

# Ray W. Herrick Laboratories

---



## **The Herrick Laboratories' Student Manual**

Ray W. Herrick Laboratories  
177 S. Russell Street  
Purdue University  
West Lafayette, IN 47907-2099

+1 (765) 49-42132 (phone)  
+1 (765) 49-40787 (fax)

*2018-2019 Edition*

## Contents

<b>1.0</b>	<b>Introduction to Herrick Labs</b> .....	<b>4</b>
1.1	History .....	4
1.2	The Mission of Ray W. Herrick Laboratories.....	4
	Mission Statement .....	4
	Goals .....	5
<b>2.0</b>	<b>General Information</b> .....	<b>6</b>
2.1	Check-In (including RTK web-based training information) .....	6
2.2	Safety .....	6
2.3	Security .....	7
2.4	Cleanliness .....	7
2.5	Conference Rooms .....	7
2.6	Mail .....	7
2.7	Patents and Copyrights .....	8
2.8	Paychecks .....	8
2.9	Progress Reports .....	8
2.10	Herrick Laboratories Research Reports .....	8
2.11	Proprietary Information .....	8
2.12	Purchases .....	9
2.13	Fiscal Matters .....	9
2.14	Research Reference Materials .....	9
2.15	Office Equipment .....	9
2.16	Telephones .....	10
2.17	Leaving the Laboratories .....	10
2.18	Travel .....	10
2.19	Clerical Work .....	10
2.20	Vacations .....	11
2.21	Computers .....	11
	Downloads and Web Access .....	11
	Reporting Computer Problems.....	11
2.22	Graduate Education at Purdue .....	11
<b>3.0</b>	<b>Laboratory Equipment</b> .....	<b>11</b>
3.1	Equipment Types.....	11
3.2	Guidelines for Equipment Use at the Ray W. Herrick Labs .....	12
	Everyone Shares Equipment .....	12
	Preserving Our Equipment Pool .....	12
	We Need to Know We Have the Equipment and its Location .....	13
	Out of Herrick Equipment Use: Off-campus, at Zucrow, Home, etc. ....	13
	Calibration .....	14
	Manuals, Web Sites and Support Information .....	14
	Equipment Software and Software Upgrades .....	14
	Ordering New Equipment .....	15
3.3	Safety Inspection .....	15
3.4	Manuals .....	15
3.5	Reserving Set-up Equipment .....	16
3.6	New Equipment Acquisition .....	16
3.7	Remote Testing .....	16
<b>4.0</b>	<b>Herrick Laboratories Technical Services</b> .....	<b>16</b>
4.1	General Guidelines .....	16
4.2	The Shop .....	17
4.3	Design and Construction .....	17
4.4	Fabricating Your Own Equipment .....	18

4.5 Instrumentation and Tools .....	19
4.6 Lockers .....	19
4.7 Broken Equipment and Discarding Metals and Glass .....	19
4.8 Deliveries to the Herrick Laboratories .....	19
<b>5.0 The Industrial Advisory Committee (IAC) .....</b>	<b>19</b>
<b>6.0 Important People .....</b>	<b>20</b>
6.1 People at Mechanical Engineering .....	20
6.2 People at Herrick Laboratories .....	21
<b>7.0 Student Committee .....</b>	<b>22</b>
<b>8.0 Coffee and Snacks .....</b>	<b>22</b>
8.1 Candy and Miscellaneous Snack Foods .....	23
<b>9.0 Counseling Services .....</b>	<b>23</b>
<b>10.0 Emergency Procedures .....</b>	<b>24</b>



## **1.0 Introduction to Herrick Labs**

The students, faculty, and staff welcome you as a fellow worker in the unique research environment at Ray W. Herrick Laboratories. In beginning, the Herrick Laboratories were unique because they are the only university engineering research laboratories in the country whose mission was, and still is, to promote interaction between industry and the university in pursuit of research goals that are beneficial to both the individual and academic communities.

### **1.1 History**

The following is an excerpt from an article by Dr. Raymond Cohen, former Director of the Herrick Laboratories (photo, next page), which appeared in the May 1990 (Vol. 3, No.5) issue of Research Review: “The Herrick Laboratories were established by Purdue’s President Frederick L. Hovde in 1958 as an interdisciplinary laboratory with the aid of a large grant from Ray W. Herrick, who was President of Tecumseh Products Company. Ray Herrick and Professor William E. Fontaine, the first Herrick Laboratories’ director, had a vision of a cooperative enterprise between Purdue University and the air conditioning and allied industries. The purpose was to attract graduate students to the climate control industry. They believed that funding graduate student theses on research projects of significant value to the climate control industry would have this effect. I believe they were correct...” An anecdotal history of the Laboratories is also recorded in a small book called, “*Comets Amongst the Stars*,” by William E. Fontaine (photo, next page). Copies are available from Donna Cackley if you are interested in reading more about the history of Herrick Labs.

### **1.2 The Mission of Ray W. Herrick Laboratories**

#### **Mission Statement**

An institution dedicated to graduate education and engineering research with emphasis on technology transfer to industry.

## Goals

1. To build upon the research excellence of the *Noise and Vibration Control Research Area* and the *Heating, Ventilation, Air-Conditioning, and Refrigeration Research Area* and grow the reputations of these areas as the top such research programs in the world.
2. Support the emerging research area of *Electro-Mechanical Systems* to enhance its national and international visibility.
3. To develop a proactive evolutionary strategy for the Laboratories to ensure its long-term stability and growth.
4. To improve the educational environment at the Labs so that its graduate students are multi-functional engineers who rate as the top engineering students in the country.
5. To continually monitor the technology transfer process by which research results are transferred to sponsors and the engineering community such that the Labs will be recognized as *the* premier source of practical cutting edge research in our areas of expertise.
6. To continually grow the research environment at the Labs for the benefit of the students and faculty at the Labs.
7. Practice and teach industry safety standards.



*William E. Fontaine*  
*First Director of Herrick*  
*Lab*  
*Director 1958–1971*



*Raymond Cohen*  
*Second Director of*  
*Herrick Labs*  
*Director 1971–1993*



*Robert J. Bernhard*  
*Third Director of Herrick*  
*Labs*  
*Director 1994–2005*



*Patricia Davies*  
*Fourth Director of*  
*Herrick Labs*  
*Director 2005-present*

## 2.0 General Information

### 2.1 Check-In

The first step in getting established at Herrick Labs is to check in. The procedure is as follows:

1. See the Administrative Assistant (Donna Cackley) to begin your paperwork and for a brief introduction to the laboratories. You may also ask general questions in regard to the Herrick Laboratories operating procedures.

