

Progressive Insurance Automotive X PRIZE

TECHNICAL BULLETIN July 9, 2010

Rules Clarifications, Revisions, and Penalties for Final Stage

TECHNICAL INSPECTION OF VEHICLES

1. **At the beginning of Finals, all vehicles will be subject to a complete mechanical and electrical inspection in the Technical Inspection garages.** Vehicles must pass this inspection before being allowed to be driven in any event, or driven around premises. Vehicles must be pushed, not driven, to the inspection garages.
2. **Vehicles will be checked before each track event, in the Technical Inspection garages.** These Pre-Event Inspections will be primarily for weight and tire pressure checks. However, any other mechanical or electrical item on the vehicle may be subject to examination.

NOTE: In the case of vehicles being held in the Impound/Electric Charging Area (tent) between heats of the multi-stage Efficiency Event, re-weighing will not be necessary.

3. **Vehicles must run events in the configuration and specifications as presented in initial Technical Inspection, and in Pre-Event Inspections.** Vehicles cannot be modified, or worked-on in any way after the Pre-Event Inspection, on their way to the Staging Area for the event, or while waiting in the Staging Area. Vehicles will be in a “parc ferme”, hands-off state. Team members must step away from their vehicles until direction is given for drivers to strap in.
4. **Laptop computers cannot be plugged into, or carried aboard, vehicles during events.** Computer, or any other electronic device, connection, to a vehicle is strictly forbidden between entering Pre-Event Inspection and during the actual track event. Please see further rules regarding laptop usage under the section titled “Work on Vehicles – During Impound”
5. **Vehicles must be presented in time for Pre-Event Technical Inspection.** Teams must allow time for, and to pass, Pre-Event Inspection, and be in the Staging Area, 15 minutes before the official starting time of the event. Failure to appear in time for official start of the event (unless through no fault of their own) may result in the vehicle not being allowed to participate in that event, and therefore disqualified from the Competition.
6. **Vehicles must proceed from Pre-Event Technical Inspection directly to the event Staging Area (The “breezeway” under the suites).** Vehicles cannot return to their garages at this point, without re-inspection directly before an event.

7. **No tape on any body surface before or during an event.** The rules state that body modifications are not allowed between events. They also state that "In general, any modification that gives an unfair advantage as defined in Section 7.2 or modifies vehicle performance to achieve an advantage for a specific event (e.g., Acceleration and Fuel Economy Event) is prohibited." Tape on hood gaps, doors, etc., including fascia covers or 're-shaping' of surfaces will not be allowed. Besides eliminating the "gaming" aspect of such a practice (for opportunistically reducing drag), hoods and doors must remain easy to open for emergency responders in the case of an incident.
8. **Modifications for cooling purposes:** If a Team discovers that it must increase the cooling system capabilities for drivetrain or ESS components, a formal request must be made, and approval granted, before any changes can be made. Consideration may be given to enlarging cooling openings, line sizes, ducting, and fans. Not for Consideration: changing of vehicle component "configuration" or location of major items like radiators.

Any change in size of openings in body for cooling must be approved beforehand, and work must have "finished" appearance: painted to match rest of body before Technical Inspection.

Request for approval, granting of approval, and execution of any such modifications must be completed BEFORE Pre-Event Inspection. No changes can be made after that time, such as adding fans or modifying ducting, during an event.

9. **Occupant compartment cooling:** Once vehicle leaves Pre-Event Inspection and proceeds to run an event, occupant cooling system must be considered "sealed" for the event. As with any work during impound, replacement of cooling-medium (R-12, R-22, ice, etc.) is allowed by request and only under supervision of a Technical Official. System must not leak on ground, except thru normal condensation.

Interior temperature will be monitored in real time during events. Failure of interior temperature to remain at 95 degrees F or below, will result in a Stop & Go penalty. (See Penalties list below). In order to give a representative measurement of vehicle interior, cockpit temperature sensor must not be covered, shrouded, or locally cooled.

