropriate implement (tongue depressor, scoopula, chemical spatula) to transfer the material into a container for later use. Corrosive substances should never be stored in metal containers. Small amounts should be removed to prevent waste and contamination. Material should never be returned to its original container to prevent contamination.

Funnels must be used when transferring liquids. Liquids (especially solvents) should be covered with a watch glass to retard evaporation. Disposable weighing boats make excellent chemical transfer containers while weighing.

Safety Data Sheets (SDS) are stored in a designated binder next to the Fume Hood and organized alphabetically. They are also found as a scannable QR code in safety labels and made available as PDFs online.

bit.ly/lab-msis.

SDSs outline critical information on first aid measures, chemical composition, fire-fighting measures, handling and storage, exposure control, transportation and disposal, and other relevant safety information. It is mandatory for all lab members to read all relevant SDS before using any hazardous substance.

Other commercial and industrial products such as waxes, resins, detergents, powders, etc. are stored in cabinets by type or use (e.g., adhesives). These also have a designated SDS in the binder. Prepared solutions are stored in the appropriate cabinet and must always be identified with a safety label. Prepared reagents for micro chemical analysis should be labeled and temporarily stored in the Fume Hood.

DISPOSAL

④ Hazardous Chemicals

SDSs should always be consulted before chemicals are disposed. Chemical disposal is conducted by the Lab Manager and Teaching Assistant(s) in coordination with EHRS. Substances may not be mixed and must be stored on the Chemical Waste cart next to the Fume hood. Notify the Lab Manager or TA(s) when containers are nearing capacity to schedule a pickup.

⑤ Broken Glassware

Broken glassware is to be placed in the cardboard box marked "Laboratory Glassware" near the main door. This container is not for sharps, glass, or plastic recycling. Empty reagent and chemical containers —both glass and plastic— should be left to evaporate in the fume hood, triple rinsed with water, and have their labels defaced before being thrown away. Note what was thrown away on the sheet located above the glassware disposal box.

Items to be disposed of in this container are limited to broken

Map

Hazardous Chemicals

- G General
- B Toxic
- F Flammable
- W Corrosive
- Y Reactive and Oxidizer

Dry Area

- N North
- S South
- E East
- W West
- I Island
- LS Lab Supplies
- FR Fridge
- C Corridor
- GS General Supplies

