



2019 SAE SUPERMILEAGE® RULES

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2019 SAE SUPERMILEAGE® RULES

INTRODUCTION

This introduction is intended to highlight some revisions to the SAE Supermileage Rules that you may find of interest. These highlights touch on only part of the revised text and do not replace or change the Rules.

Caution - Neither this introduction, nor any other summary, is a substitute for reading and understanding the Rules. The Rules are a reference document and should be used for that purpose. Do not attempt to design your vehicle based on the parts of the Rules you happen to remember from the last time you read them or from previous year's rules. We cannot stress it too strongly – read the Rules thoroughly and repeatedly.



PART A – ADMINISTRATIVE REGULATIONS

ARTICLE 1: SAE SUPERMILEAGE OVERVIEW

A1.1 Supermileage Competition Objective

The objective of the SAE Supermileage competition is to offer undergraduate and graduate students the opportunity to enhance their engineering design and engineering project management skills in a challenging competition.

A1.2 Design Goal

The engineering design goal for SAE Supermileage is to develop a single person, extremely high fuel economy vehicle that complies with the Supermileage rules. The vehicles will run a specified course with the vehicle obtaining the highest combined kilometers per liter (miles per gallon) rating plus design segment points winning the event.

A1.3 Good Engineering Practices

Vehicles competing in SAE Supermileage competitions are expected to be designed and fabricated in accordance with good engineering practices.

ARTICLE 2: RULES

A2.1 Rules Authority

The SAE Supermileage Rules are the responsibility of the SAE Supermileage Rules Committee and are issued under the authority of the SAE Education Board. Official announcements from the SAE Supermileage Rules Committee, SAE or the Supermileage organizers shall be considered part of and shall have the same validity as these rules.

A2.1.1 Ambiguities or questions concerning the meaning or intent of these rules will be resolved by the SAE Supermileage Rules Committee, SAE staff or by the individual competition organizers as appropriate.

A2.2 Rules Validity

The SAE Supermileage Rules posted on the SAE website and dated for the calendar year of the competition are the rules in effect for the competition. Rule sets dated for other years are invalid.

A2.3 Rules Compliance

By entering a SAE competition, the team, members of the team as individuals, faculty advisors, and other personnel of the entering university agree to comply with, and be bound by, these rules and all rule interpretations or procedures issued or announced by SAE, the SAE Supermileage Rules Committee, and the other organizing bodies.

Any rules or regulations pertaining to the use of the competition site by teams or individuals and which are posted, announced and/or otherwise publicly available are incorporated into the Supermileage Rules by reference. As examples, all event site waiver requirements, speed limits, parking and facility use rules apply to Supermileage participants.

All team members, faculty advisors and other university representatives are required to cooperate with, and follow all instructions from, competition organizers, officials, and judges.



A2.4 Understanding the Rules

Teams are responsible for reading and understanding the rules in effect for the competition in which they are participating. The section and paragraph headings in these rules are provided only to facilitate reading; they do not affect the paragraph contents.

A2.5 Participating in the Competition

Teams, team members as individuals, faculty advisors and other representatives of a registered university who are present on-site at a competition are considered to be “participating in the competition” from the time they arrive at the event site until they depart the site at the conclusion of the competition or earlier by withdrawing.

A2.6 Official Communications

All teams are required to read and follow official announcements concerning the competition and the rules that are sent from SAE and/or the organizers to the team members.

Information will be posted on the SAE Supermileage website at <http://www.sae.org/students/supermw.htm>. Additional event information may be directly provided to registered teams through e-mail correspondence sent to the addresses provided during registration.

A2.7 SAE Technical Standards Access

A cooperative program of SAE’s Education Board and Technical Standards Board is making some of SAE’s Technical Standards available to teams registered for any North American Collegiate Design competition at no cost. The Technical Standards referenced in the Collegiate Design Series rules, along with other standards with reference value, will be accessible online to registered teams, team members and faculty advisors. To access the standards (1) your team must be registered for a competition in North America and (2) the individual team member or faculty advisor wanting access must be linked to the team in SAE’s system.