10. **Tire Pressures:** Tire pressure as measured in Pre-Event Inspection must not exceed the tire manufacturer's maximum recommended tire pressure. Tire pressure will not be measured during or after events for max pressure compliance, but may be checked for safety. Rules prohibit any on-board means of modifying tire pressure during events.
11. **Tire tread depth:** The rules state "All automotive tires must have a minimum tread depth of 5mm across the entire width of the tire measured at the wear bars. Motorcycle tires must have a minimum depth of 3mm in, from 1 inch to either side of the centerline. Teams must use tires that have enough tread to meet this requirement throughout the Competition under planned use." Tire tread depth may be measured at any time between events; depth must not fall below the required levels. Failure to maintain minimum tread depth will require changing of tire(s) before next event.

12. **Vehicle Weight:** Vehicle must weigh at least as much as the established “Master Weight” at all Technical Inspections. Master Weight includes driver off-set weight, and ballast box including ballast, but not weight of fuel (if ICE), or driver.

WORK ON VEHICLES

Work on Vehicles Between Knockout and Finals

1. **No changes to vehicle configuration or specification allowed as stipulated in Section 8.3 of the Supplemental Regulations for Knockout and Finals.**
 - Vehicle at Finals will be compared during Technical Inspection to vehicle as run at Knockout, thru photos and other means.
2. **Replacement of components may be allowed**, subject to Technical Official approval of written request filed by individual Team.
 - Components for replacement must be of same make, model, and performance level of as those they are replacing.
 - Wear and tear, maintenance items most likely to get approval.
 - Manufacturer specifications, comparison photos, etc. must be submitted for consideration for approval of replacement powertrain components.
 - Replacement of components that will have no effect on performance must still have approval. (for example: replacing cracked windshield).

Work on Vehicles During Competition Events

Work on Vehicles During Events:

Unlike the practice at Knockout, vehicles will no longer be allowed to stop at the Start/Finish Line for work to be performed on them by Team members.

In the Finals events, vehicles will have to make any “pit stops” in the regular MIS Pit Lane, which is where Teams *will be* allowed to work on their vehicles. However, there will be an automatic penalty accrued as a result: the “in” and “out” laps will not count for the Event total.

In the situation where a vehicle has a breakdown on the track, and it cannot make its way back to the Pit Lane, the driver may stop it on the MIS Back Straightaway’s apron. In this case, for safety, the vehicle must be steered onto the apron, and parked as close as possible to the inside barrier wall (away from the active track surface). Team members, under the supervision of a Technical Official in an official vehicle, will be led to the Team’s vehicle, using infield access roads. The Technical Official will approve and oversee any work done on the vehicle. If the vehicle can be made to run again, to officially re-join the competition, it must pass through Pit

Lane (on the Front Straightaway) on its next lap and will receive the penalties stipulated for working on vehicles as described in the section titles “Penalties” below.

If a vehicle breaks down elsewhere on the track, and cannot make its way to either the Front Straightaway’s Pit Lane or the Back Straightaway’s apron, vehicle should be driven below the white line and parked safely on the grass. Team members, under supervision of a Technical Official, will be led to the vehicle’s location. If it is deemed safe to do so, Team members may push their vehicle to the Pit Lane or Back Straightaway, whichever is closest. (Competition vehicle must be manually pushed, and not pushed/pulled by a golf cart or other powered vehicle). No work can commence on vehicle until it is safely located onto one of the two designated work areas and a Technical Official arrives with team members. Again, the Technical Official must approve and oversee any work done on the vehicle. If the vehicle can be made to run again, and it is on the Back Straightaway, to officially re-join the competition, it must pass through Pit Lane (on the Front Straightaway) on its next lap.

For any work, if permitted to be carried out on vehicle during an event, the following will apply:

- No powertrain components can be added/replaced.
- No electrical charging or adding of fuel allowed.
- Water or ice can be applied externally for cooling of vehicle components. No fluids of any kind can be added – water or coolant to the radiator, oil, transmission fluid, etc. are not allowed.
- Possible disqualification, or additional time/distance penalties, will be imposed on Team for violations of above.