Wet Area

- WA Wet Area
- L Label Station and Waste
- HT Hardware and tools

Microscopy

- RM Rocks and Minerals
- MI Microscopy Room

Administrative

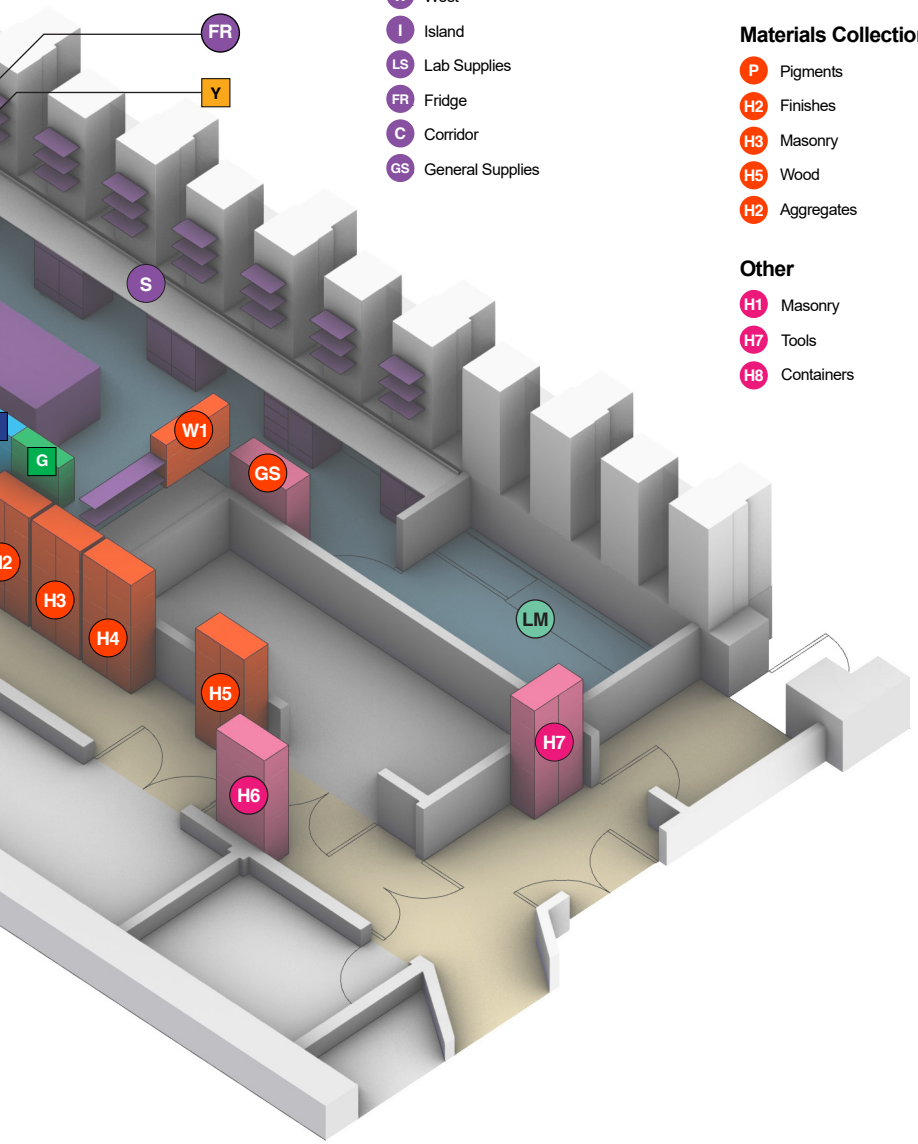
- LM Lab Manager Room

Materials Collection

- P Pigments
- H2 Finishes
- H3 Masonry
- H5 Wood
- H2 Aggregates

Other

- H1 Masonry
- H7 Tools
- H8 Containers



glassware, clean empty chemical containers, and empty syringe barrels (not needles).

⑥ Sharps

Used microscope slides, needles, pins, syringe tips, broken glass stirring rods, glass seekers, and other sharps only are to be placed in the sharps containers located near the fume hood and in the Microscope Room. No chemicals or biohazards should be placed in this container. When they are full, the tops should be locked/ sealed and EHRS contacted for non-hazardous sharps pickup and marked with "non-hazardous sharps / chemicals / do not autoclave".

EMERGENCY RESPONSE

Penn Police should be contacted first in the case of any emergency as they are familiar with the campus buildings. They can be reached 24/7 at **511** using on campus phones and **215.573.3333** from mobile phones. Lab members are required to save this phone number in their mobile phones.

⑦ First Aid Kits

A general First Aid Kit and a Hydrofluoric Acid Response Kit are located at the Wet Lab.

For injuries that cannot be controlled with adhesive bandages and gauze please call 511 or proceed to Student Health Services (215.746.3535) or the Emergency Room at the Hospital of the University of Pennsylvania on 34th Street. If you or other members notice the need for emergency medical care call Penn Police immediately, then notify the Lab Manager & Operations.

⑧ Eyewash

An eyewash station is integrated into the sink of the Wet Lab. SDSs must be consulted as certain hazardous substances do not recommend using an eyewash in case of an emergency.

⑨ Safety Shower

The safety shower in the Wet Lab should only be used in emergencies, since there is no drain. The shower will discharge 55 gallons of water onto the person below for 15 minutes. Unnecessary activation of the safety shower can damage lab equipment and is considered a serious violation of ACL policy. If the safety shower must be used, someone should remain with the person using the shower until help arrives.

⑩ Chemical Spills

Small chemical spills can be contained using the all-purpose absorbents from the spill kit on the Wet Lab. For very large spills (large bottles of liquid) containment should be attempted only if it does not pose a safety hazard to lab members. All rooms should be evacuated, and both the WSOD Operations Office and Lab Manager should be notified immediately. UPenn's office of Environmental

Health and Radiation Safety (EHRS) 24-hour phone line must be called at **215.898.4453** and/or the emergency pager at **215.308.52**

Solid chemicals that are spilled should be contained in an appropriate container and be disposed by EHRS.

All lab members must use absorbent counter protectors when working with any hazardous substance. These are available as rolls next to the emergency exit door.

11 Fire Extinguishers

Fire extinguishers are located outside the lab manager's office and at the emergency exit door outside to the Microscopy Room.

In the case of fire contact Penn Police immediately and alert the Lab Manager. Pull fire alarms to begin evacuation of the building.

Small fires should be extinguished as soon as they are noticed when possible. Members should always spray the base of the fire to extinguish it. Water should be avoided for fires that may be close to open chemicals due to reactivity. Sand from the rolling wooden cabinets under the center island in the Dry Lab may also be used to extinguish small flames. Care should be taken when flammable items are placed in the drying ovens. Ovens containing flammable materials like wood or filter paper must not exceed 60 °C.

