Russ College of Engineering and Technology

Center for Electrochemical Engineering Research (CEER)

CEER Safety Policy (Updated)

I. Underlying Principles

The fundamental principle on which the Center for Electrochemical Engineering Research (CEER) safety policy is based is a commitment to achieving a healthy and safe working environment, as well as to supporting environmentally sound practices in the performance of all experiments and activities. Although CEER expects excellence from all of its personnel, performance success must never take precedence over safety concerns.

The maintenance of a safe and environmentally friendly workplace is everyone’s responsibility. CEER wishes to establish a "culture of safety" in which workers are continually on the lookout for potential hazards and are actively working to prevent their occurrence. Each individual member of CEER, from managers and supervisors to students and employees, has a share of the responsibility for maintaining a safe and environmentally friendly workplace. Training programs, reporting mechanisms, safety meetings, and other tools will be implemented which will enable CEER personnel to have a clear idea of what is expected of them in relation to workplace safety.

Safety matters will be handled with an eye towards transparency: questions, comments, and concerns will be handled in an open, forthright, and timely manner which takes into account the views and rights of all parties concerned.

A safe and environmentally friendly workplace benefits the organization in a variety of important ways. In addition to the intrinsic benefits of a safe workplace, there is the additional benefit that a reduction in workplace mishaps and accidents leads to enhanced productivity and efficiency. A safe, environmentally friendly operation also reaps significant rewards in terms of public image and reputation.

All CEER safety policies must be fully consistent with existing Ohio University policies, including those for Safety Management, and with state and federal laws and regulations.
The development of a safe work environment is an ongoing process of continual improvement. As a result, this document is a “work in progress”: it will be revised on a regular basis in order to reflect changes and improvements in safety management at CEER.

II. Administrative Information

CEER is a research center contained within the Russ College of Engineering and Technology’s Department of Chemical and Biomolecular Engineering.

This safety policy applies to all CEER faculty, staff, and students. This policy also applies to visiting researchers and students, contractors directed by CEER personnel, and all others who use CEER facilities.

This policy will be reviewed periodically, at least once every two years, to ensure that it is up-to-date, and consistent with university and statutory regulations and policies. Updates or revisions of this policy related to any safety related event or incident will be implemented immediately.

Before anyone can work in laboratory CEER facility, all personnel must sign a form (Appendix 1) acknowledging that they have been made aware of the updated CEER safety policy and that they have been given the opportunity to ask questions about the policy.

The safety policy will be posted in the CEER Shared_by_All folder, in a folder kept by the Chemical Hygiene Officer and in a folder kept at CEER’s administrative office library (Stocker 166).

A safety policy organizational tree for CEER is presented in Appendix 2. The safety organizational tree will also be posted in the CEER Shared_by_All folder. The organizational tree lays out the chain of command for safety issues. As each CEER member is a safety officer, every member is included in the tree. Explanatory notes accompany the tree.

The Chemical Hygiene Officer (CHO) is the principal safety official for the organizational unit (CEER). He/she is ultimately responsible for planning, implementing, disseminating, training, enforcing, updating, and performing all other functions relating to safety. A centralized approach to safety administration will ensure consistent, coherent, and efficient safety management. While the CHO is superseded by the Center Director in the safety organizational tree, the CHO is the single most important person in relation to safety matters.

The Chemical Hygiene Technician (CHT) is the CHO’s principal assistant. The CHT may be delegated certain responsibilities by the CHO. During the CHO’s absence, the CHT will take charge of all safety related matters, including, but not limited to, planning, coordinating, implementing, training, investigating, and enforcing safety related issues. However, responsibility for all safety related matters ultimately rests with the CHO.

Questions or concerns relating to safety, or to the implementation of this policy, should be addressed to the CHO:

Mr. John Goettge, 740 593-1443 goettge@ohio.edu,
or, in the absence of the CHO, to the CHT:

Dr. Brian Hassler, 740 597-9045  hassler@ohio.edu

The Appendices to this safety policy consist of the following documents:

- **Appendix 1.** Safety Policy Agreement Form. This form must be signed by all CEER personnel and acknowledges that each individual understands CEER’s overall commitment to safety as well as the specific safety policies and procedures.

- **Appendix 2.** Safety Management Tree and Individual Personnel Responsibilities. This appendix contains an organizational chart and summarizes the responsibilities of all CEER and safety related personnel according to the safety policy.

- **Appendix 3.** Student/Staff Equipment Sign-Out Form. This form must be used when personnel request to borrow equipment or supplies (e.g., platinum foils) that are restricted from common access.

- **Appendix 4.** Equipment Sign-Out Form: Check Instrument’s Operational Capability. This form must be used when personnel wish to borrow a piece of equipment or instrumentation from the Center that needs to be tested before being lent out.

- **Appendix 5.** Equipment Sign-Out Form (for non-CEER Personnel): Borrower’s Acknowledgment of Responsibility for Damaged or Lost Equipment. This form must be used when non-CEER personnel request to borrow a piece of equipment or instrumentation from the Center that needs to be tested before being lent out. This form informs the borrower of his/her potential financial responsibility for repairing or replacing damaged or lost equipment.

- **Appendix 6.** New Student/Staff Checklist Form. Each new CEER member who works in the laboratory must acknowledge that he/she has received laboratory space in the Center along with general use equipment and glassware.

- **Appendix 7.** Student/Staff Checkout List Form. Each CEER student/staff member must complete this form upon their departure from CEER due to graduation, separation from employment, or any other reason.

- **Appendix 8.** Workspace Warning Sign. This “experiment in progress” sign must be posted whenever an experiment is left unattended in order that others will understand the nature of the ongoing experiment and know whom to contact should there be a concern about the experiment.

- **Appendix 9.** Sample of Electrode Birth Certificate. This “birth certificate” provides descriptive information about the electrode’s construction, structure, composition, properties, and age, and information about the person from whom further information can be obtained (i.e., the electrode’s creator).

### III. Safety Policy

#### A. Introduction

Ohio University wishes to ensure the protection of all laboratory employees from health and safety hazards associated with hazardous chemicals in the laboratory and to comply with the requirements of the OSHA Chemical Hygiene Standard and Ohio Public Employee’s Risk Reduction Act. The safety policy is written to provide methods and procedures for all laboratory personnel to follow while working in laboratories at Ohio University.
All students, faculty, and staff who perform research or operate in a research environment within the CEER laboratories are required to read and understand the safety policy.

