Risk Assessment
Safety Plan

Project information:

Self Powered Wireless Sensor		3/2/18
Name of Project		Date of submission

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Faculty mentor	**Phone Number**	**e-mail**
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I. Project description:

Design, build, and demonstrate a self-powered wireless sensor for a Cummin's engine. The project will consist of a microcontroller, a battery, a sensor, a thermal electric generator, and an aluminum housing.

II. Describe the steps for your project:

First, the microcontroller will be programmed to monitor battery power, control the sensor, transmit data via Bluetooth, and control power generation from the thermal electric generator. While the microcontroller is programmed, the electrical components will be assembled using a soldering iron, wire, and a wire stripper. Once the electrical components are assembled, the device will be tested using a hotplate, calibrated thermometer, Bluetooth enabled device like a smart phone or a computer, a beaker and water. Once the device is tested, it will be mounted into a housing. The housing will consist of a machined container, screws, and support rods.

III. Given that many accidents result from an unexpected reaction or event, go back through the steps of the project and imagine what could go wrong to make what seems to be a safe and well-regulated process turn into one that could result in an accident. (See examples)

Soldering iron could be placed without care in a place that could cause burns or fires, hot solder could drip outside of the working area and cause burns. While testing the battery, the battery could overheat and possibly explode from overcharging or improper power management. Microcontroller could short potentially causing fire if soldering is done improperly across pins. Though the wires in this project will be very small, the wire stripper could be used improperly and cause abrasions. Improper power or temperature management could cause the thermal electric generator to catch on fire or melt down. Improper use of the hotplate during testing could cause burns or fires. The beaker could break into sharp glass if handled improperly. If the water encounters the electrical components, it could cause electrical shorts, or fire. The electrical components, though running on low voltage, could still carry an electrocution risk if the power is not properly managed. The housing will be outsourced. The housing will be assembled using screwdrivers and drills. Improper usage of screwdrivers and drills could result in abrasions, punctures, or eye damage from airborne particles.

IV. Perform online research to identify any accidents that have occurred using your materials, equipment or process. State how you could avoid having this hazardous situation arise in your project.

Ensuring proper power management techniques are used in the microcontroller program. Using proper safety techniques when using tools like the soldering iron, drill, screwdriver, hot plate, and beaker. Using proper wiring techniques and soldering techniques, as well as using proper power management techniques will be essential in preventing accidents.

V. For each identified hazard or "what if" situation noted above, describe one or more measures that will be taken to mitigate the hazard. (See examples of engineering controls, administrative controls, special work practices and PPE).

In the case of an electrical fire, power will be disconnected immediately. Due to the size and power ratings of the equipment used in this project, the fire may be small, or only a spark. If shutting off the power to the equipment does not work, a fire extinguisher will be used, the fire alarm will be triggered, and emergency personnel will be contacted. If this occurs, the equipment will be disposed of, the cause of the fire will be evaluated, and new equipment will be acquired. In the case of a team member getting cut or burned, the current procedure will be halted immediately, and first aid will be applied to the affected person. The procedure will be assessed and changed to prevent further accidents.

VI. 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").

First, the microcontroller will be programmed to monitor battery power, control the sensor, transmit data via Bluetooth, and control power generation from the thermal electric generator. Proper power management techniques will be practiced within the code to ensure the electronics are not overloaded to prevent fires, shorts, and electrocution. While the microcontroller is programmed, the electrical components will be assembled using a soldering iron, wire, and a wire stripper. The working piece, soldering iron and wire will be kept over the working surface to prevent burns. Flammable materials will be kept away to prevent fires. The soldering iron will be set at an appropriate temperature to ensure good solder connections but to prevent burns and fires. Once the electrical components are assembled, the device will be tested using a hotplate, calibrated thermometer, Bluetooth enabled device like a smart phone or a computer, a beaker and water. Temperatures of the hot plate will be monitored to make sure it does not exceed the operating temperatures of the electrical and physical equipment. The electrical components will be kept separate from the water. Gloves will be used when handling hot objects. Once the device is tested, it will be mounted into a housing. The housing will consist of a machined container, screws, and support rods. Safety glasses and gloves will be used when assembling and machining the product for eye protection from potential airborne particles and protection form sharp objects.

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

In case of a fire or battery meltdown, if possible safely disconnect power, trigger fire alarms, use fire extinguishers, evacuate the premises, call 911, notify advisors and lab managers. In case of minor burns or abrasions, first aid will be applied to the effected area, all work will be ceased, accident will be analyzed to prevent further injury. In case of serious injury, all work will be ceased, 911 will be called, notify advisors and lab managers.

VIII. 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
Jacquelyn Burnham	850-320-2474	Shayne McConomy	(850) 410-6624
Meghan Busch	850-776-8492	Camilo Ordonez	(850) 410-6365
Thomas Dodamead	305-407-7441		
Caleb Stallings	904-318-7305		
Omar Rodriguez	813-919-8730		

IX. Safety review signatures

- Faculty Review update (required for project changes and as specified by faculty mentor)
- Updated safety reviews should occur for the following reasons:
  1. Faculty requires second review by this date:
  2. Faculty requires discussion and possibly a new safety review BEFORE proceeding with step(s)
  3. An accident or unexpected event has occurred (these must be reported to the faculty, who will decide if a new safety review should be performed.
  4. Changes have been made to the project.

Team Member	Date	Faculty mentor	Date

Report all accidents and near misses to faculty mentor.