

# **Lafayette Formula Electric Vehicle Electrical Safety Plan 2014**

This plan establishes rules for both the design and operation of the Lafayette Electric Vehicle Systems. These rules are intended to enhance the safety of the participants in the initial project and future users and developers.

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## **1. General Responsibility**

### **1.1 Participants**

- 1.1.1 All participants in the Lafayette Electric Vehicle project and all spectators will abide by the guidelines of this safety plan, the Lafayette College Department of Electrical and Computer Engineering Laboratory Safety Policy, and the Lafayette College Public Safety Electrical Safety Program.
- 1.1.2 Any immediate safety hazard must be reported to the Lafayette Department of Public Safety, dial 4444 from any campus phone or call 610-330-4444.

### **1.2 Documentation**

- 1.2.1 This safety plan and all approved test procedures will be archived on the course website; a hardcopy of each approved test procedure will also be stored in a Test Procedure Binder in AEC Room 400.

### **1.3 Competition and Course Safety Requirements**

- 1.3.1 All systems and subsystems shall strictly follow the safety requirements located in the Statement of Work and the 2014 SAE Formula Hybrid Rules. For reckless failure to follow these requirements, the discipline actions as described in Section 3 will be followed.
- 1.3.2 The team must choose one member to act as the Safety Officer. This Officer must keep track of the test procedure binder in Room 400 and must be notified of any violation. All test procedures will first be checked by this officer. This Officer must also be notified of the use of any system requiring a test procedure at least 24 hours in advance.

## **2. Equipment Guidelines**

### **2.1 Specified Locations**

- 2.1.1 All cells purchased for use in the tractive system will be stored in room 402 while they are not being used (\*Except for one example cell). After testing has been completed on a cell or group of cells, they must then be returned to that room. Loose cells must not be left unattended in the lab, unless an approved test procedures states otherwise.  
\*This cell must be kept in the cabinet next to the team's binders when not in use
- 2.1.2 Any testing that uses the cells for the tractive system must occur in Room 402 or Room 400, unless an approved test procedure states otherwise. If the testing occurs in Room 400, the PPE zone (see rule 2.2.1) must be clearly marked off with tape (and/or rope). For tests in Room 402, the whole room will be considered the PPE zone. Only students and faculty that are involved in the testing may be allowed in the room/area during the test.
- 2.1.3 Any testing that uses the cells for the tractive system may occur in other locations, but a test procedure must be put in place. This test procedure must include the PPE zone in the new location and must have a clear boundary marked (either with tape or rope). This location may NOT be used until Faculty approves, Public Safety approves, other affected parties approve, and this safety plan is amended to permit the new location. Only students and faculty that are directly involved with the testing may be in this area during the testing.

### **2.2 Test Guidelines**

- 2.2.1 Any testing that uses the cells for the tractive system must have a specified Personal Protective Equipment (PPE) zone that is determined based off of an arc hazard calculation, with the minimum distance being a two foot radius from where the cell is located. Everyone in this zone must be wearing safety goggles in addition to following all other lab rules.

- 2.2.2 Any testing that uses the cells for the tractive system must take place with at least one individual present. One individual must always be acting as the “safety watch” and be isolated from the electrical system. The individual who is acting as the safety watch must have a working cell phone in their possession in case of any malfunction.

**Clarification:** Rule 2.2.1 implies that TWO people are required to begin or end a test. It's OK for one of them to leave once the test is running. The remaining person is on safety watch, but that person cannot be actively interacting with the test. Of course, if there's a problem, the single person is authorized to shutdown the test, subject to "qualified individual" restrictions. Students can't interact with a high voltage test even if there's a problem, so the safety watch individual **MUST** be a qualified individual if it is a high voltage test. For low voltage testing, safety watch can be a student.

- 2.2.3 Any test requiring a test procedure must be checked by the Safety Officer before the circuit can be energized.

### 2.3 Test Procedures

- 2.3.1 Any group or team member that develops AC RMS or DC potential differences of greater than 30 Volts between any two points within the design must develop a test procedure that will ensure the safety of all participants.
- 2.3.2 Any group or team member that develops AC RMS or DC potential differences of greater than 50 Volts between any two points within the design must develop a test procedure that meets the Lafayette College Public Safety Electrical Safety Program’s 50V requirement. This test procedure must specifically outline the steps that a qualified professional will perform before the students can begin using or testing the design.
- 2.3.3 Any group or team member that develops a system that will use greater than 6 Amps within the design must develop a test procedure that will ensure the safety of all participants.
- 2.3.4 All test procedures are required to reference any and all safety rules from the 2013 Formula SAE Competition that pertain to the design. This test procedure also must include step by step instructions on how testing will be carried out, what would happen in the case of a failure or malfunction of the system, and a block diagram of the testing equipment (with a description of how components will be connected).
- 2.3.5 All test procedures are required to be approved first by the Safety Officer and then by the ECE Director of Laboratories before the circuit is energized. All approved test procedures will be archived on the course website; a hardcopy of each approved test procedure will be stored in the Test Procedure Binder in AEC Room 400.

## **3. Reporting and Consequences**

### **3.1 Reporting of Safety Violations**

- 3.1.1 Any individual observing the violation of a safety plan directive is required to report the act to the Safety Officer, ECE Director of Laboratories, and the Head Professor of ECE as soon as possible. If the safety violation presents an immediate hazardous condition, report the condition to Lafayette Public Safety immediately: dial 4444 from any campus phone or call 610-330-4444.
- 3.1.2 Consequences for violation may include a reduction in the course grade or failure for the course. Consequences for intentional violations of this safety plan may be subject to Lafayette College disciplinary procedures and applicable local, state, and federal laws.
- 3.1.3 If a violation is found, any system(s) pertaining to the violation must be shut down immediately. This violation becomes the top priority of the group and the solution must be approved by the ECE Director of Laboratories before the system(s) can be restored.