# FAMU-FSU College of Engineering
# Project Hazard Assessment Policy and Procedures

## INTRODUCTION

University laboratories are not without safety hazards. Those circumstances or conditions that might go wrong must be predicted and reasonable control methods must be determined to prevent incident and injury. The FAMU-FSU College of Engineering is committed to achieving and maintaining safety in all levels of work activities.

## PROJECT HAZARD ASSESSMENT POLICY

Prior to starting an experiment, laboratory workers must conduct a project hazard assessment (PHA) to identify health, environmental and property hazards and the proper control methods to eliminate, reduce or control those hazards. PI/instructor must review, approve, and sign the written PHA and provide the identified hazard control measures. PI/instructor continually monitor projects to ensure proper controls and safety measures are available, implemented, and followed. PI/instructor are required to reevaluate a project anytime there is a change in scope or scale of a project and at least annually after the initial review.

## PROJECT HAZARD ASSESSMENT PROCEDURES

It is FAMU-FSU College of Engineering policy to implement the following:

1. Laboratory workers (i.e. graduate students, undergraduate students, postdoctoral, volunteers, etc.) performing a research in FAMU-FSU College of Engineering are required to conduct PHA prior to commencement of an experiment or any project change in order to identify existing or potential hazards and to determine proper measures to control those hazards.
2. PI/instructor must review, approve and sign the written PHA.
3. PI/instructor must ensure all the control methods identified in PHA are available and implemented in the laboratory.
4. In the event laboratory personnel are not following the safety precautions, PI/instructor must take firm actions (e.g. stop the work, set a meeting to discuss potential hazards and consequences, ask personnel to review the safety rules, etc.) to clarify the safety expectations.
5. PI/instructor must document all the incidents/accidents that happened in the laboratory along with the PHA document to ensure that PHA is reviewed/modified to prevent reoccurrence. In the event of PHA modification a revision number should be given to the PHA, so project members know the latest PHA revision they should follow.
6. PI/instructor must ensure that those findings in PHA are communicated with other students working in the same laboratory (affected users).
7. PI/instructor must ensure that approved methods and precautions are being followed by :
    a. Performing periodic laboratory visits to prevent the development of unsafe practice.
    b. Quick review of the safety rules and precautions in the laboratory members meetings.
    c. Assigning a safety representative to assist in implementing the expectations.
    d. Etc.
8. A copy of this PHA must be kept in a binder inside the laboratory or PI/instructor’s office (if experiment steps are confidential).

| Project Hazard Assessment Worksheet | | | | |
|---|---|---|---|---|
| PI/instructor: Dr. Bayaner Arigong | Phone #: (850) 410-6410 | Dept.: Electrical Engineering | Start Date: August 23rd, 2021 | Revision number: 2 |
| Project: Digital Beamsteering Phased Array | | | Location(s): FAMU-FSU College of Engineering | |
| Team member(s):<br>Andrew Cayson<br>Tiernen Pan<br>Christian Balos<br>William Snyder<br>Katheryn Potemken | | | Phone #:<br>(850) 524-3458<br>(305) 989-7609<br>(941) 348-4615<br>(904) 570-8928<br>(240) 252-8118 | Email:<br>ac12m@my.fsu.edu<br>tjp17@my.fsu.edu<br>cb16t@my.fsu.edu<br>wjs18b@my.fsu.edu<br>kfp18@my.fsu.edu |