Automatic External Defibrillator

An automatic external defibrillator (AED) is located on the 4th floor of Fisher Fine Arts Library and at the basement of Meyerson Hall. The defibrillator should be used if someone is experiencing a heart attack. The one at Fisher is closest and is reached fastest by taking the elevator in the basement of Fisher and take it to the 3rd floor, then walk one flight to the 4th floor. All information for using the AED is printed on the equipment. Penn Police / Fire should be notified immediately.

Rules & Responsibilities

The following section outlines general responsibilities for all lab members and responsibilities specific to conservation courses.

GENERAL LAB RULES

1. Wear a lab coat and safety goggles.
2. Wear gloves.
3. Read safety data sheets.
4. Never pour chemicals back to the original container.
5. Do not taste or sniff, always waft.
6. No food or drinks.
7. Store personal items in lockers.
8. Use closed-toe shoes.
9. Work with a partner.
10. Tie back long hair.

RESPONSIBILITIES

Do not pour waste down the sink

The sinks are intended only for water and water soluble, non- toxic liquids. Lab members should never pour hazardous chemicals, sand, resins, clay, pastes, paint or pigments, or any waste materials down the sink. Contact the course TA or Lab Manager on proper handling and disposal.

12 Use bench protectors

Plastic (non-porous) bench protectors, available as rolls next to the emergency exit , should be used for all experiments that do not use chemicals. These protect the epoxy counters from scratches. When chemicals are in use, place a silicon blue bench pad and label with tape your name or group. Clean it when it has become stained or after working with hazardous chemicals.

Keep your workspace organized

All lab members should strive to keep their workspaces and storage areas as clean and organized as possible to prevent accidents. Lab members should keep only active materials on the bench and keep all other materials in their assigned storage spaces. Supplies and equipment should be returned to their proper locations promptly. Check the online inventory on *Quartzy* for specific location.

Work neatly

Every member should wipe down their station before and after use with damp paper towels (no reusable rags). After working with hydraulic

materials, polishing powders, and salt solutions extra care must be taken to assure that streaks are not left on the bench top. Work neatly. Always clean your workstation, and reshelve equipment before you leave.

Reshelve glassware

Every student is responsible for the proper cleaning and storage of glassware used in the lab. Soiled glassware must be scrubbed using an abrasive pad or brush (not sponges) with hot water and lab soap. Rinsing with water alone is not sufficient. All marker writing, labels, and traces of adhesive must be removed from glassware. A small amount of alcohol or acetone, stored in the Fume Hood, can be applied on damp paper towel to effectively remove stubborn dirt. All cleaned glassware must be reshelved after drying. Do not let glassware accumulated at the sink.

COURSE RELATED

Conservation Science (HSPV 555)

The Conservation Science course holds weekly labs for the Fall academic semester. Students work in small groups of two or three designated by letter. Lab assignments are due three times during the semester. Group samples may be stored on trays in the dedicated bakers rack located near the Lab Manager's Office. Trays should be labeled by group with tape.

Seminars

Conservation seminars (Wood, Masonry, Finishes, Concrete, Metals) include lab demonstrations and exercises. Faculty from other courses may ask the Lab Manager to borrow general supplies and equipment from the ACL.

Conservation Theses

Students working on conservation theses with lab-based components are primary members of the ACL for their research. This work is coordinated with their adviser and the Lab Manager. Suplementary orientation sessions and guidelines are organized for thesis students and external researchers.

ACL BOOKS AND MATERIALS

All lab books are to be used in the lab only. If copies or scans are needed, please consult with the lab manager. Materials and equipment can only be borrowed with approval from the Lab Director and Manager.

Inventory

Inventory of hazardous chemicals, glassware, and equipment is maintained by the Lab Manager.

CHEMICALS

Chemicals are stored and grouped according to the Globally Harmonized System (GHS) and the Chemical Hygiene Plan established by EHRS. They are color-coded using Fisher Scientific's *ChemAlert* code system and sub-grouped by EHRS' Chemical Hygiene Plan (table on opposite page).

EQUIPMENT

Various equipment is used at fixed (weatherometer, freeze-thaw chamber, balances, Isomet cutting machine) locations while movable (small stereo microscopes, grinder, blenders) are usually set up as needed. Items with specific additional instructions are listed alphabetically in this section. Blue instruction sheets and sign-up sheets are placed adjacent to the equipment. Instructions and complete manuals are available electronically on Penn+Box:

bit.ly/lab-manuals.

Equipment and supplies are inventoried in Quartzy to monitor maintenance and track vendors.

Balances

The electronic beam balances located in the laboratory should only be used after training on weighing techniques and calibration. Be careful not to exceed capacity as this will require repair. A weighing boat or weighing paper should always be used to protect the balance. Do not over-use the tare function.