Access Procedure - Once your team has registered there will be a link to the technical standards titled “Design Standards” on the main registration screen where all the required on-site insurance information is added. On the technical standards webpage, you will have the ability to search standards either by J-number assigned or topic of interest such as brake light.

A list of the accessible SAE Technical Standards can be found in Appendix S.

ARTICLE 3: INDIVIDUAL PARTICIPATION REQUIREMENTS

A3.1 Eligibility Limits

Eligibility is limited to undergraduate and graduate students to ensure that this is an engineering design competition. High school students are prohibited.

A3.2 Student Status

Team members must be enrolled as degree seeking undergraduate or graduate students in a college or university. Team members who have graduated during the seven (7) month period prior to the competition remain eligible to participate.

A3.3 SAE Membership

Team members must be members of SAE. Proof of SAE membership is required at the event.



A3.4 Age

Team members must be at least eighteen (18) years of age.

A3.5 Driver's License

Team members who will drive a competition vehicle at any time during a competition must hold a valid, government issued driver's license.

A3.6 Liability Waiver

All on-site participants, including students, faculty, team spectators, and volunteers, are required to sign a liability waiver upon registering on-site.

A3.7 Medical Insurance

Individual medical insurance coverage is required and is the sole responsibility of the participant.

A3.8 Online Registration Requirements

A3.8.1 All students and faculty must be affiliated to your respective school/ college/ university on the SAE website by January 31 of the competition year.

A3.8.2 Any faculty advisors who are not SAE International members are required to create a free customer account profile on www.sae.org. Upon completion, please email assigned customer number to CollegiateCompetitions@sae.org also including university name.

A3.8.3 Every participant, including advisors must affiliate themselves and complete the following information on under the team's registration page on the SAE website www.sae.org:

- Emergency contact data (point of contact (parent/guardian, spouse), relationship, and phone number)

If you need assistance in registering your team or affiliating yourself to the team registration page, please visit the Frequently Asked Questions located at <http://students.sae.org/cds/supermileage/faq/>.

All students, both domestic and international, must affiliate themselves online by January 31 of the year of the competition. For additional assistance, please contact CollegiateCompetitions@sae.org.

A3.8.4 Fast Track Registration Form

Two weeks prior to competition the Fast Track Registration form will be locked for editing. Any student or faculty who have not affiliated or completed their required information will need to do so manually after the form is printed.

This form is to be brought to onsite registration.

ARTICLE 4: FACULTY ADVISOR

A4.1 Status

Each team is expected to have a Faculty Advisor appointed by the respective university. The Faculty Advisor is expected to accompany the team to the competition and will be considered by competition officials to be the official university representative.

A4.2 Responsibilities

Faculty Advisors may advise their teams on general engineering and engineering project management

theory.

A4.3 Limitations

The Faculty Advisor may not design any part of the vehicle nor directly participate in the development of any documentation or presentation. Additionally, Faculty Advisors may neither fabricate nor assemble any components nor assist in the preparation, maintenance, testing or operation of the vehicle.

In short: Faculty Advisor may not design, build or maintain the vehicle.

ARTICLE 5: VEHICLE ELIGIBILITY

A5.1 Student Developed

The vehicle must be conceived, designed and fabricated by the team members without direct involvement from professional engineers, faculty and technical staff in the college/school or professionals in the motorsports community. The team should be prepared to discuss/explain their design if asked to do so by the organizers.

A5.2 Professional Fabrication Limits

Vehicles that have been professionally fabricated may be disqualified from the competition. If a team lacks access to machine shop facilities, a reasonable number of components may be professionally fabricated without penalty. The team should be prepared to document such lack of fabrication facilities.

A5.3 Re-entered Vehicles/Engines

To ensure a genuine design effort, significant modifications to a previous year's entry must be made.

ARTICLE 6: REGISTRATION

A6.1 Registration

Registration for SAE Supermileage must be completed online.

A6.2 Registration Dates

Registration for the competition will open at the date and time posted on the competition website.

Registration for the competition will close at the date and time posted on the competition website.

There are no exceptions to this registration policy.

A6.3 Registration Fee

Payment for registration fee must be initiated within 48 business hours of team registration.

Registration fees are NOT refundable, nor deferrable to future competitions.