Initially, do the Comprehensive Right-to-Know (RTK) Training at **(Internet Explorer):** <https://www.purdue.edu/ehps/rem/>. Click on the Radiological & Environmental Management (REM) department's website link. Click on "Training" on the left-hand side of page. On the next page, click on "H" at the top. You do the training listed "Hazard Communication-Comprehensive".

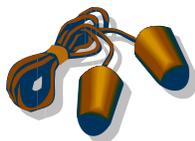
For renewal every October, do the Awareness Training at **(Internet Explorer):** Same instructions as above, but do the renewal training listed "Hazard Communication-Awareness".

2. If you are a new graduate student, you will have a professional photo portrait taken by Purdue photographers located at Purdue West, 1408 W. State St. (behind Follett's Bookstore and across from McCutcheon Hall). The picture will become a permanent part of the Herrick Laboratories Graduate Display in the lounge area, so please dress appropriately.
3. Have a tour of the facility, at which time you will meet the staff members at the laboratories. They are there to help you so don't hesitate to ask questions. A tour of the facility takes a minimum of 30 minutes. At the completion of the tour, you will receive your office assignment.
4. Meet with Bob Brown in the Shop for a safety talk. The safety talk varies from 60 to 90 minutes. Safety talks are available at 8:30, 10:30 and 1:00 on most work days. After the safety talk you will receive a key to the building if one is authorized. You will also have a temporary photo taken.

### 2.2 Safety

Common sense dictates the appropriate dress for working in the experimental areas. For example, closed-toe shoes must be worn. Loose fitting clothing or long hair should not be worn around rotating machinery. Safety glasses or goggles must be worn where eye damage is possible from flying debris, LASER or other high-intensity light. Use proper ear protection when working around loud (> 80 dB) experiments. There are

first aid boxes and fire extinguishers located in each experimental area—make sure you know where they are before doing anything else!



Besides these dictums of common sense, there are two major safety rules that must be followed at Herrick Labs:

1. Do not operate any experimental apparatus before YOU and THE APPARATUS have been safety inspected. New students working on old apparatus must be safety checked! You can find the Safety



Check form and Pre-safety Checklist along with other Safety and General Lab Information at: <https://engineering.purdue.edu/Herrick/information/Safety>. This rule is extremely important, and can land you into hot water in more ways than one if it is not followed.

2. Do not operate any equipment with high pressures, rotating components, or high electrical power without having someone else present who can help you in case of an accident.

### 2.3 Security

All outside doors are to be locked from 5:30 p.m. to 7 a.m. and on weekends. **Please do not let strangers in at those hours.** Do not hesitate to challenge anyone that you do not recognize to determine if they belong in the building. Undergraduates do not have access to the building unless they are working with someone at the labs and have special permission. They are also not issued keys. Herrick Labs has rarely suffered from any theft or vandalism, and we would like to keep it that way.

### 2.4 Cleanliness

1. Offices and research areas should be kept as neat and clean as possible; we have many visitors to the laboratories and are thus in a continuous state of *open house*.
2. In order to keep painted surfaces presentable, please do not use tape or push pins on them. Most offices have picture moldings to hang artwork or calendars. If you need help with hanging items on your wall, see someone in the shop.
3. The floors are periodically cleaned and vacuumed, so please try to minimize the clutter on the floor of your office space.
4. Cleaning service will not clean desktops, experimental equipment, or the kitchen area in the student lounge. Please do your best to keep these areas clean. They are your responsibility.



### 2.5 Conference Rooms

The Eisele Conference Room (room # 2061), Bernhard Conference Room (room # 1012), and the Coates Conference Room (room # 1017) are designated as conference rooms for your use. The conference rooms are for sponsor meetings, thesis and dissertation defenses, research roundtable seminars, and student-faculty meetings. There is a calendar for each conference room in Room 2024. To reserve a room, simply write the time, your name, and the reason for the reservation on the appropriate calendar and day.

### 2.6 Mail



Each student is assigned a mailbox located outside of the Living Lab area on 3<sup>rd</sup> floor. These mailboxes are re-alphabetized the beginning of each semester. Should you join the labs mid-semester, your mailbox will be placed in the last column until the beginning of the next semester. Mail is delivered around 10:35 each morning. Outgoing mailboxes for U.S. and Campus mail are located on the 1<sup>st</sup> floor under the stairwell near the main entrance. Purdue management has asked that you do not use the University as your personal mailing address or the University Mail Service for personal mail.

Donna Cackley can help you with the paperwork necessary to send project-related material by U.S. Mail, UPS, or FedEx. Pack, tape, and address the item to be shipped, and bring it to Donna along with your account number.

Project related Federal Express (Fed Ex) or United Parcel Service (UPS) packages that arrive for you will be recorded and taken to room 2024 (in HLAB) and/or the shop (in HERL). You will be notified either by e-mail or phone with instructions to collect the package. HLAB personnel should verify the contents of the package and the receiver will sign the packing slip before the package is removed from the area. After the packing slip has been signed by the receiver, and give it and any other paperwork to Donna Cackley or Cindy Cory for filing in the project files.

## 2.7 Patents and Copyrights

Purdue Executive memorandum B-10 specifies the University policy regarding Patents and Copyrights. Please see Donna Cackley if you have any questions about this.

## 2.8 Paychecks

Pay information is available online the last working day of each month or bi-weekly on Wednesdays for student employees. The Business Office in the Mechanical Engineering Building (ME) can explain tax situations for the various categories of stipends.



Your paycheck is deposited directly into your financial account. Bring a bank deposit slip or voided check to the Business Office on the second floor of the Mechanical Engineering Building, Room 2051. They will arrange for your check to be directly deposited into your checking account.

## 2.9 Progress Reports

You may be required to write regular progress reports describing the status of your research, highlighting your recent results, and outlining a plan for the next part of your research. Monthly progress reports are often required by sponsors and listed in the contract as a deliverable.

