

TSV: Steps to being Competition Ready

ECE 492 Spring 2017

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This document lists needed improvements of the TSV for the LFEV in order to comply to the 2017-2018 Formula SAE Rules. The following table lists known rules TSV fails as of Spring 2017. This list does not account for unknown rules, oversights, or misinterpretations of the rules. This is also not a comprehensive list of what is needed at the competition. In order to be prepared and competition ready, read the full list as posted in pdf form on the Spring 2017 Website under TSV.

SAE Rule	Rule Description	Comments
IC4.4.4	Battery packs based on Lithium Chemistry: a. Must have overcurrent protection that trips at or below the maximum specified discharge current of the cells.	This could be done in the PacMAN software similar to Fault 0 or 1 in order to trip the safety loop.
IC4.4.5	All batteries using chemistries other than lead acid must be presented at technical inspection with markings identifying it for comparison to a datasheet or other documentation proving the pack and supporting electronics meet all rules requirements	
EV1.2.8.	All components in the tractive system must be rated for the maximum tractive system voltage	It is likely that we fail this as AMS Board and PacMAN parts most likely are not rated for 96V (the tractive system voltage). However, an argument could be made that the AMS Board and PacMAN are part of the "Accumulator Segment" and would only ever see 24V.
EV4.9.1	In the tractive system supply wires, see EV4.8, a calibrated energy meter must be inserted at the competition. The energy meter is used to calculate the efficiency score by measuring the total energy being sourced by the accumulator.	
EV4.8.1	All accumulator containers must be wired to a single point. It does not matter if they are wired in series or parallel, but all the power supplying the tractive system must flow through this single point and must pass the energy meter position, see EV4.9.	

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EV4.9.2	The energy meter is sealed by the officials before the dynamic events. Any manipulation or broken seals of the energy meter result in at least a DNF for the efficiency scoring.	
EV4.9.3	The energy meter must be in an easily accessible location so that the recorded data can be quickly downloaded by the officials after the Endurance Event to calculate the efficiency score.	
EV4.9.4	The energy is calculated as the time integrated value of the measured voltage multiplied by the measured current logged by the Energy Meter.	
EV6.1.5	<p>Battery packs with low or non-voltage rated fusible links for cell connections may be used provided that:</p> <ul style="list-style-type: none"> ● An overcurrent protection device rated at a current three times lower than the sum of the parallel fusible links and complying with Section EV6.1.1 is connected in series. ● The accumulator monitoring system can detect an open fusible link, and will shut down the electrical system by opening the AIRs if a fault is detected. ● Fusible link current rating is specified in manufacturer's data or suitable test data is provided. 	
EV5.8.1	The charging shutdown circuit when charging consists of at least the charger shutdown button, the insulation monitoring device (IMD) and the accumulator management system (AMS).	
EV7.3.1	Teams have to pass a rain test during Electrical Tech Inspection to be allowed to move the car under its own power on the event. The car must pass the IMDT; see EV7.1, before the rain test can be performed.	
EV7.3.2	During the rain test the tractive system must be active and none of the driven wheels may touch the ground. The car must NOT be in ready-to-drive-mode. It is not allowed to have a driver seated in the car during the rain test. Water will then be sprayed at the car from any possible direction for 120 seconds. The water spray will be rain like. Therefore, there will be no direct high-pressure water jet shot at the car.	This is probably a major issue for the packs.

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EV8.2.3	The accumulator containers must have a label with the following data during charging: Team name and Electrical System Officer phone number(s).	
EV8.3.1	Only chargers presented and sealed at Electrical Tech Inspection are allowed. All connections of the charger(s) must be isolated and covered. No open connections are allowed.	
EV8.3.2	All chargers must either be accredited to a recognized standard e.g. CE or where built by the team they must be built to high standards and conform with all electrical requirements for the vehicle tractive system, for example EV4.1, EV4.3 and EV4.6 as appropriate.	Unsure if our charger meets the standard
EV8.3.4	HV charging leads must be orange	
EV8.4.2 EV8.4.3	The hand cart must have a brake such that it can only be released using a dead man's switch, i.e. the brake is always on except when someone releases it by pushing a handle for example. The brake must be capable to stop the fully loaded accumulator container hand cart.	Our cart could potentially be jury-rigged to have a break... Or you need to buy a new one.