**Risk Assessment**

**Team 516**

* 1. **What Can Go Wrong**

Working with cryogenic fluids always presents a significant risk when running tests. In our case, we will be working with a dewar and liquid nitrogen (LN2) to test our designs in order to verify that they are capable of handling cryogenic conditions. Just as one can get burns from touching something too hot, cryogenic burns occur when skin comes into contact with cold, liquified gases.

**1.1.1** **Designing and Assembling Prototype**

When assembling our prototype it is important to wear personal protection at all times. Since we will be working with metal, it is important to stay aware of where all the pieces are so that we do not cut ourselves on the metal. When assembling the prototype it is important to be fluent in understanding the tools that we will be using. Being able to operate the tools efficiently and safely is paramount to our safety during assembly.

**1.1.2 Operation and Testing**

Operation and testing will occur at the MagLab. It is important to have completed the safety courses that MagLab provides such that we are proficient in handling the equipment we will be using. Testing will occur using a dewar so all members should understand how a dewar works and how to safely operate one. The testing will also include using liquid nitrogen, so all members should understand how to work with cryogenic fluids, especially liquid nitrogen.

**1.1.3 Transportation**

Transportation is an important safety factor as well. The structure will need to be secured and wrapped with a protective layer to not harm anyone carrying the assembly. The transportation of cryogenic fluid is a huge risk as well since it can be harmful to humans. All members should be wearing personal protection when transporting the cryogenic fluid to thew testing area.

**Accidents Identified**

Refer to hazards sheet and reference primary sources below:

<https://www.osha.gov/laws-regs/standardinterpretations/1984-09-11>

<https://law.resource.org/pub/us/cfr/ibr/003/cga.p-1.1965.pdf>

**1.3 Steps to Avoid Hazards**

**1.3.1 Cryogenic Fluids**

When operating with cryogenic fluids, all members should wear personal protection such as pants, gloves, goggles, and lab coats. The utilization of personal protection is paramount to the safety of all members.

**1.3.2 Designing and Assembling Prototype**

When assembling the prototype to be tested, all members should wear personal protection and be familiar with how the tools operate. Each member should understand the risks of the tools they use and how to properly use them. This includes turning the tools on and off, exchanging the drill bits, etc.

**1.3.3 Proper Operation and Testing**

To avoid any potential harm from the cryogenic fluid or dewar, all members will understand the operation of dewars and how cryogenic fluids behave. To mitigate this risk, the testing operations will only utilize the minimum amount of liquid nitrogen needed in order to obtain adequate measurements.

Sleep Deprivation – Get adequate sleep.

Stress and Anxiety – Take breaks, contribute to a positive group dynamic, talk to someone

**Safety Measures**

1. Verify that all participating members can produce verification of completion for the safety training program.
2. Verify everyone is wearing proper attire.
3. Verify there is a designated path and both members can lift dewar.
4. Verify the amount of liquid nitrogen needed in the dewar.
5. Verify the user can handle the structure with care and will not drop.
6. Verify the data acquisition system is operating properly.
7. Verify the tongs can hold the structure without dropping.
8. Verify the room is well-ventilated so that the liquid nitrogen will fully evaporate.

**Personal Protection Equipment**

Each student should wear proper personal protection equipment when performing the tests and assembly. This includes but is not limited to close toed shoes, eyewear, no loose clothing/jewelry, insulated cryogenic gloves, and lab coats.

**Emergency Response**

The first responders if there is an emergency is to call 911, depending on the magnitude of the situation. Another first responder is Florida State University Medical Response Unit. This response unit functions as a basic life support quick response unit for Florida State University. A college employee emergency contact is Dr. McConomy. He is the supervisor for the senior design projects and the senior design lab where most assembling will take place. A non-team member emergency response would be Dr. Vanderlaan. He is the advisor for the project so can provide an emergency response.

**Emergency Contact**

The emergency contacts are listed below:

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| Yazan Jesri | (813) 528-5202 |
| Thomas Seal | (850) 727-3713 |
| Kristie Lay | (561) 756-5357 |
| Dan Peters | (850) 694-3145 |
| Ellen Potts | (850) 510-1295 |