The generation of progress reports is your responsibility and must be submitted to Miranda Gick in office # 2025 at HLAB after your major professor has approved it. The rate at which these are required and their format will vary according to major Professor and sponsor. If the progress report is emailed directly to your sponsor, please be sure to “CC” a copy to Cindy Cory (coryc@purdue.edu) for the files.

Ask your major professor how often reports are to be written; then produce them ON TIME (in most cases the 15<sup>th</sup> of the month) without having to be asked.

## 2.10 Herrick Laboratories Research Reports

In addition to progress reports, your major professor may require you to write one or more reports to be prepared as bound Herrick Laboratories research reports. Donna will also assist in preparing these. Give her the finalized written report, the number of copies desired, and your project account number. Please keep in mind that the copying and binding process at Xerox (former Printing Services) takes 7-10 days, so plan accordingly.

## 2.11 Proprietary Information

Most of our sponsors expect the research conducted here to be confidential. As a rule, work sponsored at Herrick Laboratories must be treated as such. See your major professor for an explanation of the confidential restrictions.

It is preferable to use theses and dissertations as references in journal publications rather than reports to sponsors. All reports to sponsors are kept confidential *forever*, even though some of the material within them may be released for publications. Theses may also be maintained in a confidential status for a limited period of time. See your major professor concerning what can be reported regarding a thesis or dissertation during the confidential period.

## 2.1 Purchases

See Donna or Cindy for instructions on purchases of any items relevant to your research. Different approvals must be obtained depending on the nature of the purchase.

Most purchases require a purchase request signed by your faculty advisor. If your faculty advisor is unavailable, you may submit a previously authorized work order with your purchase request. Supporting documentation, like quotes or e-mails, is also important to include.



Please do not make purchases for items with cash and expect to get reimbursed. Purdue has arrangements with vendors that will avoid such cash purchases.

Herrick Labs does have a credit card with a \$700 limit that can be checked out. Donna has a checkout sheet which must be signed when the card is taken and returned. Be sure that you are not charged tax on any purchases when using this card. The University has tax exempt status.

If your credit card purchase is more than the \$700 limit, you should work with the Business Office for a different credit card number. It is very important that you return the card along with the receipt from your purchase.

If your purchase was made online, remember to receive your order online, and write the receipt confirmation number on the packing slip before submitting it to the main office.

### 2.13 Fiscal Matters

One of the most important fiscal matters to understand is that most graduate students are paid from a research account which is set up for them when they come to the Labs. In addition, any research-related purchases made by a student are charged to this account. If you have any questions about your own fiscal status, the Business Office is the best source for information regarding funding, computer accounts, purchases, etc. They understand University rules and regulations and are very helpful in explaining them.

### 2.14 Research Reference Materials

The campus library system and the engineering library located in the Potter Building (POTR) have references available. Your research account number is accepted by them for literature searches, copying, etc. In addition, the Herrick Laboratories maintains a library of all Herrick theses, dissertations, and reports. Some reports are on microfiche and others are on CD-Rom. Confidential materials are available under certain conditions.

### 2.15 Office Equipment

The following are guidelines for the use of the copy machine and fax machine, which are located in HLAB main office.

Questions regarding the use or operation of these machines can be directed to Donna Cackley.



**Copy Machine:** The photocopier is available for research and university use. The photocopier also has printer capability and can collate and staple. It scans to e-mail addresses.

**Fax Machine:** The fax number is +1 (765) 49-40787. See Donna for user instructions.

## 2.16 Telephones

The main office number is 1 (765) 49-42132.

### *Conference rooms and lab areas*

Eisele Conference Room (Rm. 2061, HLAB)	61535
Bernhard Conference Room (Rm. 1012, HLAB)	61536
Coates Conference Room (Rm. 1017, HLAB)	61537
Shop (HERL)	42142
Donna Cackley (Rm. 2129, HLAB)	42129

To call from one campus phone to another, it is understood that the first two digits are 49. You only need to dial the last 5 digits. For that reason, many campus phone numbers are written as 49-xxxxx or as above with only the last 5 digits.

To call a local city phone from campus, dial 7 to get off campus, then the local 7-digit number. You do not need to use the area/city code, which is 765, to make a local call.



Long distance calls that are sponsor-related can be charged to your research account. You will need an authorization code to place a long distance call from a campus phone. See Cindy Cory or Donna Cackley for instructions. Your faculty advisor or faculty host may give you an authorization code to use.

All personal calls should be charged to your own phone account through the Purdue operator.

## 2.17 Leaving the Laboratories

Sometime before your departure, see Donna Cackley for procedures and a “Check-Out” form or get one from the Herrick Web site in the current student section, and see Julayne Moser, Graduate Administrator, for a similar “Mechanical Engineering Check-Out Procedure” form. You’ll be surprised how many signatures and time this procedure takes, so plan for it accordingly. Also check with the shop to make sure all equipment in your name has been returned.

In addition to checking out from Purdue, obtain a change of address kit from the Post Office and complete it so your mail will be forwarded to your new address. Also, advise your bank, magazines, old friends and Society organizations of your new address.

## 2.18 Travel

To access Purdue’s CONCUR Travel & Expense system, go to <http://www.purdue.edu/business/travel/>. There you will find instructions and training information. If any questions, see Cindy, or the Business office staff in ME.



## 2.19 Clerical Work

Cindy Cory is available for project-related letters and reports. Drafts of documents you prepare in a computer file may be transferred to her for final typing/formatting. Progress reports, most major sponsor reports, as well as conference and journal papers should be typed by the student (see Progress Reports).

## 2.20 Vacations

Almost everyone works a full twelve-month year at the Laboratories and has limited vacation, so when the semester ends, don't pack up and leave for home. Arrange with your major professor when you wish to take holidays. If you are leaving town, complete a Request for Absence from Campus (Form 33A) and give the signed form to Donna Cackley. This is so that you can be contacted in an emergency, or to pass on urgent messages from sponsors and major professors.

## 2.21 Computers

The Computer Lab is located in room 1025 in HLAB. **ONLY** Herrick Lab students, faculty, and staff are allowed to use these computers.

The Mechanical Engineering Building also has computer resources available for your use. All students are given an ECN/ME computer account for accessing the ME departmental computers once you are registered as ME students. This process is automatic and specifically keyed to your registration as an ME student. If you don't have an account, contact the ME Business Office or your advisor to initiate an account request. You'll need a student ID and faculty signature for this. When filling out the account request form, be sure to note that you're from Herrick so you'll be added to the "herl" mail alias.