This safety plan is to be approved at both the departmental and Dean’s level. Copies of this safety plan should be distributed to the following entities:

- CEER students, staff, and faculty
- Chemical Hygiene Officer (CHO)
- Chemical Hygiene Technician (CHT)
- Center Director
- Department Chair
- Departmental Safety Coordinator
- Dean’s Office (through the Associate Dean for Research)
- Environmental Health and Safety Department (EHS)

B. Incident Avoiding

1. General Safety Considerations for Working in All CEER Work Areas
   a) The work area must remain clean at all times.
   b) Any glassware, tools, instruments, safety equipment, or other supplies borrowed from CEER laboratories or facilities should be replaced in their original location in a timely manner.

   1) A form (Appendix 3), the “CEER Student/Staff Equipment Sign-Out Form,” must be filled out to borrow glassware, tools, instruments, safety equipment, or other supplies which do not need to be tested before being lent out.
      a. It is the CHO’s responsibility to ensure that lending out equipment is done in a responsible manner. No piece of equipment should be lent out which will interfere with ongoing CEER projects. It may be the case that a potential borrower may have to wait a period of time until the equipment becomes available.
      b. The CHO should explain to borrowers the cost of damaging or losing CEER equipment. Borrowers are liable for up to 100% of the full replacement cost of damaged or lost equipment.

   2) A form (Appendix 4), the “CEER Equipment Sign-Out Form: Check Instrument’s Operational Capability,” must be filled out to borrow tools, instruments, safety equipment, or other supplies which need to be tested before being lent out. The Mettler Toledo conductivity meter is an example of a CEER piece of equipment which must be tested before being lent out.
      a. It is the CHO’s responsibility to ensure that lending out equipment is done in a responsible and efficient manner. Equipment should not be lent out which would interfere with ongoing CEER research. It may occasionally be the case that the potential borrower may have to wait a period of time until the equipment becomes available.
b. The CHO will test the equipment before it is lent out to make sure that it is in good operational condition and then enter “OK” on the Form for “Equipment Checked at Checkout.” If the equipment is not in proper working condition, the CHO should repair it, or take appropriate measures to repair or replace it, before lending it out.

c. The CHO should explain to borrowers the cost of damaging or losing CEER equipment. Borrowers who are not members of CEER must sign the “Equipment Sign-Out Form (for non-CEER Personnel): Borrower’s Acknowledgment of Responsibility for Damaged or Lost Equipment” (Appendix 5). Borrowers who are not members of CEER are liable for the full replacement cost of damaged or lost equipment. The CEER Director, in consultation with the CHO and the borrower’s advisor (if applicable), will decide how much borrowers who are members of CEER must pay in relation to the cost of damaged or lost equipment.

d. When the equipment is returned, the CHO will test the equipment. If the equipment is not working properly, then the CHO will note that fact on the Form and send an email to the borrower (and his/her advisor, if applicable) informing them of the damage. As explained in the “Equipment Sign-Out Form (for non-CEER Personnel): Borrower’s Acknowledgment of Responsibility for Damaged or Lost Equipment” (Appendix 5), borrowers who are not from CEER are responsible for all costs relating to repairing or replacing the equipment. The CEER Director, in consultation with the CHO and the borrower’s advisor (if applicable), will decide how much borrowers who are members of CEER must pay for costs relating to repairing or replacing the equipment.

e. If the equipment is not returned to CEER from a borrower outside of CEER after a reasonable amount of time, then the CHO will send an email to the borrower inquiring about the equipment’s location. If the borrower confirms that the equipment has been lost, or if the borrower fails to respond within a reasonable period of time to the original email, then the borrower will be responsible for the full replacement cost of the equipment. In such a case, an email stating that the equipment is presumed lost and providing the amount of the financial liability of the borrower will be sent to the borrower (and his/her advisor, if applicable).

3) Note that all requests to borrow CEER equipment or materials must go through the CHO.

a. If a CEER piece of equipment is borrowed without the explicit approval of the CHO, then an investigation will be made by the CHO to determine the nature of the process by which the equipment was lent out. Lending out equipment without the consent of the CHO will be viewed as a serious violation of the CEER safety policy subject to enforcement procedures and penalties.

4) If the borrowed object(s) cannot be returned in a timely manner, the CHO should be informed immediately.

c) Glassware and solutions should not be left on countertops. These should be stored in the proper area in order that no passerby accidentally breaks glassware or spills a solution, and in order that equipment doesn’t end up in someone else’s possession.
d) For a major spill, a spill kit is located inside the door of Stocker 039 and another one outside the door of Stocker 044. These kits will help to contain a spill. Immediately report the spill to either the CHO or CHT. Similarly, if there is any other incident involving broken glass, equipment, or injury to anyone, the incident should immediately be reported to the CHO or CHT who can file the proper paperwork with EHS. In the case of broken glass, reporting will allow to reorder in a timely manner.

e) Each student/staff member will be assigned a work station to store their research related belongings. Each researcher should store their laboratory book in the top drawer of their work station in order that the Center Director or research advisor may have access to it at any time.

f) Any solutions or chemicals should be stored on the bottom shelf of the cabinet in the plastic spill containment tub supplied when the student/staff member arrives.

g) All solutions or chemicals not in their original container should be clearly labeled with their chemical content and concentration.

h) Disposal of chemical wastes of any type (solid, powder, or liquid) is a serious safety and environmental concern. Incorrect disposal of chemicals can lead to damage to pipes and containers, environmental and toxicological problems, and other undesirable consequences.

1) While general guidelines are listed below, EHS maintains two websites which deal extensively with the handling and disposal of chemical wastes:

   “Chemical Waste”
   http://www.ohio.edu/riskandsafety/ehs/hazmat/chemical.htm

   “Non-Hazardous Chemical Wastes”
   http://www.ohio.edu/riskandsafety/ehs/hazmat/chem_list.htm

2) Liquid chemical waste should be placed in a proper container (typically a 4 liter brown glass bottle) with a tight fitting lid. The waste bottle should be properly labeled with the chemical names and concentrations or molarities of each chemical in the solution.

3) When adding more waste to a partially full bottle it is very important to only add similar solutions (i.e., acids should only be added to acids, bases should only be added to bases). After adding the waste, the waste container needs to be relabeled to in order to display the new contents and concentrations.

