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

Principal investigator (PI)/instructor are responsible and accountable for safety in the research and teaching laboratory. 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 followings:

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 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 reviewing 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. McConomy	**Phone #:** 850-410-6624	**Dept.:** Mechanical Engineering	**Start Date:** 11/15/2019	**Revision number:** 0
Project: Team 512: Temperature Sensitive Medication Storage for Natural Disasters			**Location(s):** FAMU-FSU College of Engineering, FSU Innovation Hub	
Team member(s): J. Arrington; M. Israel; C. Torpey; T. White; T. Willms			**Phone #:** 727-744-1713	**Email:** tjm15m@my.fsu.edu

Experiment Steps	**Location**	**Person assigned**	**Identify hazards or potential failure points**	**Control method**	**PPE**	**List proper method of hazardous waste disposal, if any.**	**Residual Risk**	**Specific rules based on the residual risk**
3D Printing	FSU Innovation Hub	Timothy Willms	Skin Burns/Lacerations	All Innovation Hub rules will be followed exactly.	N/A	N/A	**HAZARD:**1 **CONSEQ:** Negligible **Residual:** Low	Safety controls are planned by both the worker and supervisor. Proceed with supervisor authorization
Laser Cutting	FSU Innovation Hub	Timothy Willms	Eye Damage/Sight Impairment/Smoke Inhalation/Skin Burns/Splinters	All Innovation Hub rules will be followed. User will not look at laser while in use, will only operate when the fan is on, and will not remove materials from the laser less than 3 minutes after cutting is completed	Work Gloves/Eye Protection	N/A	**HAZARD:** 2 **CONSEQ:** Significant **Residual:** Medium	After approval by the PI, a copy must be sent to the Safety Committee. A written Project Hazard Control 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.
Electrical Operation Testing	FAMU/FSU College of Engineering Mechatronic	Tyler White	Electrocution/Electrical Burns	Current testing procedures for using the power regulator will be followed, including	N/A	N/A	**HAZARD:** 1 **CONSEQ:**Minor	Safety controls are planned by both the worker and supervisor.

	s Lab/FSU Innovation Hub			connecting terminals while the device is off. Additionally, the manufacturer's guidelines for maximum input voltage and current for the modules will be followed.			**Residual:** Low Med	A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization.
Impact Testing/Drop Testing	FAMU-FSU College of Engineering Materials Lab	Matthew Israel	Crushed Appendages/Lacerations/Hearing Loss/Contusions/Brain Damage	Impact testing will be carried out with the supervision of a more experienced authority present.	Work Gloves/Eye Protection/Ear Protection/Long Pants, Closed-Toed shoes, and No Loose Clothing (If Necessary)	N/A	**HAZARD:**4 **CONSEQ:**Significant **Residual:** Med High	After approval by the PI, the Safety Committee and/or EHS must review and approve the completed PHA. A written Project Hazard Control 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.
Gluing	FAMU-FSU College of Engineering	Timothy Willms	Toxic Fume Inhalation/Skin Irritation/Eye Damage	Manufacturer recommendations will be followed. All adhesives will be applied in a well-ventilated area. User will wear gloves while handling and wash hands before and after use. Any containers with torn or damaged labels will be relabeled with the brand, product, and/or chemical name. All containers will be labeled with the date of purchase and last use.	Latex or Nitrile Gloves/Respirator Mask	Leftover adhesive will be stored in a proper location recommended by manufacturer.	**HAZARD:** 1 **CONSEQ:**Medium **Residual:** Low	Safety controls are planned by both the worker and supervisor. Proceed with supervisor authorization.