A6.4 Withdrawals

Registered teams for the competition that find that they will not be able to attend the competition are required to officially withdraw notifying CDS Staff at collegiatecompetitions@sae.org prior to the competition.



A6.5 United States Visas

Teams requiring visas to enter to the United States are advised to apply at least sixty (60) days prior to the competition.

Neither SAE staff nor any competition organizers are permitted to give official advice on visas, customs regulations or vehicle shipping regulations concerning the United States or any other country.

A6.6 Visa Requests

Affiliated CDS Student Team Members will have the ability to print out a Registration Confirmation Letter for the event under their registration page at www.sae.org.

Please be advised that SAE International cannot intervene with by calling or sending personal letters to the State Departments, Embassies or Consulates of the United States or other governments on behalf of any meeting or event participant.

A6.7 Vehicle Shipping

Competition vehicle shipments by commercial carrier must comply with the laws and regulations of nations from which, and to which, the vehicle is being sent. The process for shipping a vehicle can be complex and lengthy. Teams are advised to consult with their shipping company or freight forwarder to be sure their shipment fully complies with all relevant, customs, import/export and aviation shipping requirements.

Shipments must be sent with the sending team or university listed as the receiving party. Neither the competition organizers nor the competition site can be listed as the receiving party.

Competition organizers will not supply documentation for removal of the competition vehicle from the competition site. Teams must arrange for all facets of the removal of the vehicle from the competition site. Outbound vehicle shipments from the competition site must be collected / removed within three (3) business days (the following Monday, Tuesday, Wednesday) after the conclusion of the SAE Supermileage competition. Shipment removal on Saturday and Sunday is not available.

The competition site has both a commercial vehicle loading dock and fork-truck resources for unloading and loading vehicle shipment off and onto commercial transport vehicles. Vehicle shipment packaging should be appropriately sealed for outside storage at the competition site.

A6.8 On-site Registration

All team members and faculty advisors must complete the on-site registration procedures immediately after they arrive at the competition site.

On-site registration must be completed, and any credentials and/or other identification issued by the organizers properly worn before the car can be unloaded, uncrated or worked upon in any manner.

ARTICLE 7: AWARDS

The following awards will be made at the SAE Supermileage® Competition:

A7.1 Overall Performance Awards

Award recognizes those top teams with the highest overall score. This will be determined by the sum of the points earned on the Design Report added to the team's highest fuel mileage.

A7.2 Specialty Awards

Additional awards include:

Closest Predicted to Actual Fuel Economy

(Teams will submit prediction on first day at competition site; form available on SAE website)

Best Demonstrated Overall Team Attitude

(Selected by event organizers with input from volunteers and team participants)

Best Design Execution

(Selected by event organizers)

Endurance Award

(Highest sum of fuel economy run results; minimum of four positive runs for the award to be issued; at the discretion of the Event Organizer, the minimum number of runs may be increased to reflect the endurance spirit of the award.)

Newcomer Award

(Highest overall score; open only to schools not entering competition in previous three (3) years)

By not attending the event awards banquet, a team indicates forfeiture of any potential awards.

A7.3 Design Award

An award will be given for the team with the highest Design Report score. The Design Report score is the combined score from the submitted written report plus the verbal report conducted on-site at the competition.

ARTICLE 8: QUESTIONS & HOST SITE GENERAL INFORMATION

A8.1 Registration Information

Questions pertaining to the registration process (including engine ordering, affiliating a participant with a team, SAE membership, etc.) should be directed to CollegiateCompetitions@sae.org.

A8.2 Rules Questions & General Comments

Any questions or comments about the rules should be brought to the attention of the organizing committee as soon as possible to prevent misconceptions about the competition proceedings or intentions. All correspondence should be sent to the event organizers at Supermileage@Eaton.com.

A8.3 Host Site - General Information

A schedule of events will be provided to registered teams directly or through the event website.

Personal Transportation Onsite

No personal transportation vehicle shall exceed the speed limit of 15 MPH (miles per hour) at any time while on the Host Site property. The Host Site property begins at the point of leaving the public roadway. Violators (vehicle and/or vehicle operator), as determined by and at the discretion of the Host Site, may be refused access to the Host Site property for exceeding the 15 MPH requirement.