4) Solid waste should be placed in a proper container (typically a 4 liter Nalgene bottle) with a tight fitting lid. As with liquids, waste containers should be labeled with the chemical names and concentrations or molarities of each chemical in the solution.

5) Waste containers should be stored in the chemical waste cabinet located in Stocker 042. The CHO should be notified when a container is full.

6) As EHS collects the full waste containers from CEER facilities, it is very important to make sure the contents of the containers are properly labeled.

i) A check-in list of items (Appendix 6) that will be supplied to new students/staff members will be signed by all new researchers. This form lists all supplies given to researchers when they start at CEER.
j) Significant care must be exercised in ordering new chemicals, in terms of cost, storage, and laboratory (as well as national) security concerns.

1) All chemical orders must be submitted to CHO in the form of a purchase request. Purchase requests are available in the Shared_by_All folder.

2) Before initiating an order, researchers should check the Material Safety Data Sheet (MSDS) for that specific chemical in order that they are familiar with the properties, storage requirements, and potential hazards.
   a. After reviewing the MSDS, researchers should go the Shared_by_All folder to determine if the chemical is a “chemical of interest” as determined by the U.S. Department of Homeland Security. These chemicals, such as nitric acid, pose potential national security risks and therefore need to be handled in a special fashion. If the chemical is a “chemical of interest,” this designation must be clearly noted on the purchase order and special arrangements must be made for secure storage.
   i. In addition to these general guidelines, EHS maintains a website relating specifically to the handling of chemicals of interest:

   “Chemical Security”
   www.ohio.edu/riskandsafety/ehs/chemsecurity/index.html

3) Following the above procedures relating to the ordering of chemicals will:
   a. Help to reduce costs by preventing the ordering of chemicals which are already available within CEER.
   b. Make it easier to plan for the storage of incoming chemicals.
   c. Verify if desired chemicals require special security measures (e.g., if the chemicals are “chemicals of interest”).

k) A check-out list of items (Appendix 7) will be signed by all departing researchers when they are ready to leave CEER due to graduation, separation from employment, or any other reason. Along with returning chemical supplies, keys, and office equipment, departing personnel must also make sure that their laboratory and/or office work spaces are clean.

1) Any special exit instructions relating to electrodes, solutions, laboratory notebooks, computers, or research data must be followed.
2) Forwarding instructions for correspondence (e.g., email or U.S. postal service) may be given to the CEER Assistant Director for Administration and Special Projects.

l) The laboratory dress code is based on common sense: all reasonable measures must be taken to prevent possible injury or harm to laboratory workers or visitors.

1) All researchers using laboratory equipment must:
   a. Wear appropriate footwear at all times. No sandals, flip-flops, slippers, open-toed shoes, or shoes with open sides or heels are allowed. Note that the top of the foot must be covered at all times.
   b. Wear splash-proof goggles or safety glasses at all times. State and federal regulations require the use of safety eyewear.
c. Wear clothing (such as a shirt, blouse, or dress) which covers and protects your chest, stomach, sides, back, shoulders, and upper arms at all times. No cutouts or cutoffs, tank tops, tube tops, muscle shirts, or similar dress items are allowed.

d. Avoid at all times wearing clothing which is loose enough to knock over containers, or which will dip into flames or chemicals.

e. Avoid wearing valuable jewelry, especially on your hands and wrists, at all times.

f. Tie back long hair at all times (if applicable).

2) All researchers are strongly encouraged to wear clothing (such as pants, a very long skirt, or a very long dress) which covers and protects your body from the waist all the way down to, and including, your ankles.

a. **No shorts** are allowed.

b. No short or mid-length skirts are allowed.

3) All **visitors** entering any CEER laboratory area, other than the CHO’s office within Stocker 042, must abide by all of the dress code regulations given above.

a. If the visitor is unwilling or unable to comply, then he/she may **not** enter a CEER laboratory area, and must ask a properly attired laboratory worker for assistance (e.g., to find the person for whom he/she is looking).

b. When **tour groups** visit CEER facilities, some of the above dress code requirements may be less strictly enforced. Safety eyewear, however, must be worn by all tour group members at all times. Tour groups must be escorted by qualified CEER laboratory workers at all times and every effort must be made to keep tour group members away from potential dangers. It is the responsibility of both the person inviting the tour group and of the CHO to manage safety concerns for the tour group.

m) Violations of any of these rules or guidelines will result in enforcement actions as listed in the “Enforcement” section.

n) If there are questions or concerns on any rules or necessary safety equipment, please see the CHO.

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2. **Training**

All CEER operations must be carried out in strict accordance with the requirements set forth in this Safety Plan and all other relevant safety procedures. In addition, there are mandatory training requirements for all personnel, which may include, but are not limited to, EHS Chemical Hygiene Training, Laboratory Equipment training, and/or Shop Tool Usage Guidelines.

a) **Coordinator of Training**

1) It is the CHO’s responsibility to talk with *all* new CEER members who work in the laboratories or facilities to inform them of training requirements. The CHO must make him/herself readily available for questions or concerns relating to training.

2) It is the responsibility of the CHO to show *all* new CEER members the CEER safety policy within the first week of their arrival. A follow-up meeting with the
CHO to discuss the policy and have the opportunity to ask questions must occur
during the following two weeks.

b) Chemical Hygiene Training
Anyone who works in the CEER laboratories or facilities is required to attend a
mandatory Chemical Hygiene Training course offered by EHS. Courses are
offered on a regular basis and new students are expected to attend this training
within their first academic term of appointment. Copies of all training certificates
must be supplied to the CHO for update and filing. Personnel will not be allowed
to work in CEER laboratories or facilities until the mandatory Chemical Hygiene
Training is complete.

c) Shop Tool Safety/Usage Training
All undergraduate students, graduate students, staff, and faculty who operate shop
equipment (e.g., drills, saws, lathes, and mills) are required to observe a training
demonstration performed by a designated shop lead and then demonstrate mastery
back to the shop lead. Use of equipment without proper training is expressly
forbidden.

d) Analytical Equipment Safety/Usage Training
Some projects require the use of special analytical equipment. In order to ensure
that this equipment is used in a safe and proper manner, all graduate students, staff,
and faculty are required to undergo specialized training related to the analytical
research instruments. Upon completion of this training, the trainee must
demonstrate to the analytical technician competence in using the equipment. Only
after this is successfully performed will the analytical lead approve the trainee for
use (and then document said training). Use of analytical equipment without proper
training is expressly forbidden.

e) Project Specific Training
Some students, staff, and/or faculty may be required to attend additional training
that falls outside standard training requirements. One example is radiation safety
training which is required of all students, staff, and faculty who use the X-Ray
Diffractometer (XRD). Individuals must attend this training before beginning
independent unsupervised work. Copies of all training certificates must be
supplied to the CHO.