If your computer needs are not available on campus, contact your faculty advisor and Mike Logan in the Mechanical Engineering Building about the possibility of purchasing specialized equipment.

### Downloads and Web Access

Computers at Purdue are for class related work and for sponsored research. Information Technology at Purdue (ITaP) does monitor computers so it is in your best interest not to Web surf at inappropriate sites or illegally download programs. You can be tracked and prosecuted!

### Reporting Computer Problems



If you have computer, printer, e-mail, or internet problems, contact Technical Services Supervisor in the Herrick Shop first. If he can't assist you, he'll refer you to Mechanical Engineering (ME) computer support. The Web address is <https://engineering.purdue.edu/MECL/>. The ME Computer Consultants can also be reached by phone at 49-48756. If none of these work, contact Mike Logan, Computer and Electronics Systems Manager, [loganm@purdue.edu](mailto:loganm@purdue.edu). The phone number is 49-48756 or visit the Electronics Shop in the Mechanical Engineering Building, Room 2042. To report printing or printer connection problems, contact ECN at <https://engineering.purdue.edu/ECN/AboutUS/ContactUS> or send email to [mesite@ecn.purdue.edu](mailto:mesite@ecn.purdue.edu).

## 2.22 Graduate Education at Purdue

The Graduate School has a Web site to assist you in making your educational experience at Purdue successful. For insights on your advisor, your thesis or dissertation, the role of your department, and similar topics, please read the information at <http://www.gradschool.purdue.edu/downloads/GradEd.pdf>. This is recommended reading for all graduate students.

## 3.0 Laboratory Equipment

### 3.1 Equipment Types

We have two types of equipment in the lab: the free-for-all type and the check-out type. Free-for-all equipment (signal analyzers, computers, amps, shakers, etc.) is stored on shelves in the East and West wings (HERL) and at the North end of the Acoustics wing (HERL), and should be returned after experiments. You will appreciate being able to find the right connector or cable that someone else was thoughtful enough to return.

Check-out equipment (tools, accelerometers, microphones, pressure transducers, flow meters) is stored in the shop and may be checked out from the shop staff when you need to use it. This equipment should be returned to the shop when you are finished with it. Lockers (located in the East, West, and Acoustic wings) may be available where this material can be stored during the period you are using it. Free-for-all type equipment should not be locked up.

### 3.2 Guidelines for Equipment Use at the Ray W. Herrick Labs

#### Everyone Shares Equipment

We share equipment (and facilities) at the Herrick Laboratories, and we all work together to schedule use so that everyone can make progress on their research. We are each responsible for taking good care of equipment.

#### Preserving Our Equipment Pool

We need to operate in a manner that helps ensure that equipment is in good condition when it is needed. Only use equipment that you are knowledgeable about.

**Educate yourself:** If you do not know how to use a piece of equipment, it is your responsibility to find someone who can help you learn how to use the equipment and understand how to protect it from being damaged. The shop can help you find the right people. Read the manuals. Find out the cost of replacement.

**Teach others:** If you know how to use certain equipment, it is your responsibility to help others learn how to use it properly. By all means offer an informal workshop (Friday afternoon) if a group of people want to learn about the equipment.

**Loaning equipment checked out to you:** Only done on a short term basis, in general, better to do this officially with a Check-In/Check-Out procedure through the shop.

- Never lend your equipment to people who do not know how to use and care for it.
- Make sure that you know where it is going to be used and that you can retrieve it, if necessary.
- Make sure that it is in good working order when you lend it and when it is returned to you.
- Make sure that the person knows that if it is damaged while in their care, it is their responsibility to organize and find funds for its repair and/or replacement.

**Broken equipment:** Equipment wears out and breaks, if this happens, it needs to be repaired or replaced:

- Report it to your major professor,
- Return it to the shop (HERL) and explain how it was damaged.

Professors include funds in research projects to cover replacement of smaller items, and they share the costs on larger pieces of instrumentation depending on available resources.

**New equipment:** When we have new, complicated equipment that no one has used before:

- Arrange for some training from the vendor on use and calibration (perhaps arrange for a Friday afternoon workshop so others can learn, too),

- Work with the Shop so that they also can gain expertise with this instrumentation,
- While reading the manual and learning about the equipment, make user friendly notes to be kept with the equipment for future users (put copies of these notes with the manuals in the shop).

### **We Need to Know We Have the Equipment and its Location**

**Up to date Shop inventory:** All equipment must be tagged by the shop. When new equipment arrives, make sure it is put into the Herrick Laboratories inventory by the shop (HERL).

**Shop knows location:** All instrumentation must be checked out from the shop (HERL), and you should inform them of where it is to be used so that they can locate it if they need to.

**Project specific instrumentation:** When equipment is purchased for a specific project, that project has first call on its use. Hence, equipment **may** be kept out in the Labs with specific projects but:

- Its location must be known by the shop (HERL),
- It should be shared with other projects, as explained on this page.
- When your project ends, the equipment must be checked back into the shop (HERL).

**Short-term “borrowing” of general purpose equipment (analyzers, filters, meters etc.) from other projects:** In all but exceptional circumstances, don’t “borrow” equipment from other set-ups without the consent of the student running that experiment. If you absolutely need to do so (i.e., there is no alternative equipment available) and you cannot find the student to get their permission, after trying many times to so, contact their major professor and the shop (HERL). If they agree that it is OK to borrow the equipment:

- Be careful that you do not compromise the experiment when removing the equipment,
- Be 100% certain that you can use and care for the equipment properly,
- Leave a note saying where the equipment is being used and give contact information,
- Return the equipment in the same condition (or better) than it was in when you borrowed it, and do so quickly.

**Don’t keep instrumentation you are no longer using:** Check the instrumentation back into the Shop (HERL). If someone is taking over use of this instrumentation, do an official Check-In/Check-Out with the shop (HERL), so we know who is currently responsible for the equipment.

**Periodic shop Check-In/Check-Out for equipment in long-term use:** For equipment tied up in specific projects: we need to confirm that equipment is still in good working order, doesn’t need manufacturer calibration, and that we really do know where it is. Thus, if possible, equipment needs to be checked back in and out periodically. It is also wise to reconcile the list of equipment the shop (HERL) has checked out in your name against your records.