Work on Vehicles – During Impound of Vehicle

Work on Vehicles - During Impound, Between and After Efficiency Event Drive Cycles:

1. Teams will be allowed, under strict Technical Official or designated Charging Area Inspector supervision, to connect a laptop or other electronic device to a vehicle for two purposes: to download vehicle data from on-board data acquisition systems and to monitor battery cell temperatures and voltages before and after charging:
 - Teams must wait their turn for a Technical Official/Designated Inspector to be free to supervise their vehicle. Official/Designated Inspector will allow and supervise connection and download of vehicles, on a First Come – First Serve basis, upon their arrival at Impound tent.
 - Only two Team members allowed near vehicle for this operation.
 - Other Team members must remain at least 10 feet behind vehicle.
2. No other work may be performed on vehicles while in Impound, unless specifically allowed and supervised by a Technical Official/Designated Inspector.

3. If it is announced that work on vehicles will be allowed, it will only be permitted per Level 1 or Level 2 guidelines below:
 - Level 1 – Routine checks of maintenance and safety items, including: fluid levels, fuses, tire condition, battery condition, etc. Only two Team members allowed to examine their vehicle at a time. Other Team members must remain at least 10 feet behind vehicle. Approval required for any fluid topping, fuse replacement, adjustments, tightening, etc.
 - Level 2 – Specific repairs/replacements of components. Reviewed and approved on an individual basis. Team must alert Technical Officials with written request, and receive permission before proceeding. Number of Team members allowed to work on vehicle must be approved ahead of time.
4. **Impound/Electric Charging Area, open at 7:00 AM.** No one is allowed into area before this time. Every team member must remain outside of the impound area until a Technical Official provides the clear to enter the impound area.
5. **Impound/Electric Charging Area closed at 7:00 PM, or as announced.** No one is allowed into area after this time. Vehicles that remain overnight will be protected by security. Teams will be contacted immediately if there is an emergency.
6. **Support Vehicles.** Any non-competition vehicle must remain outside of the Impound Tent.

Work on vehicles During Impound, After Combined (“Race”) Event:

No work allowed, except:

1. **To download data** from vehicle to laptops or other device (same supervised procedure as above)
2. **To check and replace a limited number of failed items** (after receiving approval): tires, fuses, belts, etc.
3. **To check and top off** coolant levels
4. **To confirm that all power systems are shut off/disabled** for vehicle shipment to Chrysler, Chelsea Proving Grounds.
5. **To assist vehicle shipper** in loading and securing vehicle on transporter

Work on Vehicles During Impound, After Cooldown:

No work allowed, except:

1. **To download data** from vehicle to laptops or other device (same supervised procedure as above)

2. **To check and replace a limited number of failed items** (after receiving approval): tires, fuses, belts, etc.
3. **To check and top off** coolant levels
4. **To confirm that all power systems are shut off/disabled** for vehicle shipment to ANL
5. **To assist vehicle shipper** in loading and securing vehicle on transporter

Work on Vehicles - Between Competition Events – In Garages

In general, vehicles must be kept in the same configuration and specification as seen at Knockout, and as approved in Finals Technical Inspection.

1. Vehicles may be worked on only in Garage Area.
2. Welding or grinding, when approved, can only take place outside of garage building, approximately ten feet minimum from garage building
3. **Garages open at 7:00 AM.** No one is allowed into garage before this time.
4. **Garages close at 7:00 PM, or as announced.** No one is allowed into garage after this time.
5. **Teams not allowed to take competition vehicles off site.** Vehicles and their components must remain in the Garage (or Impound Area) overnight and through the weekend. Removal of vehicle or components from MIS garages (or Impound Area) will result in elimination from the Competition.
6. **Any driving of competition vehicles between events requires permission from Technical Officials.** All teams must receive permission to drive vehicles anywhere other than on the track surface during events. A designated area north of Garage 3 has been established but teams must receive permission for every time they wish to utilize this driving area.

Work on Vehicles - While at ANL Emissions Lab:

Specific instructions will be provided for vehicles going on to the Argonne National Labs.