3. Specific Safety Considerations for Working in Stocker Center 044 (“Shared Space”)

a) Stocker 044 is a “shared space” and therefore several different rules apply as
opposed to those for other CEER facilities.
b) In addition to acting as an overflow and wet laboratory, this space is used as an
exhibit room for visitors. In view of this public relations aspect, great care should be taken
to maintain a clean, neat, and safe professional work environment.
c) Stocker 044 will serve as the wet lab for CEER. All solution preparation should be
carried out in this room.
d) As many researchers mix chemicals in Stocker 044, all chemicals should be
returned to their proper storage area after use. This procedure will ensure that incompatible
chemicals do not mix, and that the next user of the area in Stocker 044 will be able to find their chemicals when needed.
e) When weighing chemicals make sure that the scales are free of all spilled debris and that all countertops are wiped clean before leaving the area.
f) When finishing with a chemical, or when a chemical is beginning to get relatively low, the CHO should be informed in order to facilitate reordering.
g) Stocker 044 is sometimes used as an “overflow” laboratory. When necessary to set up an experiment in this laboratory, every effort should be made to limit testing to one day. All test setups must be broken down and put away, chemicals properly stored, and countertops cleaned at the end of an experiment. Should it not be able to complete testing within one day, explicit permission should be obtained from the CHO.
h) Anytime an experiment is left unattended, an “experiment in progress” sign (Appendix 8) must be plainly visible. The sign should have the experimenter’s name and contact number, the time the experiment was started, and the expected time of completion of the experiment. If the experimenter is running an experiment for a relatively long time (e.g., for 24 hours), then it is not sufficient to just post an “experiment in progress” sign and then return upon completion of the run; instead, the experimenter must make an effort to return to the laboratory every few hours to check on the experiment.
   1) “Experiment in progress” signs are available upon request from the CHO.
   Researchers must return the signs to the CHO after the experiment is complete.
i) All chemicals must be stored in their proper container (N.B. there should not be any beakers with parafilm) and properly labeled with the chemical content and concentration.
j) A spill kit is located just outside the door facing Stocker 042 and should be used for any major spill. Any major spills should be reported to the CHO immediately.
k) Violations of any of these rules or guidelines will result in enforcement actions as listed in the “Enforcement” section.

4. Specific Safety Considerations for Working in Stocker Center 039
a) The workstation must remain clean and neat at all times.
b) Upon starting work in CEER facilities, a checklist of items issued to the student/staff member will be implemented. The list includes glassware and laboratory supplies.
   1) The CHO will show the researcher a price sheet of replacement charges for broken, or lost, glassware in order that the researcher will be aware of potential expenses.
c) If any laboratory supplies are lost or broken, the CHO must be informed immediately. Replacement cost, as listed on the CHO’s price sheet, will be charged for broken glassware.
d) Beakers, glassware, and/or solutions are not allowed to stay on the top of the counter unless an experiment is in progress. If an experiment requires a relatively long time, a sign, such as “an experiment in progress (Appendix 8),” must be posted nearby giving the expected completion time of the experiment.
   1) “Experiment in progress” signs are available upon request from the CHO.
   Researchers must return the signs to the CHO after the experiment is complete.
e) The first aid kit and spill kit is mounted on the wall next to the entrance to Stocker 039. In the event of a spill, it should be immediately reported to the CHO.
f) Each student/staff member will be assigned a work area with cabinets to store their research related belongings.
g) There are 4 drawers and 1 large cabinet for each work area. The top drawer should be used for storing the laboratory notebook(s), data, and results folder(s). Laboratory notebooks should stay in the top drawer at all times when not in use as the research advisor may inspect the work station in order to review the lab book.
h) Electrodes should be labeled properly. A record of the electrode’s “birth certificate” (Appendix 9) should be kept up-to-date, as it could be requested by the CHO, CHT, or Center Director for inspection at any time.
i) The large cabinet of the personal work area has 2 levels. The bottom level should be used for solution containing bottles and beakers. Any containers with solutions should be stored in a plastic tray. All solutions stored in the cabinet should be properly capped and labeled.

1) Only storage of “special” solutions is allowed in the large cabinet. Special solutions include, but are not limited to: plating solutions and solutions which require sample analysis (e.g., post-mortem analysis). The CHO will determine whether a solution can be classified as “special.”

2) Permission is required in order to keep “special” solutions in the large cabinet of the personal work area. This permission includes the CHO signing a “special solutions” slip. Failure to obtain permission from the CHO before storing a special solution in the personal work area will be considered to be a serious violation of the CEER Safety Plan.
j) There are 2 full aisles plus 1 half aisle in Stocker 039. Each aisle has 2 work areas and a working sink on each side. The ridge separating the sides of an aisle is considered a “shared space.” Similar rules to those described above for Stocker 044, which is also a shared space, apply here.
k) The items that are permanently fixed on the ridges include a squeeze bottle holder, pipette stand, and drying rack. No other object or laboratory supplies should be left on the top of the ridges, unless it is approved by the CHO.
l) Sinks are considered shared spaces. Users of the sinks must wipe them clean immediately after their use.
m) Drying racks are placed next to the wall which is a shared space. Therefore, any student/staff member who uses the drying racks should be careful not to disturb other researcher’s work spaces.

n) An organizer with 3 levels of storage space has been wall mounted next to the eight-channel Arbin instrument in Stocker 039. The organizer contains glove boxes, labels, Teflon tape, Kimwipes, clear tapes, cleaning paper, and scissors. Any supplies or tools removed from the organizer for use at a student/staff member’s personal work area should be returned to its proper place in the organizer in a timely manner.
o) Note that Stocker 044 will serve as the wet lab. All solution preparation should be carried out in that room.
p) Violations of any of these rules or guidelines will result in enforcement actions as listed in the “Enforcement” section.
5. Standard Operating Procedure (SOP)

All experimental equipment require a Standard Operating Procedure (SOP) to ensure safe and consistent research conditions. It is not only the responsibility of CEER but also of the individual researcher to ensure that all relevant parties are properly trained and understand these safety plans and initiatives. The key to a safe and successful experiment is proper planning, and the development of a detailed Standard Operating Procedure (SOP) is required for all CEER research in order to ensure that proper thought is given to all aspects of an experiment before it is started. The SOP must be written specific to the apparatus, the method of testing, and the environment in which the operation will occur. A good rule of thumb is to remember that an accurate properly written SOP will allow a user, unfamiliar with the apparatus, to perform the operation from startup to shutdown without question or need of assistance.