### **Out of Herrick Equipment Use: Off-campus, ME, Zucrow, Home, etc.**

There is paperwork to fill in to make sure that we are insured for theft or breakage. See Donna Cackley for the forms.

If you are doing this on a regular basis, fill in the information and make copies, so you can easily complete the paperwork next time. Do not keep it at the remote location, if it is not being used.

## Calibration

There are many levels of calibration. Ones that you can do locally and ones that the manufacturer needs to do. **Calibration should be done at the start of an experiment, periodically throughout a long experiment and at the end of the experiment.** Rule, you cannot do calibrations too often.

- **Your calibration procedure** is done so: (1) you can ensure that the instrumentation is working properly and (2) you can translate volts out of the measurement chain back into physical units (Pascal, m/s<sup>2</sup>, K, etc.) and understand how many volts/amps etc. produce the desired physical input to a system. Clearly, you will need to calibrate before you embed sensors into a set-up that makes them difficult to remove and calibrate. Even, when you cannot do a full scale calibration, you should devise a simplified calibration procedure to satisfy yourself that the instrument is working properly.
- Periodically equipment does need to be sent **back to a manufacturer for a much more rigorous calibration**, particularly instrumentation that you are using to do your local calibration. Time cycle for calibration depends on the instrumentation. When using equipment, check when it was last calibrated. No point in doing a long set of experiments with instrumentation that is not working properly.
- We are very supportive of students putting together calibration groups to, e.g., regularly calibrate all of a type of transducer used by your group. The Shop will gladly help you do this.
- The Shop (HERL) will include the last calibration date with their inventory.

## Manuals, Web Sites and Support Information

Most equipment comes with manuals. If possible, order another set of manuals, or download from the web, or photocopy original. **Provide the Shop (HERL) with a copy.** There should always be a copy of the manual in the shop (HERL). If manuals are lost, you may copy the one in the Shop (HERL), but immediately return the copy to the Shop (HERL). The secretarial staff can help you with copying.



If you find web sites with information that you found useful when learning about the equipment, make a note of them on the manual associated with the instrumentation. Similarly, note down names and contact information of people that you found at the instrument manufacturer's company who were helpful.

## Equipment Software and Software Upgrades

You **must have a license** to use software and/or show proof of purchase. Illegal downloading will result in severe penalties. Information Technology at Purdue (ITaP) keeps tabs on this type of activity. Be warned!

- First check with the Shop in HERL (who may refer you to Mike Logan, Mechanical Engineering Shop supervisor) on Purdue protocols for software installation. It may be OK to load it yourself, but check first. The Herrick and Mechanical Engineering shops will be able to alert you to any potential incompatibility with other software.
- For instrumentation-related software, we **keep a log of software installations and upgrades in the Shop.** When this involves CD-Roms or thumb drives, if possible, make a copy and let the originals reside in the Shop (HERL). If reinstallation is a regular need, the shop needs a placeholder for the

software with information on the location of the disks. Clearly label the disks to identify the hardware associated with the software—this will require hardware serial numbers because there are often multiple versions of particular hardware.

### Ordering New Equipment

When professors write research grants they include funds for new equipment and repair/calibration to help maintain and expand the pool of instrumentation available to Herrick researchers. While the instrumentation will have relevance to that research project, we purchase instrumentation to complement and improve our current pool of equipment. We do not want to waste money by purchasing instrumentation we already have. **ALWAYS check with the Shop (HERL) before purchasing new instrumentation** to avoid wasting valuable resources. When you fill out the form to order the new equipment, it needs to be signed by the shop (HERL). Even when you do this electronically, the business office people will want to see purchases approved by a Shop person and your faculty advisor. If you are ordering gas, fuel, or other petroleum distillates they require special handling and ordering procedures.

### 3.3 Safety Inspection

Technically, each experiment must go through a formal safety inspection (see safety section). This is for your own safety. Special attention should be paid to the following:

- high voltages (piezo-electrics)
- heavy equipment such as compressors, vehicles, engines, and large fans
- wind tunnel, psychometric rooms
- open flames
- big, long, sharp, pointy things
- high pressure, either hydraulic or pneumatic
- anything else that is potentially dangerous

The shop may decide to waive the safety test for small experimental setups such as little speakers in ducts, or standard noise tests in the reverberation room. In these cases, the shop must still be sure you don't damage or misuse the equipment and that the work is done safely.

Manuals and other students are good resources when trying to find out how the equipment works. The shop staff provides excellent help, and far prefers showing students and visitors how to use things at the start (as opposed to after they're broken, and the shop has to fix them). Original manuals are to be copied and originals taken to the shop (HERL).

### 3.4 Manuals

For equipment (1993 or newer), copies of the manuals can be checked out from the shop. Manuals for older equipment are on microfiche. If you need to use the microfiche reader, see Donna Cackley or Bob Brown. You will need to ask shop personnel for help before using it. Computer software manuals are either in the computer room or can be found online. We need to think of others when removing manuals from their happy homes. Don't take them for more than 30 minutes (especially the often-needed computer ones), and always leave a note when you are taking a manual to your office.

Please take the time to READ the appropriate manual BEFORE attempting to operate equipment. If you have questions AFTER reading the manual, ask for help, either from the shop or other students.

### **3.5 Reserving Set-up Equipment**

Setup thefts can be a big problem. You can make yourself a “reserved” card which should consist of a ‘Do Not Remove’ side and an ‘If you borrow it, return it by \_\_\_: \_\_\_’ side. The former side is for sponsor meeting setups and setups you are using within one hour. The latter side is for when you will be using the setup again tomorrow, but are done for the evening. Put the time you plan to use the equipment on the card, so others will be able to have the equipment back in time. For safety reasons, your name and your major professor’s name should also appear on the card.

These should be used to benefit everyone’s research. Remember that you are one of many people who are trying to get their research done.

### **3.6 New Equipment Acquisition**

Sometimes even Herrick Laboratories does not have the equipment needed for research, and your kind and ever-thoughtful major professor will buy some new equipment for you to use. When it comes in, the first place it should go is the shop (HERL) so they can register it with the University and make a copy of the manual.