| **Experiment Steps** | **Location** | **Person assigned** | **Identify hazards or potential failure points** | **Control method** | **PPE** | **List proper methods of hazardous waste disposal, if any.** | **Residual Risk** | **Specific rules based on the residual risk** |
|---|---|---|---|---|---|---|---|---|
| Soldering | Senior Design Lab | Andrew | Risk: burns, inhaling dangerous fumes.<br><br>Fire hazard<br>Toxic fumes | Don't put a soldering iron tip on anything flammable. Don't breathe fumes. | Ventilator<br>Safety Glasses | Make sure solder is discarded in the proper container. | HAZARD: 3<br><br>CONSEQ: Minor<br>Residual: low med | Safety controls are planned by both the worker and supervisor.<br><br>Proceed with supervisor authorization.<br><br>A second worker knowledgeable of the task and hazards are in the vicinity (buddy system). |
| Configuring I/O Ports | Anywhere | Tiernen | Risk: getting aches from sitting at a desk for too long, eyes hurting from looking at screen,<br><br>Ergonomic Hazard | Take breaks and stretch in intervals. Sit in a good chair. | Blue light glasses (optional).<br>ergonomic chair | N/A | HAZARD: 1<br><br>CONSEQ: Negligible<br>Residual: low | Safety controls are planned by both the worker and supervisor.<br><br>Proceed with supervisor authorization. |
| Program FPGA to create a clock that feeds into the DDS to create a sinusoidal signal | Anywhere | Christian | Risk: getting aches from sitting at a desk for too long, eyes hurting from looking at screen, | Take breaks and stretch in intervals | Blue light glasses (optional) | N/A | HAZARD: 1<br><br>CONSEQ: Negligible | Safety controls are planned by both the worker and supervisor. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| and calculate the phase offset the slave antennas from the master antenna. | | | Ergonomic Hazard | | | | Residual: low | Proceed with supervisor authorization. |
| Connecting Hardware Together | Senior Design Lab | Katheryn | Risk: getting shocked (but not serious damage).<br><br>Short circuits<br>Electrical Shock | Double check every connection | Safety Glasses<br>Fire extinguisher | Dispose of ruined components at a proper electronics disposal area. | HAZARD: 2<br><br>CONSEQ: Minor<br>Residual: Low | Safety controls are planned by both the worker and supervisor.<br><br>Proceed with supervisor authorization. |
| Drilling holes in junction box | Senior Design Lab | Andrew | Risk: Causing injury to body parts with the drill.<br><br>Being struck by | Has a lot of experiences | Safety goggles & gloves | N/A | HAZARD: 2<br>CONSEQ: Moderate<br><br>Residual: Low Med | Safety controls are planned the worker and supervisor.<br><br>A second worker knowledg the task and hazards is in the (buddy system).<br><br>Proceed with supervisor authorization. |
| Testing components using DC power supplies, oscilloscope, spectrum analyzer, etc. | Senior Design Lab | William | Risk: potential shock or inhalation of fumes if a component burns<br><br>Electrical Shock | Double check connections. Ensure power is off when changing connections | Safety Glasses | Dispose of components at a proper electronics disposal area. | HAZARD: 2<br>CONSEQ: Minor<br><br>Residual: Low Med | Safety controls are planned the worker and supervisor.<br><br>A second worker knowledg the task and hazards is in the (buddy system).<br><br>Proceed with supervisor autho |

**Principal investigator(s) PHA certification:** I certify that I have reviewed and approved the PHA worksheet and will ensure the control measures are available and implemented in the laboratory.

| Name | Signature | Date |
|---|---|---|
| Oscar Chuy | DocuSigned by: Oscar Chuy F2E19426A17D40B... | 4/1/2022 \| 3:21 PM EDT |

**Team members' certification:** I certify that I have reviewed the PHA worksheet, am aware of the hazards, and will ensure the control measures are followed.

| Name | Signature | Date |
|---|---|---|
| Andrew Cayson | DocuSigned by: 0E16D09CF22D471... | 4/1/2022 \| 4:16 PM EDT |
| Tiernen Pan | DocuSigned by: Tiernen Pan 5A2CB5BF3863481... | 4/1/2022 \| 1:04 PM EDT |
| Christian Balos | DocuSigned by: 29082D7A2310467... | 4/4/2022 \| 2:02 AM EDT |
| William Snyder | DocuSigned by: William J Snyder 68D26C5F68E2472... | 4/1/2022 \| 12:53 PM EDT |
| Katheryn Potemken | DocuSigned by: A111272872E8420... | 4/1/2022 \| 1:10 PM EDT |

## DEFINITIONS:

**Hazard:** Any situation, object, or behavior that exists, or that can potentially cause ill health, injury, loss or property damage e.g. electricity, chemicals, biohazard materials, sharp objects, noise, wet floor, etc. OSHA defines hazards as "*any source of potential damage, harm or adverse health effects on something or someone*". A list of hazard types and examples are provided in appendix A.