The SOP will be written by a researcher, or group of researchers, who is very experienced in the use of the instrument. Once the SOP has been written, then the CHO will act as a facilitator in organizing other expert users to evaluate the proposed SOP.

Once the SOP has been approved by the group of reviewers, the SOP must be saved in digital format in the Shared_by_All folder, as well as in hardcopy format filed in the respective laboratory area where the research will be performed. It is expected that the researcher will have a copy of the SOP present at all times that experimental work is ongoing, and will make frequent references to it to ensure that all steps are properly followed. In cases where the operator cannot reference the SOP during testing, a second operator must be present to ensure that the proper steps are being followed.

6. Inspections / Audits

In order to maintain a high level of safety and awareness about safety issues, both periodic planned and surprise safety inspections/audits will be conducted of all research projects, facilities, and personnel. The results of the inspections/audits will be reported in writing to the Center Director, and a written copy will be kept in the CEER records. Feedback from the results of the inspections/audits will be presented to all CEER personnel either during the regular weekly CEER group meeting or at a meeting dedicated specifically to safety matters.

a) Planned inspections

1) The following items will be inspected monthly by the CHO and/or CHT:
   - Fire extinguishers (verify existence)
   - Eyewashes
   - Safety showers
   - First aid kits
   - Chemical Spill Kits
   - Emergency lighting (including illuminated exit signs)

2) The following items will be inspected on a quarterly (3 month) basis by the CHO accompanied by 2 volunteers (volunteers must be CEER staff, faculty, or graduate students and will rotate out every quarter):
   - Chemicals stock
3) The following items will be inspected annually by Facilities Management in cooperation with EHS (in some cases, a more frequent interval may be more appropriate):
   - Fire extinguishers (verify operation)
   - Fire doors
   - Smoke detectors/fire alarms
   - Fire suppression systems
   - Local exhaust ventilation hoods (EHS has the fume hoods inspected and certified every year)

4) MSDS forms will be inspected annually by the CHO in cooperation with EHS and will be updated as needed.

5) EHS may periodically conduct laboratory inspections using a bar-coding system. These types of inspections will generate reports to the Department Chair.

6) The CHO will conduct weekly inspections of 2 CEER personnel’s laboratory areas. The 2 people will be chosen at random. The results of the inspection will be provided in writing to the CEER personnel involved and a copy will be given to the Center Director.

b) Surprise inspections
In order to maintain an emphasis on safety and cultivate an organizational “culture of safety,” the Center Director or CHO may request an unplanned (surprise) inspection/audit of all research projects, facilities, and personnel at any time. The inspection/audit will be conducted by one of the following external (non-CEER) inspectors:
   - Departmental Safety Coordinator
   - EHS Representative

The results of the surprise inspections/audits will be reported in writing to the Center Director, and a written copy will be kept in the CEER records. Feedback from the results of the inspections/audits will be presented to all CEER personnel either during the regular weekly CEER group meeting or at a meeting dedicated specifically to safety matters.

7. Updates to “Incident Avoiding”
Safety measures will undergo continuous review and will be evaluated by the CHO to ensure the adequacy of the measures and the capability of the researchers to safely perform their work.

Copies of this safety plan should be distributed to the following entities whenever updated:
   - CEER students, staff, and faculty
   - Chemical Hygiene Officer (CHO)
   - Chemical Hygiene Technician (CHT)
   - Center Director
   - Department Chair
   - Departmental Safety Coordinator
C. Incident Reporting

1. Basic Incident Reporting Guidelines
All safety related incidents are to be reported, whether they pose an immediate danger or not. The person or persons present when an incident occurs will need to make a decision as to the immediate danger involved. The order in which officials are notified might change depending on the immediate danger present. If there is any doubt, the individual making the report is to err on the side of being too cautious. Notification of an incident when it later is shown to not have been necessary, will never result in “punishment” of the person or people involved. If the incident is a fire or obvious major building incident, the fire alarm should be pulled and 911 should be called from a safe location.

2. Mandatory Posting of “Safety Response Guidelines”
   a) The full prioritized “Safety Response Guidelines,” with names and phone numbers, will be posted inside the lab, and the first four contact names and numbers are to be posted outside the lab in a designated placard.
   b) “Safety Response Guidelines” may be added to for an individual lab on an ad hoc basis. For example, a laboratory technician, postdoctoral research associate, or departmental safety officer may be included at the discretion of the individual department.

3. Notifications Roster for an Event that Poses an Immediate Danger
   a) Notifications should proceed in the following order when the incident is judged to pose an immediate danger:

   1) Campus Police
      • OUPD [740 593-1911]
         o OUPD will contact the City of Athens Fire Department, Ohio University’s Facilities Management Department, and/or EHS, as needed
   2) Environmental Health and Safety Department (EHS)
      • EHS [740 593-1666]
   3) Principal Investigator
      • Dr. Gerardine Botte [740 593-9670 (office), 740 541-5611 (cell)]

      Note: If the PI is unavailable, proceed down the list until someone is contacted. Once a person on this list is contacted, by the person or persons present during the incident, it becomes that contact person’s responsibility to contact the remaining people.

   4) Department Chair, Department of Chemical and Biomolecular Engineering
      • Dr. Valerie Young [740 593-1496 (office), 740 517-2252 (cell)]
   5) Office of the Dean of College of Engineering and Technology
b) In all cases, those involved in a safety event or incident should not speak to any media representatives. All media questions are to be referred to the Russ College’s Director of External Relations.

c) In all cases, those involved in a safety event or incident should not make any promises of compensation or health care.