13 Desiccators

The clear acrylic desiccators are used to keep samples in a controlled environment for short term storage or while waiting for samples to cool down after being removed from the ovens. Drierite desiccant is used to reduce humidity. The desiccant changes color after absorbing water but this should not be confused with exhausted desiccant, the color change reaction doesn't occur after multiple regenerations. Digital thermo-hydrographs are used to monitor temperature and humidity levels inside instead.

Cabinet	*Cabinet description*	*Group*	*Group Description*
General G	Presents no more than moderate hazard in any of the categories above.	E	Compatible oxidizers (including peroxides)
		G	Not intrinsically reactive or flammable or combustible
		L	Non-reactive flammables and combustibles, including solvents
Toxic B	Toxic if inhaled, ingested, or absorbed through skin. Store in secure area.	-	Proprietary cleaning and restoration products
Flammable R	Store separately only with other flammable chemicals in a flammable liquid storage	L	Non-reactive flammables and combustibles, including solvents
		K	Compatible explosive or other highly unstable materials
Reactive & Oxidizing Y	May react violently with air, water, or other substances. Store away from flammable and combustible materials.	E	Strong oxidizers
Corrosive W	May harm skin, eyes, or mucous membranes. Store away from red-, yellow-and blue-coded reagents.	A	Compatible organic bases
		C	Compatible inorganic bases
		D	Compatible organic acids
		F	Compatible inorganic acids

(14) Fume Hood

The Fume Hood is a workspace for preparing and using volatile, noxious, and toxic materials which require containment and rapid ventilation. Use of the hood is required when handling hazardous materials which are dangerous or annoying to lab members. No materials should be stored in the chamber and safety goggles must be used at all times.

(15) Isomet Cutting Machine

The *Buehler Isomet*® is used for preparing embedded samples such as paints, stone, mortar, and metals and should be used with extreme care as parts are delicate and difficult to replace. The *Isomet* saw blade should be honed before and after each use and the appropriate solvent should be used to always lubricate the blade and sample when the blade is turning.

A basin containing several bottles of stoddard solvent (new, used and filtered, used and unfiltered) is located next to the machine. Dispose of lubricant in the designated container when finished and clean all parts of the mechanism after use. Various abrasives and abrasive pads are available depending on sample type for post cutting polishing. Training must be completed to operate this equipment. Contact the Lab Manager to arrange a session.

(16) Microscopes

A *Leica*® *MZ-16A* stereo zoom microscope, *Nikon*® *Alphaphot 2 YS2* compound microscope retrofitted for pseudo darkfield and fluorescence microscopy, a *Nikon*® *Optiphot2-Pol* polarized light microscope, and an *Olympus*® *CX-31* compound microscope are permanently located in the Microscope Room for use. *Zeiss Stemi* stereo microscopes and *Olympus*® *CX-31* polarized light microscopes are available for student use throughout the semester. All work must be logged on the signup sheets. Microscopes should remain covered when not in use with the light source turned off. Specialized training is required.

Hot Plates & Stirrers

Hot plates left out to cool before returning to storage should be labeled as dangerous to avoid accidental burns. Spills on stirrer/hot plates must be cleaned off before returning to cabinets.

(17) Ovens

Ovens should be left at the lowest temperature regularly required for work. They should not be adjusted for temperature, turned off, or unplugged without permission from the Lab Manager. The most useful temperature for work in the ACL is 60 °C (140 °F). A note to other lab members must be posted on the oven if you must change the temperature for a particular experiment. This

can only be done if the oven is clear of other students work. All samples must be logged on the sheets on the oven doors. Samples can be logged under groups with numbers listed instead of each sample individually. Only chemically treated (acids, salts, consolidants, other…) items should be placed in the ovens marked for chemically treated samples.

(18) Water Filtration

Deionized water is available in the Wet Lab. Deionization occurs by using tap water passing through a *2 Cole Parmer Universal* grade filter columns and *2 Cole Parmer Research* grade filter columns installed in the sink. Replacement cartridges are replaced by plumbers when the ion-exchange resin cartridges change color, transferring the column on the left (cleaner) to the right and installing a new column (of each type) on the left. Water should be drawn from the filtration system by opening the valves on the right filtration columns, then the valve on the dispensing line, then the valve on top of the left filtration columns. All valves should be closed when the system is not in use. The water purification system should not be operated without training from the Lab Manager and is restricted to the Laboratory Teaching Assistant(s) and others with permission. Reagent water is purchased to ensure accuracy for precision work and reagent preparation.

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