Cutting/Drilling	FAMU-FSU College of Engineering Machine Shop/Senior Design Lab	Timothy Willms	Lacerations/Crushed Appendages/Eye Damage/Contusions	All metal machining of components from raw material will be carried out by the COE Machine Shop only, not a team member. Any minor drilling or cutting not done by the machine shop will be done in the Senior Design Lab and will be carried out following the lab procedure. Only handheld power drills and hand saws (no power saws) may be used by team members.	Work Gloves/ Eye Protection/ Long Pants/Closed-Toed Shoes/No Loose Clothing	N/A	**HAZARD:** 2 **CONSEQ:**Significant **Residual:** Medium	After approval by the PI, a copy must be sent to the Safety Committee. A written Project Hazard Control 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.
Applying Spray Foam Insulation	FAMU-FSU College of Engineering	Timothy Willms	Toxic Fume Inhalation/Skin Irritation/Eye Damage	Spray foam will only be applied in a well-ventilated area and with at least one other team member present. Spray foam will only be handled by team members and approved supervisors.	Latex or Nitrile Gloves/Respirator Mask/Long Pants/Eye Protection	N/A	**HAZARD:**3 **CONSEQ:**Minor **Residual:** Low Med	Safety controls are planned by both the worker and supervisor. A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization.
Electrical Assembly/Soldering	FAMU-FSU College of Engineering Mechatronics Lab/FSU Innovation Hub	Tyler White	Electrocution/Toxic Fume Inhalation/Skin Burns	A power supply will never be connected to any component while any assembly is occurring, even if it is not the component being worked on at the time. Soldering will only be done in a well-ventilated workstation and the operator must notify team members of hot components. All power leads will be taped over with red electrical tape and labeled while	N/A	N/A	**HAZARD:** 1 **CONSEQ:**Minor **Residual:** Low Med	Safety controls are planned by both the worker and supervisor. A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization.

				electrical components are being worked on.				
Hardware/Final Assembly	FAMU/FSU College of Engineering Senior Design Lab	Timothy Willms	Contusions/Lacerations	Unless actively assisting, all persons present must stand a minimum of 3 feet back from the device. Only team members and approved supervisors may participate in final assembly. Assembler must notify all others working before any component movement. Unless assistance is necessary, only one person should be handling a component at a time.	Work Gloves /Closed-Toed Shoes/No Loose Clothing	N/A	**HAZARD:** 2 **CONSEQ:**Moderate **Residual:** Low Med	After approval by the PI, a copy must be sent to the Safety Committee. A written Project Hazard Control 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.
Handling on Medicine	FAMU/FSU College of Engineering Senior Design Lab	Jesse Arrington	Ingestion of chemicals	When dealing with the different medicines, all team members will use gloves and be careful not to allow any substance to be ingested or contact the body. No one team member will experiment with the medicine alone.	Latex or Nitrile Gloves	If chemicals are spilled, they are to be wiped up and dispensed in a garbage can immediately.	**HAZARD:** 2 **CONSEQ:**Moderate **Residual:** Low Med	Safety controls are planned by both the worker and supervisor. A second worker must be in place before work can proceed (buddy system). Proceed with supervisor authorization.

Principal investigator(s)/ instructor PHA: I have reviewed and approved the PHA worksheet.

Name	**Signature**	**Date**	**Name**	**Signature**	**Date**
_____	_____	_____	_____	_____	_____

Team members: 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**	**Name**	**Signature**	**Date**
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

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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 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 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 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 are used to determine project's risk level. The hazard assessment matrix (table 1) and the residual risk assessment matrix (table 2) are used to identify the residual risk category.

The instructions to use 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 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 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 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 must be in place before work can proceed (buddy system).
- Proceed with supervisor authorization.

Med:

- After approval by the PI, a copy must be sent to the Safety Committee.
- A written Project Hazard Control 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 Project Hazard Control 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 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 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. 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. 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 effect 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 arm with `white-finger' or Raynaud's Syndrome, and the whole body with motion sickness, giddiness, damage to bones and audits, 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.

Project Hazard Control- For Projects with Medium and Higher Risks

Name of Project: Team 512: Temperature Sensitive Medication Storage for Natural Disasters		**Date of submission:** 11/15/2019
Team member	**Phone number**	**e-mail**
Jesse Arrington	850-218-8471	jca15@my.fsu.edu
Matthew Israel	941-704-3758	mi16e@my.fsu.edu
Christian Torpey	850-324-7812	cbt13b@my.fsu.edu
Tyler White	850-545-5767	tpw16@my.fsu.edu
Timothy Willms	727-744-1713	tjm15m@my.fsu.edu
Faculty mentor	**Phone number**	**e-mail**
Dr. Yousuf Ali	850-410-6588	myali@eng.famu.fsu.edu
Dr. Shayne McConomy	850-410-6624	smcconomy@eng.famu.fsu.edu

Rewrite the project steps to include all safety measures taken for each step or combination of steps. Be specific (don't just state "be careful").