D. Enforcement

1. Basic Enforcement Concepts

All safety infractions, once validated, will be documented and may have significant consequences for the researcher during the performance review and evaluation process.

The primary enforcement officer for the Safety Plan is the CHO. In his absence, the CHT becomes the primary enforcement officer for the Safety Plan.

Any safety directive or order issued by the CHO or CHT, or other CEER personnel acting on the part of the CHO, must be followed without delay (unless the individual believes his/her action will result in bodily harm).

Violations of this safety plan which are found to be of a deliberate nature will be addressed swiftly and judiciously.

The right to appeal a disciplinary action is an inherent right guaranteed by the legal principle of due process. This enforcement process provides the right to appeal at every step.

2. Disciplinary Procedure

a) Formation of Safety Review Committee (SRC)

For a disciplinary action relating to a specific incident that is a second, or further, violation by a CEER member, or for the purposes of appealing a disciplinary action relating to a specific incident that is a first violation, an SRC consisting of at least 3 of the following CEER personnel will be formed (N.B. either the CHO or CHT must sit on any committee formed):

- CHO
- CHT
- Center Director
• CEER Assistant Director for Administration and Special Projects
• Dr. Madhivanan Muthuvel

b) Formation of a Safety Review Appeals Committee (SRAC)
For the purposes of appealing a disciplinary action relating to a specific incident that is a second, or further, violation by a CEER member, an SRAC consisting of at least 3 of the following Ohio University personnel will be formed (N.B. at least two non-Center personnel, such as the Departmental Safety Coordinator or EHS Representative, and one Center personnel, such as the Center Director or CEER Assistant Director for Administration and Special Projects, must sit on any committee formed):
• CHT
• Center Director
• CEER Assistant Director for Administration and Special Projects
• Department Chair
• Departmental Safety Coordinator
• Associate Dean for Research
• EHS Representative

c) Investigation of Violation
When a violation of a safety plan rule or guideline has been determined, the CHO will investigate immediately. The violator(s) involved will meet with the investigator to fully explain the details of the incident. The incident will be discussed and appropriate corrective and disciplinary actions will be determined.

The primary objective of the investigation is to remove any immediate source of danger.

The secondary objective is to remove any on-going or long term source of workplace danger. In this vein, a progressive series of disciplinary actions will be implemented.

d) Range of Disciplinary Actions
1) First violation
   a. Written reprimand (written record of disciplinary action placed in violator’s personnel file)
   b. The violator may file an appeal to the SRC within ten days of notification of the investigator’s decision. The appeal must be written. The written appeal must clearly indicate the grounds on which the appellant believes the investigation and/or decision were incorrect. The SRC must respond in writing to the appellant within 14 days after receiving the appeal.
2) Second violation: SRC may choose one, or more, from the following disciplinary actions, depending on the severity of the violation:
   • Written reprimand (written record of disciplinary action placed in violator’s personnel file)
   • Violator must complete a safety related task (e.g., labeling a group of unmarked containers containing chemicals) assigned by the SRC within 7 days of the task’s being assigned
- Violator must present a 20-30 minute PowerPoint presentation at the regular weekly CEER group meeting, within 14 days of the presentation’s being assigned, on a safety related topic chosen by the SRC
- Violator will be suspended from using Stocker 044 (“shared space”) for 30 calendar days from the date of the SRC disciplinary decision
- Meeting with the Dean or Associate Dean for Research
  
a. The violator may file an appeal to the SRAC within ten days of notification of the SRC’s decision. The appeal must be written. The written appeal must clearly indicate the grounds on which the appellant believes the investigation and/or decision were incorrect. The SRAC must respond in writing to the appellant within 30 days after receiving the appeal.

3) Third violation: SRC may decide that the violator’s employment or student status be suspended, including with loss of pay, or terminated.
  
a. The violator may file an appeal to the SRAC within ten days of notification of the SRAC’s decision. The appeal must be written. The written appeal must clearly indicate the grounds on which the appellant believes the investigation and/or decision were incorrect.
  
b. The SRAC will convene a closed door hearing in which the appellant and the SRAC will be present within 30 days after receiving the appeal. The CHO will act as the “advocate” who will present the SRC’s arguments supporting the SRC’s decision. The appellant will have the opportunity to present his/her case to the SRAC directly. The appellant will be allowed to call witnesses, provide evidence, and cross-examine witnesses.
  
i. If the appellant is a student, he/she may have their advisor present at the hearing. However, the advisor may not speak on the appellant’s behalf.
  
ii. The SRAC must respond in writing within 30 days of the end of the hearing.

   iii. Minutes of the hearing will be kept. The minutes and the SRAC’s decision will be placed both in the appellant’s employment/student folder and in a folder in the Center Director’s office.

   iv. There is no appeal beyond the decision produced by the SRAC hearing.

e) Corrective Action and Relation of Corrective Action to Future Laboratory Work
  
1) It is the responsibility of the CHO to ensure that all corrective actions following disciplinary procedures are completed in a timely manner as outlined by the CHO, SRC, or SRAC.

2) No further research activities or laboratory work may be attempted by the violator until the corrective actions are complete, unless specifically outlined by the CHO, SRC, or SRAC.
LIST OF APPENDICES

- Appendix 1: Safety Policy Agreement Form
- Appendix 2: Safety Management Tree and Individual Personnel Responsibilities
- Appendix 3: Student/Staff Equipment Sign-Out Form
- Appendix 4: Equipment Sign-Out Form: Check Instrument’s Operational Capability
- Appendix 5: Equipment Sign-Out Form (for non-CEER Personnel): Borrower’s Acknowledgment of Responsibility for Damaged or Lost Equipment
- Appendix 6: New Student/Staff Checklist Form
- Appendix 7: Student/Staff Checkout List Form
- Appendix 8: Workspace Warning Sign
- Appendix 9: Sample of Electrode Birth Certificate
APPENDIX 1: SAFETY POLICY AGREEMENT FORM
1. I understand that safety is an individual as well as group concern, and that I will fully participate in maintaining and promoting a safe and environmentally friendly workplace.
2. I understand that safety training was made available to me through Ohio University’s Environmental Health and Safety Department (EHS), Chemical and Biomolecular Engineering Department, and the Center for Electrochemical Engineering Research (CEER). It is my responsibility to complete at least the EHS training session, and to complete other training as specified by the Chemical Hygiene Officer (CHO).
3. I have read and understand CEER’s safety policy and agree to follow the established rules and guidelines when working in CEER sponsored activities or in using CEER facilities.
4. I have been given the opportunity to discuss the CEER Safety Policy with the CHO and to ask questions about the Policy.
5. I agree that should I violate the CEER Safety Policy, I will be subject to procedures specified in the Policy. These procedures include revocation of my laboratory privileges or other disciplinary actions, up to and including termination of my employment/student status.
6. I understand that a written record of any disciplinary action taken in regards to the CEER Safety Policy will be placed in my personnel record.