PENALTIES

Penalties for On-Track Events During Finals Stage:

Efficiency Event:

- Drive trace violation – RMS Error as described in document distributed during Knockout (Penalty is applied to miles driven in the cycle in which the penalty is incurred)
 - 0.0-0.5 = 0 penalty
 - 0.5-1.0 = 10% penalty
 - 1.0-2.5 = 20% penalty
 - >2.5 = 50% penalty
- Working on the vehicle outside of pit lane = 50% penalty
- Pushing the vehicle outside of pit lane = 50% penalty
- Significant safety incident = 100% penalty for the cycle the incident occurs within
- With the exception of a significant safety incident, the maximum penalty applied will be 50%.
- In order for laps to be counted toward the total required miles driven toward the cycle, vehicles MUST cross the start/finish line on the oval. Laps completed on pit lane will not be counted toward the mileage of the cycle.
- Exceeding maximum allowable cockpit temperature of 95 degrees F = 1 lap penalty (For Efficiency Event, this penalty lap will not be counted toward mileage of the cycle.)
- Note: Each cycle of the Efficiency Event must be concluded within the time allocated for that cycle, including extra laps due to pit stops or penalties.
- Pit lane speed violation (exceeding 40 mph on pit lane) = 1 minute time penalty applied to time score for Combined Performance & Efficiency Event for each violation
- All penalty laps must be completed for the vehicle to successfully complete the event; failure to do so will result in elimination from the Competition

Range Event:

- Failure to complete “at speed” laps in less than 2:10 (130 seconds) = 1 lap penalty
- Failure to complete “in” laps in less than 3:10 (190 seconds) = 1 lap penalty
- Failure to complete “out” laps in less than 3:10 (190 seconds) = 1 lap penalty
- Laps completed in less than 1:50 (110 seconds) = 1 lap penalty
- In order for laps to be counted toward the total required miles driven toward the Range requirement, vehicles MUST cross the start/finish line on the oval. Laps completed on pit lane will not be counted toward the mileage of the cycle.
- Exceeding maximum allowable cockpit temperature of 95 degrees F = 1 lap penalty
- Note: Mainstream vehicles will have a total of 235 minutes from your vehicle’s start time to complete the event and Alternative vehicles will have a total of 125 minutes from your vehicle’s start time to complete the event. Two minutes will be added to these totals for each additional penalty lap.
- Pit lane speed violation (exceeding 40 mph on pit lane) = 1 minute time penalty applied to time score for Combined Performance & Efficiency Event for each violation

- All penalty laps must be completed for the vehicle to successfully complete the event; failure to do so will result in elimination from the Competition

Combined Performance and Efficiency Event:

- Exceeding maximum speed of 70 MPH on-track = 6:40 (280 seconds) penalty for Alternative, 13:20 (560 seconds) penalty for Mainstream (5% of maximum time)
- Failure to meet minimum speed of 45 MPH on-track (except for pit lane or where designated) = 6:40 (280 seconds) penalty for Alternative, 13:20 (560 seconds) penalty for Mainstream (5% of maximum time)
 - Speeds will be monitored by the real time telemetry system. Teams will receive one warning to allow them to adjust for any potential discrepancy between their on-board speedometer and official speed readings.
- Failure to meet 100 MPGe (penalty for every 1 MPGe below 100) = 1:20 (80 seconds) penalty for Alternative, 2:40 (160 seconds) penalty for Mainstream (1% of maximum time). (ASTM rounding rules will apply to the calculation of MPGe and awarding of penalties.)
- Exceeding maximum allowable cockpit temperature of 95 degrees F = 1 lap penalty
- Pit lane speed violation (exceeding 40 mph on pit lane) = 1 minute time penalty applied to time score for Combined Performance & Efficiency Event for each violation
- All penalty laps must be completed for the vehicle to successfully complete the event; failure to do so will result in elimination from the Competition

Other Rules Infractions

- Unauthorized work on vehicles while in impound
 - 1st offense = 1:20 (80 seconds) penalty for Alternative, 2:40 (160 seconds) penalty for Mainstream applied to time score for Combined Performance & Efficiency Event (1% of maximum time).
 - 2nd and any subsequent offense = 6:40 (280 seconds) penalty for Alternative, 13:20 (560 seconds) penalty for Mainstream applied to time score for Combined Performance & Efficiency Event (5% of maximum time).