### **3.7 Remote Testing**

It may be necessary to use equipment at locations other than the Herrick Laboratories. For example, you may need to take some equipment to a sponsor meeting or do some on-site measurements. Before removing equipment from the laboratories, complete either an Equipment Change in Status form or a Property Off Campus form, which are available on the Web and from Donna Cackley. The proper form must be completed and processed before the equipment can leave the building. Processing the forms takes approximately 7 to 10 business days. If you need permission sooner, you may be able to personally walk the form through campus to obtain the proper signatures in a day. Even when you need the equipment immediately, this form should be completed and returned to the shop (HERL) or Donna Cackley before you remove the equipment.

University regulations prohibit the removal of any equipment from the lab without specific written approval of the Director.

## **4.0 Herrick Laboratories Technical Services**

The goal of Technical Services is to assist you in the efficient, cost effective design and construction of your research projects. They can also provide instruction in the use of much of the Laboratory equipment and instrumentation.

### **4.1 General Guidelines**

To check out equipment, instruments, or supplies any available shop personnel can assist you.

Computer, printer or electronics related advice or help see Technical Services Supervisor.

Building problems or chemical disposal see Bob Brown.

Request work or buy instrumentation see Technical Services Supervisor.

The shop maintains a database of all instruments, electronic equipment, tools, supplies, and materials. In order to check out equipment, instruments, and tools or purchase stocked supplies for your project we need to have you in our database. The following information is required:

1. Purdue login
2. Digital picture (we will take it)
3. Account number information
4. Professor
5. Office number
6. Each undergraduate also requires the name of the graduate assistant assigned to help them.

The shop has many parts, components, and instruments available for your use. Before you purchase anything, please check with the shop (HERL). It is possible to save you both time and money if we already have the needed equipment. If not, the shop may be able to suggest an alternative, less expensive solution to your needs. The shop maintains an extensive collection of vendor's catalogs, and their past experience may allow them to suggest the best source for your needs.

Anything you do wish to purchase for your research should be approved by the shop and ordered through the on-line program using ARIBA or through the Business Office. Even when ordering through ARIBA system, the Business Office will need evidence of approval by the shop, i.e. a signature on a purchase order before it is processed, or a work order, and you will also need your major professor's signature. If you have questions about ARIBA ordering, please ask Donna Cackley, Cindy Cory, or the Business Office for assistance.

If you need something immediately and it is available locally, you may use the departmental credit card to get the items you need. See Donna Cackley for the credit card. You will need to submit a Purchase Request form signed by you and your faculty advisor or a Herrick work order to the Business Office for approval before the credit card will be released.

#### **4.2 The Shop (HERL)**



The organizational structure of Herrick Laboratories Technical Services is based on the “**TEAM**” concept. Each team member has a unique area of expertise enhanced with a wide range of complementary technical skills. Electronics and mechanical personnel are able to interface effectively on collective projects.

To maintain good relations with the shop, there are only four simple things you must remember:

- Ring the bell for service (both front and back doors).
- Wait for permission to go beyond the counter.
- They take coffee breaks from 10:00-10:30 a.m. and 3:00-3:30 p.m. Let them rest at these times.
- Always make safety a priority and be aware of and practice all the procedures that insure you and your colleagues are safe.

#### **4.3 HERL Design and Construction**

Before the shop can begin work on your project, a work order must be created. The work order provides both you and the shop with accurate accounting of labor and materials used for your project. You will be asked to provide your project account number, project name, and how soon you need the task completed.

Without an account number, they will be unable to provide their services. Your major professor should be able to help you with account numbers and should also sign the work order.

The shop may prove to be a valuable resource in the design of your equipment. The process will be as follows:

1. Arrange a meeting with the shop, your major professor, yourself, and any other graduate students closely involved in your research project. Bring a sketch of your ideas, and be prepared to explain what you want to do and why. Having a good understanding of the overall goal is very helpful.
2. Refine your drawings and selection of materials and instruments that will be needed for your project. Then meet with shop personnel to make sure there is sufficient information to proceed. This may take a few iterations. At this point, it would be good to do a first look at identifying safety issues and the safety procedures that will need to be in place when the rig or experiment is operational.
3. During the fabrication of your experiment one or more of the shop team may be involved. Each team member has a great degree of latitude in working with faculty and/or students. However, please make available any drawing changes. Team members working on your project take great pride in your project and we like to foster a relationship where we are colleagues working together as a team.

The success of such a “culture” depends on all the members “buying into” it. It is difficult for those not familiar with the Herrick Labs to comprehend that such a culture does not detract from their individual problem solving efforts, but rather supports and fosters a more creative atmosphere for research. Invention and success are more often the result of the collaboration of many individuals and many ideas.

4. On completion of the construction, a startup and shut down procedure needs to be documented as well as refining a safety procedure (or protocol) for your experiment(s). Any shop team member will be able to help you with this. A final inspection and possible safety check should be performed to insure that everyone is safe to work here at Herrick Laboratories.

#### **4.4 Fabricating Your Own Equipment**

If you want to construct all or part of your own test set-up, the shop will be happy to assist you. This includes design suggestions, help in acquiring materials, and instruction in the use of tools.

Normally, students are not permitted to work in the Herrick shop. Space and equipment is very limited. The permission to use specialized tools, such as the shop’s milling machine, lathe, welders, or sheet metal equipment, is given on a case-by-case basis, at the discretion of shop personnel.

If you have the time and experience to perform your own machine work, the Student Shop in the basement of the Mechanical Engineering building is available. This facility has greater machining capability and more equipment available than the Herrick shop. Adam Krichbaum, in the Mechanical Engineering Student Shop, will work with you to get your work done.

#### **4.5 Instrumentation and Tools**

Checkout equipment and tools are stored in the shop. Check out equipment should be returned to the shop when you are done with it. Upon graduation, you will be held responsible for equipment that you have not returned to the shop.

## 4.6 Lockers

Bob Brown can issue you a locker to store the equipment that you have checked out. Please do not use your own locks. Note that at Herrick we share equipment and resources. Keeping equipment or instrumentation that you only use occasionally locked away so it is unavailable to other researchers is frowned upon. If you have concerns about damage to the instrumentation we can tag it and ensure that people are trained to use it properly, before checking it out to them.

## 4.7 Broken Equipment and Discarding Metals and Glass



The shop maintains the equipment around the lab, but due to manpower constraints, it is difficult for them to inspect every piece of equipment on a regular basis. The availability of equipment will be greatly enhanced if you will report to the shop anything you find inoperative or needing attention. Bring this equipment to the shop along with a note describing the problem. Remember, this is “your” equipment. Please help the shop keep it in good condition.