________________________________________________________________________
Faculty/Staff/Student Name (printed)  CEER Chemical Hygiene Officer (printed)
________________________________________________________________________
Signature  Signature
________________________________________________________________________
Date  Date
APPENDIX 2: SAFETY MANAGEMENT TREE AND INDIVIDUAL PERSONNEL RESPONSIBILITIES
EXPLANATORY NOTES

CEER SAFETY ORGANIZATIONAL TREE

- **THE CEER DIRECTOR RETAINS ULTIMATE RESPONSIBILITY FOR ALL CEER BUSINESS, INCLUDING SAFETY RELATED MATTERS, BUT DAY-TO-DAY AND ONGOING SAFETY ISSUES SHOULD BE HANDLED BY THE CHO.**

- **THE RED-FILLED BOX (CHO) REPRESENTS THE PRINCIPAL SAFETY OFFICER FOR CEER, TO WHOM SAFETY RELATED CONCERNS SHOULD GO INITIALLY; THE (VERY LIMITED) EXCEPTIONS TO THIS RULE ARE GIVEN IN THE CEER SAFETY PLAN.**

- **IN THE ABSENCE OF THE CHO (E.G., THE CHO IS ON LEAVE), THEN THE CHT ASSUMES ALL RESPONSIBILITY FOR SAFETY MATTERS AND BECOMES THE PERSON TO WHOM SAFETY RELATED CONCERNS ARE INITIALLY ADDRESSED.**

- **SOLID BLUE LINES IN TREE: PERSONNEL CONNECTED IN A DIRECT REPORTING CAPACITY.**

- **DASHED RED LINES IN TREE: PERSONNEL CONNECTED IN AN ADVISORY/SUPPORTING CAPACITY.**

**explanatory notes and list of individual safety roles attached**
INDIVIDUAL SAFETY ROLES

• **CHO**
  o Provides leadership to CEER personnel about safety matters
  o Responsible for long-term vision and updating of safety policy
  o Coordinates safety training for all personnel
  o In charge of day-to-day safety operations, including communication, implementation, maintenance, housekeeping, and enforcement
  o Responsible for informing Center Director about significant safety developments
  o Serves on Safety Review Committees (SRC’s) as needed
  o Acts as “advocate” on behalf of SRC in front of Safety Review Appeals Committees (SRAC’s)

• **CHT**
  o Assists CHO as needed, including providing leadership to CEER personnel about safety matters
  o Takes on all of the roles of the CHO in the CHO’s absence
  o Serves on Safety Review Committees (SRC’s) as needed
  o Serves on Safety Review Appeals Committees (SRAC’s) as needed

• **FACILITIES MANAGER** (for Stocker 049), **RESEARCH ASSISTANT PROFESSOR, RESEARCH ENGINEER, POSTDOCTORAL RESEARCH ASSOCIATES**
  Maintain a clean, safe, and environmentally friendly workplace
  Reports safety violations to CHO
  Assists CHO in implementing new safety policies and initiatives
  Assists with providing leadership to students about safety matters

• **GRADUATE and UNDERGRADUATE STUDENTS**
  Maintain a clean, safe, and environmentally friendly workplace
  Reports safety violations to CHO

• **MENTORS**
  Instills a sense of safety awareness in students
  Trains students in safety procedures and policies
• **CEER Assistant Director for Administration and Special Projects**
  
  Assists CHO in designing and implementing long-term safety policies and initiatives.
  Assists CHO in processing training, communication, implementation, maintenance, housekeeping, and enforcement safety matters.
  Assists with providing leadership to students about safety matters.
  Serves on Safety Review Committees (SRC’s) as needed.
  Serves on Safety Review Appeals Committees (SRAC’s) as needed.

**ChBE Departmental Safety Coordinator**

Provides audits/inspections of CEER laboratories and facilities.
Provides consultative assistance on safety matters to CHO as needed.
Serves on Safety Review Committees (SRC’s) as needed.
Serves on Safety Review Appeals Committees (SRAC’s) as needed.

**EHS Representative (s)**

Provides audits/inspections of CEER laboratories and facilities.
Provide training on chemical hygiene.
Investigate/handle safety incident reports.
Provides consultative assistance on safety matters to CHO as needed.
Serves on Safety Review Committees (SRC’s) as needed.
Serves on Safety Review Appeals Committees (SRAC’s) as needed.
APPENDIX 3: STUDENT/STAFF EQUIPMENT SIGN-OUT FORM
Borrower’s Name: _______________________________________________________

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Date Borrowed</th>
<th>Due Date</th>
<th>Date Returned</th>
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APPENDIX 4: EQUIPMENT SIGN-OUT FORM: CHECK INSTRUMENT'S OPERATIONAL CAPABILITY
CEER Equipment Sign-Out Form:
Check Instrument’s Operational Capability

Equipment Name: ________________________________

<table>
<thead>
<tr>
<th>Borrower NAME</th>
<th>Borrower’s Advisor NAME</th>
<th>Equipmt. Checkout Date</th>
<th>Equipmt. Due Date</th>
<th>Equipment Checked at Checkout</th>
<th>Borrower Responsib. Form</th>
<th>Equipmt. Return Date</th>
<th>Equipment Checked Upon Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
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</tbody>
</table>
APPENDIX 5: EQUIPMENT SIGN-OUT FORM (FOR NON-CEER PERSONNEL): BORROWER’S ACKNOWLEDGMENT OF RESPONSIBILITY FOR DAMAGED OR LOST EQUIPMENT
CEER Equipment Sign-Out Form (for non-CEER Personnel): Borrower’s Acknowledgment of Responsibility for Damaged or Lost Equipment

Equipment Name: ____________________________________________

Equipment Checkout Date: _____________

Equipment Due Date: _____________

I have had the opportunity to examine the equipment named above and ask questions of the CEER representative from whom I am borrowing the equipment.

