

### **Electric Vehicle Protocols for teams competing at Formula Student**

Following a number of known Formula Student Car battery fires, the following protocol must be adhered to when operating any EV at Formula Student. The intention of this protocol is to reduce the risk of a battery fire and in the event of a fire reduce the exposure to risk.

Garage 12 D/E is provided for working on and charging battery packs. This area will be supervised by the EV Safety Team and scrutineers who will manage the space in the garage and oversee any work being conducted. The team will have the right to stop you working on your battery pack etc if they feel you are not following good working practises for working on HV systems. Failure to follow the instructions from the team may result in penalties being applied as per the Formula Student rules.

#### **1. Positioning during charging**

Accumulators / batteries **must** be removable from the vehicle for charging and accumulators **must** be charged or worked on outside of the vehicle at the event. Once the battery pack is removed from the car, it must be placed on the accumulator container hand cart with the handle bar towards the door for immediate evacuation in case of any incidents.

#### **2. Team members**

A team member must always be present when the battery is in the charging area. When working on the battery, a designated Electrical Safety Officer (ESO) must be present – List of ESOs to be provided on this form. Teams must use the pink dynamics tabards to access the charging area thus limiting the maximum number of people in the charging area per team to 4 people.

#### **3. Working on the Battery / Accumulator or exposed HV wiring that is live – Garage 12 D/E**

There is a dedicated area in garage 12D/E for working on exposed HV such as when opening up the battery. You must use the dedicated area for any work on your accumulator / battery pack. You must notify the EV scrutineers before entering this area to work on the battery and you must present to them a clear plan of what work you are going to undertake. Before leaving the area you must contact the scrutineers for a final check. Please note: Sitting on the floor to work on the battery pack is not permitted. PPE equipment (face shields and appropriate gloves EN60903 Class 00) must be used when working on the battery. If your accumulator cart is at a low level then trollies will be available so that you can work on any battery whilst standing.

#### **4. Charging your Battery / Accumulator – Garage 12 D/E**

There is a dedicated area in garage 12D/E for charging your battery. You must only charge the battery in the dedicated area, you are **not** permitted to charge your battery in your allocated pit area. The dedicated area will be overseen by the EV scrutineers. You must notify the scrutineers when you enter the area and for a final check before leaving the area.

When charging the battery you must monitor the cell voltages and cell temperatures at all times to ensure that the normal limits are not exceeded. You must not leave the battery pack unattended when it is charging.

When you have finished charging your battery, you must check that the cell temperatures are starting to drop before you leave the charging area.

#### **5. Charging Times**

Charging will be allowed during the following times: Thursday 09:00 – 21:00. Friday 09:00 – 21:00. Saturday 09:00 – 20:00. Sunday 09:00 – 16:00. It is possible that the Saturday charging times may be extended by appointment.

## **6. Running your vehicle**

Whenever you run your vehicle, you may take it back to your pit area, but you must check that all cell temperatures are within normal working limits and before you leave your vehicle, you must ensure that all cell temperatures are reducing.

## **7. Cell temperatures are not reducing.**

If the cell temperatures are above ambient after running the car or charging the battery and they do not reduce as expected or start to increase in temperature, then the car must be moved to the designated safe area. The ESO must notify the EV Safety Team immediately to alert them to the potential issue. In the designated safe area you must continue to monitor the cell temperatures to ensure that they start to drop. The EV Safety Team must be contacted for a final check before leaving the area.

## **8. Battery fires in the charging / pit / garage area**

In the event of a battery fire or incident whilst in the pit / garage area immediately inform the fire marshal and EV Safety Team. The car should be moved to the designated safe area if it is safe to do so, for example if the battery is just starting to overheat. If the fire is established, then inform the fire marshal of the incident and the car will be towed to a safe area if this is possible. The objective is to ensure that all team members are safe, but also to ensure that fire cannot spread to other areas of the pits which could further endanger life.

If there is an overheating battery or a battery fire, the fire marshal will request assistance by radio message.

The safe area will be on the paddock side of the charging area and will be an area marked with a barrier. Within the safe area will be provided a sandbox and sand suitable for dealing with EV battery fires.

Please ensure the above protocols are followed to ensure that the event is as safe as possible for everyone.

I, the Team Leader for \_\_\_\_\_ have read and understood the requirements for operating and charging an EV at the 2018 Formula Student Event and will ensure that my team complies with these requirements when charging the battery pack / accumulator or operating the vehicle.

**Signed**

**Print Name**

**Date**

**Contact number**

*One copy to be retained by the team. One copy to be signed and returned to the event organisers.*

Please complete for qualified ESOs (as many as you have), Battery Chemistry and Fire Extinguisher Type

**Battery Cell Chemistry**

**Fire Extinguisher Type**

**Print Name ESO 1**

**Print Name ESO 2**

**Print Name ESO 3**

**Print Name ESO 4**