Metal that you want to discard, including things like staplers, is taken to the Shop (HERL) for disposal. No metal is to be put in the trash cans with the exception of soft drink cans which are to be recycled. Mercury thermometers are prohibited on campus.

Glass of any kind that you want to discard should be boxed, the box sealed and labeled, and placed in the dumpsters. This includes light bulbs, thermometers, coffee cups, etc.

If you are unsure how to dispose of an item, please talk to the Shop. They will be glad to assist you. We want Herrick to be a safe and happy place for everyone.

## 4.8 Deliveries to the Herrick Laboratories



ALL parcels delivered to the Laboratories are delivered to HLAB (main office). Do not pick them up from the office unless they have been logged on the file in the main office and checked by a staff member. This is done so that we can check the equipment and instrumentation and also make sure that we have the safety data sheets (SDS) for all materials in the Labs. This also gives us advanced notice of possible modifications that may be needed to safety procedures to ensure safe handling of materials.

Note, that when ordering materials, you should always request a Safety Data Sheet (SDS) be sent with the product, and you should also check before ordering what safety procedures will be necessary for safe use of the project. These safety procedures are given on the Safety Data Sheets. The shop has Safety Data Sheets for all products currently used at the laboratories or can help you locate a Safety Data Sheet for a new product.

Additional information about equipment is in the “Equipment” section.

## 5.0 The Industrial Advisory Committee (IAC)

The Industrial Advisory Committee (IAC) was founded in 1958 to give advice to the Herrick Laboratories from persons involved in industry about what research directions Herrick Laboratories should pursue. The Industrial Advisory Committee was organized to promote the Herrick Laboratories philosophy and mode of operation.

The Industrial Advisory Committee was initially organized to give advice to Bill Fontaine, founder of Herrick Laboratories, and to provide funding for cooperative research projects. Now, however, the Industrial Advisory Committee means much more to Herrick Laboratories. The purpose of the Industrial Advisory Committee has expanded to include:

- Ideas for future research and feedback for faculty.
- A pool of high-level industrialists knowledgeable of Herrick faculty, students, facilities, programs, and potential, who pass along our capabilities to their companies and others.
- Individual advice in addition to group reports.
- Material and financial support as needed.

Once each year, the Industrial Advisory Committee meets at the Herrick Laboratories for a day of discussion on what topics the Labs have been pursuing. There are over 25 members from industry on the committee. In addition, there are about 20 other guests who are invited to attend. The agenda includes presentations by the faculty and director.

These presentations are followed by a “Research Expo”, which is essentially a student poster show. Each year, students produce posters that give an overview of their project’s goals and accomplishments. Samples of these can be found throughout the Laboratories and are used extensively when giving tours of the Labs. After lunch, the group meets to give advice on current laboratory projects and future directions of the Labs.

## 6.0 Important People

### 6.1 People at Mechanical Engineering

	<p><b>Anil Bajaj</b>, <i>William E. and Florence E. Perry Head of Mechanical Engineering and Alpha P. Jamison Professor of Mechanical Engineering</i>. If you do not have the opportunity to interact with him during your studies, most Ph.D. students have an exit interview with him when they leave. His office is on the second floor of the Mechanical Engineering Building in room 2007A.</p>
	<p><b>Ada Uche</b>, <i>Graduate Administrator</i>. Ada is probably the first person a new graduate student has contact with in the Department of Mechanical Engineering. In her capacity as Graduate Administrator, Ada advises, counsels, and in general, assists graduate students. She is the best source for general course and program related information. Her office is ME 1005A.</p>
	<p><b>Michelle Sarault</b>, <i>Accounting Assistant and Monthly Payroll Manager</i>. Most Graduate students meet Michelle during registration to have their stipends verified. She works in the Business Office located on the second floor of the Mechanical Engineering Building in room 2051. It is important that new students see Michelle to complete payroll documents on the <b>first day</b> of employment, if they have not done so previously.</p>
	<p><b>Mike Logan</b>, <i>Computer and Electronics Systems Manager</i>. All Mechanical Engineering electronic shop services are coordinated by Mike. If you decide to have work done at Mechanical Engineering, check with Mike and the Business Office about procedures for charging the appropriate Herrick accounts. Mike’s office is Mechanical Engineering Building, Room 2042.</p>

	<p><b>Michael Black</b>, <i>Graphics Design Coordinator</i>. Michael maintains the Mechanical Engineering Web site. He will also help you with project related drafting and printing large items like project posters. His office is located in the Electronics Shop, Room 2042, in the Mechanical Engineering building.</p>
---	--

## 6.2 People at Herrick Laboratories

	<p><b>Patricia Davies</b>, <i>Director of Herrick Laboratories and Professor of Mechanical Engineering</i>. Professor Davies is responsible for the Herrick Laboratories and has the final decision there are multiple acceptable options. You will meet her during your time at the Herrick Laboratories.</p>
	<p><b>Bob Brown</b>, <i>Mechanical Shop Foreman and Building Deputy</i>. Bob will help design, construct, and repair experimental hardware. Bob also provides information to new students regarding safety procedures. Among his duties are building repairs and maintenance, so please contact him if you have any building concerns, like the temperature in the room, dripping water, lights out, ceiling repairs, etc.</p>
	<p><b>Donna Cackley</b>, <i>Administrative Assistant</i>. Donna assists students with check-in and check-out procedures. She also makes desk assignments and reassignments. Questions regarding Herrick Laboratories policies and regulations should be addressed to her.</p>
	<p><b>Kim Lock</b>, <i>Building Services Representative</i>. Kim works in the new Herrick building. She works in the mornings, and her workday ends at 1:30 pm. Please see her for any building issues like accidental spills or other building cleaning issues. She is always willing to help you in any way she can.</p>
	<p><b>Charles Baxter</b>, <i>Tech Services Supervisor</i>. Charlie works in the shop electronics area with the graduate students and faculty. His expertise includes trouble-shooting, repairing, designing and fabricating various types of electronic instrumentation, controls, electrical devices and computers. He is also your first contact for any computer or printer problems at the Herrick Laboratories.</p>
	<p><b>Frank Lee</b>, <i>Machinist IX</i>. Frank handles construction and repair of experimental hardware. He frequently works on heating, ventilation, air conditioning, and refrigeration research projects in the West Wing.</p>
	<p><b>Ryan Thayer</b>, <i>Engine Test Cell Technician</i>. Ryan works mainly with the Engines group (faculty and students). He does engine set up and tear down; engine modifications, trouble shooting, instrumentation hook up and calibration and any other engine-related tasks. Ryan also helps out on non-engines research projects and in the shop area, when needed.</p>
	<p><b>Brian Barrett</b>, <i>Conference Coordinator</i>. Brian organizes conferences and short courses for Herrick Labs. He handles the arrangements for the International Compressor; Refrigeration and Air Conditioning; and the High Performance Building Conferences held in July in even numbered years. He works with the faculty members and students hosting the conference and short courses. If you need information from past conferences for short courses, Brian can help you.</p>