**Hazard control:** Hazard control refers to workplace measures to eliminate/minimize adverse health effects, injury, loss, and property damage. Hazard control practices are often categorized into the following three groups (priority as listed):

1. **Engineering control:** physical modifications to a process, equipment, or installation of a barrier into a system to minimize worker exposure to a hazard. Examples are ventilation (fume hood, biological safety cabinet), containment (glove box, sealed containers, barriers), substitution/elimination (consider less hazardous alternative materials), process controls (safety valves, gauges, temperature sensor, regulators, alarms, monitors, electrical grounding and bonding), etc.

2. **Administrative control:** changes in work procedures to reduce exposure and mitigate hazards. Examples are reducing the scale of process (micro-scale experiments), reducing time of personal exposure to process, providing training on proper techniques, writing safety policies, supervision, requesting experts to perform the task, etc.
3. **Personal protective equipment (PPE):** equipment worn to minimize exposure to hazards. Examples are gloves, safety glasses, goggles, steel toe shoes, earplugs or muffs, hard hats, respirators, vests, full body suits, laboratory coats, etc.

**Team member(s):** Everyone who works on the project (i.e. grads, undergrads, postdocs, etc.). The primary contact must be listed first and provide a phone number and email for contact.

**Safety representative:** Each laboratory is encouraged to have a safety representative, preferably a graduate student, in order to facilitate the implementation of the safety expectations in the laboratory. Duties include (but are not limited to):

- Act as a point of contact between the laboratory members and the college safety committee members.
- Ensure laboratory members are following the safety rules.
- Conduct periodic safety inspection of the laboratory.
- Schedule laboratory clean up dates with the laboratory members.
- Request for hazardous waste pick up.

**Residual risk:** Residual Risk Assessment Matrix is used to determine a project's risk level. The hazard assessment matrix (table 1) and the residual risk assessment matrix (table2) are used to identify the residual risk category.

The instructions to use the hazard assessment matrix (table 1) are listed below:

1. Define the workers familiarity level to perform the task and the complexity of the task.
2. Find the value associated with familiarity/complexity (1 – 5) and enter the value next to: HAZARD on the PHA worksheet.

**Table 1. Hazard assessment matrix.**

| | | **Complexity** | | |
|---|---|---|---|---|
| | | Simple | Moderate | Difficult |
| **Familiarity Level** | Very Familiar | 1 | 2 | 3 |
| | Somewhat Familiar | 2 | 3 | 4 |
| | Unfamiliar | 3 | 4 | 5 |

The instructions to use the residual risk assessment matrix (table 2) are listed below:

1. Identify the row associated with the familiarity/complexity value (1 – 5).
2. Identify the consequences and enter the value next to: CONSEQ on the PHA worksheet. Consequences are determined by defining what would happen in a worst case scenario if controls fail.
    a. Negligible: minor injury resulting in basic first aid treatment that can be provided on site.
    b. Minor: minor injury resulting in advanced first aid treatment administered by a physician.
    c. Moderate: injuries that require treatment above first aid but do not require hospitalization.
    d. Significant: severe injuries requiring hospitalization.

e. Severe: death or permanent disability.

3. Find the residual risk value associated with assessed hazard/consequences: Low –Low Med – Med– Med High – High.
4. Enter value next to: RESIDUAL on the PHA worksheet.

**Table 2. Residual risk assessment matrix.**

| Assessed Hazard Level | Consequences | | | | |
|---|---|---|---|---|---|
| | Negligible | Minor | Moderate | Significant | Severe |
| 5 | Low Med | Medium | Med High | High | High |
| 4 | Low | Low Med | Medium | Med High | High |
| 3 | Low | Low Med | Medium | Med High | Med High |
| 2 | Low | Low Med | Low Med | Medium | Medium |
| 1 | Low | Low | Low Med | Low Med | Medium |

**Specific rules for each category of the residual risk:**

Low:

- Safety controls are planned by both the worker and supervisor.
- Proceed with supervisor authorization.