Within the design process, multiple experimental steps representing various residual risks are identified to ensure proper safety measures are taken. While most of the steps involve low to low-medium risk, there are a few steps of medium and medium-high risk included within this section.

Laser cutting, indicated as having medium risk, will be used to obtain precision cuts, vital to accurately construct prototype concepts and the final design. Multiple physical health consequences may result from improper use including eye damage, sight impairment, smoke inhalation, burns, and splinters. Safety measures for this procedure require that all Innovation Hub rules be strictly followed by any team member who operates such device. This entails training by an Innovation Hub employee, who will further explain the operation and additional safety measures. In addition, supplemental rules established by the team prohibit the user from looking inside the laser cutter while in use, only allow operation of the laser cutter when the fan is on, and not remove materials from the cutter less than 3 minutes following the final cut to allow for cooldown. When laser cutting, the operating team member will wear work gloves and appropriate eye protection.

Cutting and drilling represents another project step of medium residual risk to the design team. Improper use of drills or saws can result in lacerations, crushed appendages, eye damage, and contusions. Therefore, all metal machining of components from raw materials will be carried out by the FAMU-FSU College of Engineering Machine Shop only. Any minor drilling or cutting not performed in the Machine Shop will be done in the Senior Design lab with the tools available to all senior design engineering groups. Operation of such tools will follow formal lab procedure. Only handheld power drills and hand saws may be used by team members (not power saws). When cutting or drilling, the operating team member will use work gloves, eye protection, long pants, closed-toed shoes, and not wear loose-fitting clothing.

Impact and drop testing to ensure the design's durability are identified by the group to pose the most significant risk out of all project steps, and therefore represent a medium high risk. To carry out such testing, the use of a lightweight shock machine or repeated drops from standardized heights often forms applicable procedure. Lightweight shock tests use a large hammer to strike the surface in all coordinate directions. Drop tests are often carried out multiple stories off the ground. Both processes pose multiple safety concerns with significant health impacts including crushed appendages, lacerations, hearing loss, contusions, and possible brain damage. Therefore, no drop test above one story

or shock test will be performed without direct supervision from an experienced authority present. When impact or drop testing, the operating team member will wear work gloves, eye protection, ear protection, head protection (if applicable), long pants, closed-toed shoes, and not wear loose-fitting clothing.

When/if handling medical equipment to include the vials and liquid medicine, extreme caution will be used during experimentation. If any medicine is ingested, poison control will be contacted immediately. If medicine contacts the body, the area will be cleansed properly. No one team member will handle the medicine alone. There must be at least one other team member present. No action will commence until authorization is given by the instructor.

Thinking about the accidents that have occurred or that you have identified as a risk, describe emergency response procedures to use.

- Remove injured from location of accident
- Call appropriate authority (supervisor, FSUPD, 911 dependent on severity)
- Shut down/close off source of injury if safely possible
- Isolate scene until responding authority arrive
- Ensure responding authority has all necessary information on the situation and assist them however they may need
- Compose an incident report with all team members present following the conclusion of the incident
- Share incident report with Faculty mentor

List emergency response contact information:

- Call 911 for injuries, fires or other emergency situations
- Call your department representative to report a facility concern

Name	Phone number	Faculty or other COE emergency contact	Phone number
Paige Arrington	**850-582-5992**	Dr. Shayne McConomy	850-410-6624
Virginia Willms	**727-744-2221**	Donald Hollett	850-410-6600
Bruce Israel	**941-518-9004**	Sahar Mohammadi	850-410-6623
Kristen White	**850-545-5767**		
Angela Torpey	**850-341-9575**		

Safety review signatures

Team member	Date	Faculty mentor	Date

Important Phone Numbers	
FSUPD Non-Emergency Line	**850-644-1234**

Poison Control	**800-222-1222**
FSU Environmental Health and Safety	**850-644-6895**
Leon County First Responders Non-Emergency Line	**850-606-5800**

Report all accidents and near misses to the faculty mentor.