**Cindy Cory, Secretary V.** Cindy assists in the preparation of monthly progress reports, Herrick Lab reports, and other official correspondence. She keeps the student and staff information sheet updated, so if you have any changes in address, phone number, marital status, etc., let her know so the listings can be corrected. She will also help with copying, general typing, proofreading, sending mail and packages, etc. Cindy is the best person to see if you have questions about foreign or domestic travel.

## 7.0 Student Committee

The student committee is a group of graduate students who meet with the Herrick Laboratories faculty members as needed to discuss ways of improving life at Herrick. The committee meetings are partially used to air student opinions and to discuss student suggestions on any Laboratory-related matter, the results of which are transmitted to the Director, other Herrick committees, and the administration, as the committee deems appropriate. More importantly, the committee is also in charge of organizing social activities for the Labs.

Elections for student committee representatives are held on an as needed basis. Graduate students who have been at the Herrick Laboratories for at least a year are eligible to serve. If you have any topics that you would like the committee to address, just let a committee member know. A list of the current members is posted in the Main Office.

## 8.0 Coffee and Snacks

1. Pay for what you drink,
2. Clean up after yourself, and
3. Do not leave your perishable foods (sandwiches, fruit, vegetables, pizza, etc.) in the refrigerator for more than a few days. Please put your name on the container and the date you put it into the refrigerator. Food without labeling may be thrown out, especially when we are worried about strange smells when we open the refrigerator.

Basically, use common sense and be considerate of others.

### 8.1 Candy and Miscellaneous Snack Foods

Candy, snacks, etc. are in the cabinet under the student mailboxes on the 3<sup>rd</sup> floor. The purchase of snacks is on the honor system. The prices for the various items are posted and please put your money in the box which is located in one of the drawers. The snack food supply is maintained by students, and they welcome your suggestions for what snacks should be available.

## 9.0 Counseling Services

Several *confidential* counseling services are conveniently located on campus.

**Counseling and Psychological Services (CAPS)**—is committed to helping students benefit from their college experience. One way that students can do this is to talk to a counselor or psychologist in a supportive atmosphere

to aid self-understanding and the resolution of personal issues. Although Counseling and Psychological Services works with students in crisis, their primary goal is to assist students with their concerns before they develop into more serious problems.

Counseling and Psychological Services main offices are located in the Psychological Sciences Building (PSYC) and at the Purdue Student Health Center (PUSH). Their office hours are 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m. Monday-Friday. For more information about Counseling and Psychological Services call (765) 494-6995 or visit them online at <https://www.purdue.edu/caps/>.

**Dean of Students**—The Dean of Students Office also provides counseling services in Schleman Hall, Room 207. They cover a variety of topics including, but not limited to,

Alcohol and Substance Abuse	Family & Childhood Issues	Eating Disorders	Sleep
Anger	Gambling	Stress	
Anxiety	Grief	Study Skills	
Assertiveness	Impulse Control	Suicide	
Attention-Deficit Disorder	Medication	Test-Taking	
Cults	Relationships	Time Management	
Cultural Issues	Sexual Assault	Traumatic Events	
Depression	Sexual Harassment	Wellness	
Disabilities	Sexual Orientation	Writing	
Dissociation		Concern for Others	

If you, or someone you know on campus, would benefit from these services, call them for an appointment at (765) 494-1747. More information about the counseling services offered by the Dean of Students is available on their Web site: <http://www.purdue.edu/ODOS/welcome.php>.

## 10.0 Emergency Procedures

What should I do in the event an **EMERGENCY** arises? What constitutes an **EMERGENCY**? Let us use the following guidelines to define an **EMERGENCY**:

Any situation in which one or more of the following conditions exist:

- Threat to life or of injury to any person
- Possibility of imminent damage to building or research equipment

The following provide examples of **EMERGENCIES**:

- The building is on fire!
- Someone is injured or seriously ill.
- The toilet is overflowing and water is running on the floor.

The following are **NOT EMERGENCIES**:

- Your office is too warm.
- You waited till the last minute to take data, and the equipment broke.

Weekdays from 8:00 a.m. to 12:00 noon and 1:00 to 5:00 p.m., the shop is open and ready to assist you with **EMERGENCIES** or just simple problems. At other times, if an **EMERGENCY** should arise, call these numbers:

### **MEDICAL EMERGENCIES:**

Ambulance ..... 911  
Purdue Student Hospital..... 4-1700  
Purdue Student Help & Crisis Line..... 5-4357  
Lafayette Crisis Center.....(7) 752-0244

### **FIRE:**

Purdue .....911  
West Lafayette .....911

### **BUILDING PROBLEMS:**

During Day - Bob Brown..... 4-2142  
Weekend/Night ..... 4-8221  
Bob Brown (*emergency only*) ..... 714-1818

### **POLICE:**

Purdue Police Emergency .....911  
Purdue Police Non-Emergency ..... 4-8221

ADDRESS FOR THE **NEW** HERRICK BUILDING: 177 S. Russell St., West Lafayette, IN 47907-2099

ADDRESS FOR THE **OLD** HERRICK BUILDING: 140 S. Martin Jischke Dr., West Lafayette, IN 47907-2031

When you call any emergency departments (Fire, Police, Ambulance), please state address, which building (old or new) and door you want them to enter—east door, west door, southwest door, along with the name of the street that it faces. Also, have someone standing at the designated door(s) to meet the emergency personnel. Telling the emergency people as much information as possible when you first make the call will save them time and will expedite the situation. Thanks for your cooperation.