If the borrowed equipment is broken or damaged in any way, I accept responsibility for the full cost of repair, as determined by the manufacturer or by a local licensed repairer, plus any shipping costs.

If the borrowed equipment is lost, or damaged beyond repair, I accept responsibility for the full replacement cost, plus any shipping costs.

Borrower’s Name __________________________

Borrower’s Signature __________________________

Date __________________________

Borrower’s Advisor’s Name (if applicable) __________________________

Borrower’s Advisor’s Signature __________________________

Date __________________________
APPENDIX 6: NEW STUDENT/STAFF CHECKLIST FORM
CEER New Student/Staff Checklist

I. Attitude about Safety

CEER is committed to achieving a healthy and safe working environment, and to supporting environmentally sound practices in the performance of all activities and experiments. Although CEER expects excellence from all of its personnel, performance success must never take precedence over safety. Members of CEER are expected to keep their work space clean and the equipment they use in good running order. Every researcher is considered a “safety officer” and is therefore expected to report any safety problems or hazards to the CEER Chemical Hygiene Officer (CHO) or Chemical Hygiene Technician (CHT).

II. Checklist

Each student/staff member will be provided with a work area in Stocker Center, either in Room 039 or another CEER laboratory area. In addition to being allocated a work area, each researcher will receive the below listed laboratory supplies. Students/staff members are responsible for keeping the items in good working condition. If a researcher loses or breaks any of these items, they must report it to the CHO, CHT, or CEER Director in a timely manner. Replacement of the laboratory supplies will be provided after the student/staff member has paid a nominal price for the item. It is expected that all glassware be kept in clean and neat condition when not being used in an experiment.

| □  | laboratory notebook                  | □  | goggles                  |
| □  | tweezers                             | □  | spatula                   |
| □  | pipette bulb                         | □  | ruler                     |
| □  | pipettes: 1 mL (1), 2 mL (1), 5 mL (1), 10 mL (1) | □  | stir bars: medium (1), large (1) |
| □  | volumetric flasks: 100 mL (1), 250 mL (1), 500 mL (1) | □  | electrode storage box     |
| □  | beakers: 100 mL (1), 250 mL (1), 400 mL (1) | □  | lab coat                  |
| □  |                                       | □  |                          |
| □  |                                       | □  |                          |
| □  |                                       | □  |                          |
| □  |                                       | □  |                          |
| □  |                                       | □  |                          |

I acknowledge that I have been allocated a work area and provided with the above list of laboratory supplies. I take full responsibility for all items on the list, including the glassware. I have also read the CEER Safety Plan and will follow all of the rules and guidelines contained in it.

_________________________________  ________________________________________
Staff/Student Name (printed)               CEER CHO, CHT, or Director (printed)

_________________________________  ________________________________________
Signature                                      Signature

_________________________________  ________________________________________
Date                                           Date
APPENDIX 7: STUDENT/STAFF CHECKOUT LIST FORM
CEER Student/Staff Checkout List (Page 1)

I. Student/Staff Checklist

Each CEER student/staff member must complete this form when they are ready to leave CEER after graduation, separation from employment, or for any other reason.

☐ laboratory notebook returned
☐ copies of all research data in electronic format
☐ copies of all research data in hard copy format
☐ all electrodes returned (self-prepared, reference, and precious metal electrodes) with accompanying list describing base metal and applied catalyst for each
☐ disposal of solutions
☐ directions and proper storage for undisposed solutions
☐ all glassware cleaned and returned
☐ work area cleaned and all related CEER supplies returned
☐ office desk cleaned and all related CEER supplies returned
☐ laboratory, office, building, and all other keys returned to Dean’s Office
☐ lab coat
☐
☐ any special exit instructions relating to electrodes, solutions, work area, office desk, or computer

☐ forwarding information (optional):

I acknowledge that I have fulfilled all of the above checked off items and the above referenced materials have been returned to the CEER CHO, CHT, or Director (except for keys, which must be returned to the Dean’s Office).

_________________________________  ____________________________________
Staff/Student Name (printed)  CEER CHO or CHT (printed)

_________________________________
Signature

_________________________________
Date
I. Chemical Hygiene Officer (CHO) Checklist

After each departing CEER student/staff member has completed the previous page of this form, then the CHO (or in his/her absence, the CHT) should complete the below checklist:

☐ access to individual’s desktop computer revoked
☐ access to individual’s laptop computer revoked (if applicable)
☐ removal from CEER web site
☐ removal from CEER email distribution lists
☐ access to modifying CEER web site revoked (if applicable)
☐ access to CEER shared files revoked (if applicable)
☐ removal from CEER shared calendars (if applicable)
☐ cancellation of P-cards (if applicable)
☐ removal from Ohio University WorkForce system (if applicable)
☐
☐
☐

_______________________________
CEER CHO or CHT (printed)

_________________________________
Signature

_________________________________
Date
APPENDIX 8: WORKSPACE WARNING SIGN
PLEASE DO NOT TOUCH
EXPERIMENT IN PROGRESS

CONTACT NAME:                CONTACT PHONE:

START TIME:                  END TIME:

EQUIPMENT IN USE:

EXPERIMENTAL CONDITIONS:
APPENDIX 9: SAMPLE OF ELECTRODE BIRTH CERTIFICATE
**CEER Electrode "Birth Certificate"**

<table>
<thead>
<tr>
<th>Electrode name/reference #:</th>
<th>Creation Date:</th>
<th>Lab book (creator's) page #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creator's name:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrode description:** (size, shape, construction materials, and catalyst loading; if necessary, provide a small sketch of electrode)

**Plating conditions:** (bath summary, CC or CV, time, temp, current voltage, ……)

<table>
<thead>
<tr>
<th>Cyclic voltammetry test results</th>
<th>Reference: Hg/HgO</th>
<th>Other notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scan rate: mV/s</td>
<td>Range: V</td>
<td># Cycles:</td>
</tr>
</tbody>
</table>

| Electrolyte(s): | |
|-----------------| |

<table>
<thead>
<tr>
<th>Peak current: A =&gt; A/g catalyst</th>
<th>Occurring at voltage: V vs. ref.</th>
</tr>
</thead>
</table>

Graph(s):

Other tests: