An Experiment Safety Plan (ESP) is required for every experiment conducted and performed by students in the WERC Design Contest. The purpose of the ESP is to assure the safety of all by identifying the safest possible methods to conduct an experiment. By signing below the individual(s) conducting the experiment, College of Engineering Safety Specialist (COE Safety), and the faculty advisor acknowledge responsibility for the following requirements.

1. Appropriate Personal Protective Equipment (PPE) ***must always*** be worn while in the lab (as described in the ESP). **The minimum required PPE to enter a research/teaching lab is (1) long pants, (2) closed toe shoes, (3) lab coat or long sleeve shirt, and (4) safety glasses with side shields.**
2. For safety reasons, no researcher is permitted to work alone in the lab at any time. If you plan to work during a time when the lab might be expected to be empty, please plan ahead and coordinate your work schedule with another lab member.
3. ESP approval occurs in two phases.
   1. Phase I is the preparation of a written safety plan. Upon approval of the written plan, by email from COE Safety, researcher(s) may order equipment and necessary supplies, and assemble experiment for transport to NMSU. Phase I also includes an evaluation by COE Safety (and if appropriate by EH&S) to establish controls of hazardous operations, avoid the purchase of inappropriate supplies, and establish expected waste(s) streams.
   2. Phase II approval will occur onsite at the event and requires evaluation of the assembled experiment, showing the basic experimental procedure. . High Hazard work may be subject to approval by official university boards, including any work with radioactive materials or radiation producing machines, certain biological materials, animals and/or human subjects.

|  |  |  |
| --- | --- | --- |
|  |  | Date |
| ESP Phase I approval:  **COE Safety** |  |  |
| ESP Phase II approval  **COE Safety** |  |  |

1. By signing below, both faculty advisor and researchers(s) understand that COE Safety can approve/disapprove any part of the ESP. It is the goal of COE Safety to help the researcher(s) find the safest method(s) of conducting an experiment. COE Safety, or any faculty member, may stop lab activity of individuals not following good lab practices.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Name | Signature | Date |
| School Name |  | NA | NA |
| Team Number – Assigned by WERC |  |  |  |
| Faculty Advisor |  |  |  |
| Researcher |  |  |  |
| Researcher |  |  |  |
| Researcher |  |  |  |
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| Researcher |  |  |  |
| EH&S (at request of COE Safety) |  |  |  |

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| --- | --- | --- | --- |
| **Task # (Assigned by WERC)** |  | |  |
| **Name/Title of Experiment:** |  | |  |
| **Contacts (Required for Team):** | Name | Cell Phone | Email |
| Serious Issue | Emergency | 911 | na |
| Safety Coordinator | Juanita Miller | 575-415-7999 | miljgh@nmsu.edu |
| Faculty Advisor |  |  |  |
| Responsible Researcher |  |  |  |
| Responsible Researcher |  |  |  |

**Required attachments to the ESP:**

Attachment 1: Experiment Scope

Attachment 2: Drawing of the Experimental Layout including P&ID

Attachment 3: Normal Operations, Startup and Shutdown Procedures

Attachment 4: Emergency Shutdown Procedure and medical emergency instructions.

Attachment 5: Waste Management Procedure

Attachment 6: Hazard Identification and Mitigation

Attachment 7: Material Safety Data Sheets

*Provide a concise description of the laboratory experiment to be undertaken.*

1. *Explain why the work is being performed, the goal(s) of the experimental program*
   1. *If this is an update/revision of previous ESP describe all changes*
2. *Provide the stoichiometry of any chemical reactions and their heats of reaction (if applicable). Demonstrate the inherent thermal safety of your experiment through calculation.*
3. *Include a complete list of all chemicals, including household and common materials involved in the work.*
4. *Include a complete list of all equipment including their power requirements (e.g. autoclave, centrifuge, pump, heat bath etc.) involved in this work. Please note that 220V available is not available at the event.*
5. *Include a timeline for this experiment including setup, sample runtime(s)and teardown and whether any part of your experiment needs to operate overnight.*

*Provide a detailed drawing of the experiment including PFD(s) showing all inputs and outputs for equipment along with process information such as material and energy balances.*

*Provide a* ***step-wise*** *procedure that describes* ***in detail*** *how the work will be performed. The procedure should begin and end with the equipment in the normal idle (inoperative) state.*

*Include a statement of the required PPE* ***at the beginning*** *of the procedure, and at every location in the procedure where the PPE requirements change.*

*Include details of how you will meet the required elements of your chosen task (e.g. run time, run rate, sample rate etc.)*

*Indicate where hazardous chemicals will be stored, how they will be transported to the location of the experimental work, how they will be transferred from storage into the experimental apparatus, and how they will be returned to storage.*

*Fill out the Take into account those items for which you indicate “yes” on the COE Lab Hazard Checklist, which is found at the end of this document.*

*Provide a* ***step-wise*** *procedure that describes how the equipment will be brought to a safe state in the event of an emergency. The description should include a detailed explanation of how to attend to potential medical emergencies that may result.*

*Prepare a Waste Management Procedure that provides the exact nature and estimated volumes of all wastes to be generated in performing these experiments. NMSU will provide containers and forms to be filled out by the researcher for proper disposal of materials. For your reference, an example of the NMSU Waste Tracking Form is included in the Developing an Experimental Safety Plan training course.*

*Fill out the attached Lab Hazard Assessment Form and describe here in detail all of the High Hazards associated with your experiment. The analysis must consider*

* *all sources of energy (electric, chemical, hydraulics, mechanical, compressed gases),*
* *extreme conditions of pressure or temperature (from flame or steam to cryogenics),*
* *chemical storage,*
* *housekeeping,*
* *fire*
* *biological hazards.*
* *substances that are highly reactive, radioactive, highly flammable, pyrophoric, highly toxic, mutagenic, teratogenic, carcinogenic, or have very low exposure limits,*
* *high voltage, high RF, x-ray, laser (class 3b or 4),*
* *high temperatures*
* *high pressure or pressurizing vessels.*

*When in doubt about whether a substance represents a HIGH HAZARD, ask for assistance.*

Provide a complete list all of your chemicals and materials. Send an SDS document for each item, in PDF format, along with the ESP document.