Low Med:

- Safety controls are planned by both the worker and supervisor.
- A second worker knowledgeable of the task and hazards is in the vicinity (buddy system).
- Proceed with supervisor authorization.

Med:

- After approval by the PI, the Safety Committee and/or EHS must review and approve the completed PHA.
- A written safety plan is required and must be approved by the PI before proceeding. A copy must be sent to the Safety Committee.
- A second worker must be in place before work can proceed (buddy system).
- Limit the number of authorized workers in the hazard area.

Med High:

- After approval by the PI, the Safety Committee and/or EHS must review and approve the completed PHA.
- A written safety plan is required and must be approved by the PI and the Safety Committee before proceeding.
- Two qualified workers must be in place before work can proceed.
- Limit the number of authorized workers in the hazard area.

High:

The activity will not be performed. The activity must be redesigned to fall in a lower hazard category.

## Appendix A: Hazard types and examples

| Types of Hazard | Example |
|---|---|
| Physical hazards | Wet floors, loose electrical cables objects protruding in walkways or doorways |
| Ergonomic hazards | Lifting heavy objects Stretching the body |

| | |
|---|---|
| | Twisting the body<br>Poor desk seating |
| Psychological hazards | Heights, loud sounds, tunnels, bright lights |
| Environmental hazards | Room temperature, ventilation contaminated air, photocopiers, some office plants acids |
| Hazardous substances | Alkalis solvents |
| Biological hazards | Hepatitis B, new strain influenza |
| Radiation hazards | Electric welding flashes Sunburn |
| Chemical hazards | Effects on the central nervous system, lungs, digestive system, circulatory system, skin, reproductive system. Short term (acute) effects such as burns, rashes, irritation, feeling unwell, coma and death.<br>Long term (chronic) effects such as mutagenic (affects cell structure), carcinogenic (cancer), teratogenic (reproductive effect), dermatitis of the skin, and occupational asthma and lung damage. |
| Noise | High levels of industrial noise will cause irritation in the short term, and industrial deafness in the long term. |
| Temperature | Personal comfort is best between temperatures of 16°C and 30°C, better between 21°C and 26°C.<br>Working outside these temperature ranges: may lead to becoming chilled, even hypothermia (deep body cooling) in the colder temperatures, and may lead to dehydration, cramps, heat exhaustion, and hyperthermia (heat stroke) in the warmer temperatures. |
| Being struck by | This hazard could be a projectile, moving object or material. The health effects could be lacerations, bruising, breaks, eye injuries, and possibly death. |
| Crushed by | A typical example of this hazard is tractor rollover. Death is usually the result |
| Entangled by | Becoming entangled in machinery. Effects could be crushing, lacerations, bruising, breaks, amputation and death. |
| High energy sources | Explosions, high pressure gases, liquids and dusts, fires, electricity and sources such as lasers can all have serious effects on the body, even death. |
| Vibration | Vibration can affect the human body in the hand with `white-finger' or Raynaud's Syndrome, and the whole body with motion sickness, giddiness, damage to bones and hearing, blood pressure and nervous system problems. |
| Slips, trips and falls | A very common workplace hazard from tripping on floors, falling off structures or down stairs, and slipping on spills. |
| Radiation | Radiation can have serious health effects. Skin cancer, other cancers, sterility, birth deformities, blood changes, skin burns and eye damage are examples. |
| Physical | Excessive effort, poor posture and repetition can all lead to muscular pain, tendon damage and deterioration to bones and related structures |
| Psychological | Stress, anxiety, tiredness, poor concentration, headaches, back pain and heart disease can be the health effects |
| Biological | More common in the health, food and agricultural industries. Effects such as infectious disease, rashes and allergic response. |