Team Paddock Area

The competition site will not guarantee the availability of electrical power in the team paddock area. Teams requiring electricity should plan to provide an electrical source. The competition site requires basic levels of PPE (personal protective equipment) like eye protection, hearing protection, and hand protection when performing certain activities. Teams should be prepared to provide PPE to all team

members who participate in activities where protection is likely to be required (including Technical Inspection and fuel bottle installation / removal). Restroom facilities are provided in the form of unisex, portable toilets.

Welding at Host Site

Teams will only be allowed to perform welding under the supervision of a site qualified staff member.

Additional Safety Requirements at Host Site

Additional safety requirements will be provided to teams by the site organizers prior to the on-site competition.

Chemical Safety Data Sheets

Teams are required to provide SDS (Safety Data Sheets) for all chemicals brought to the competition site. The SDS information must be in printed, hard copy format placed in a binder. A team will be required to show the binder, the contents of the binder, and all chemicals brought to the competition site to the event organizers upon request. Unapproved chemicals, as well as chemicals not having SDS information, may be required to be removed from the competition site.

Supermileage Competition Vehicle Operation at Host Site

The Competition vehicle may only be operated on the Host's property for the express purpose of authorized Technical Inspection, authorized Thursday practice driving on the track oval for Technical Inspection approved vehicles, and authorized Friday fuel economy attempts on the track oval.

Operation of the vehicle under engine power on the Host's property by a driver for any other purpose is prohibited.

The driver seated in the Competition vehicle must be wearing an approved safety helmet at all times when the vehicle is in motion.

Food at Host Site

The Event Organizers, in an effort to support teams' participation, arrange for a food concession stand to be available on site for lunch for both days of the Competition. The selection of food offered tries to provide a variety of options for various dietary wants and needs, but the options will not necessarily meet the desires of all participants. Participants with special dietary needs should plan to provide their own food that meets their individual needs. Heat sources for cooking are not permitted. More food related details will be provided to team leaders prior to the event.

PART B – TECHNICAL REQUIREMENTS

ARTICLE 1: GENERAL DESIGN REQUIREMENTS

B1.1 General Configuration

The vehicle must have a minimum of three wheels contacting the ground at all times. Vehicle length, width, and height are not expressly regulated. The driver must be fully enclosed within the body of the vehicle to prevent driver contact with the pavement.

B1.1.1 Relative to the driver position, the right side of the vehicle will have a space on a substantially vertical surface for placement of the 23 cm high by 31 cm long (9-inch high by 12-inch long) vehicle identification number (VIN) label that is assigned and provided by the Chief Technical Inspector after successful conclusion of the Technical Inspection Process. Once placed, the VIN label must be easily seen by Event Timing Table Staff persons in both the seated and standing positions as the vehicle moves counter-clockwise around the competition track.

B1.1.2 All competition vehicles are required to reserve a minimum of five (5) spaces on each side of the vehicle for placement of event principal sponsor decals. Reserved spaces must enable the placement of decals in the following approximate size: 10 cm high by 41 cm long (4-inch high by 16 inches long). Decals will be placed on a substantially vertical surface and will be easily seen by a person in the seated or standing position. The Event Organizer will provide the required decals during the registration process, and Technical Inspection will confirm proper placement of these required decals. Other event sponsor decals may also be provided, and the placement location on the vehicle will not be evaluated by Technical Inspection. Placement of these subject supplied decals on the vehicle is required.

B1.2 Vehicle Power Limitations

The sole source of vehicle propulsion must be from the single cylinder engine. This means no human power system, no sail, etc. Any inertial system, if used, must be at rest prior to the start of the performance run.

B1.2.1 All energy used for propulsion of the vehicle must come from the fuel. Incidental burning of minute traces of lubricant on the engine cylinder wall is acceptable as a normal attribute of internal combustion engines; fuel modifiers nor consumable catalysts are not permitted. Any vessel used in or in support of the propulsion system may not be pressurized prior to the start of a fuel economy run.

B1.3 Driver Position

The driver must be seated in the vehicle so that the driver's feet are forward in the vehicle pointing in the direction on travel. Drivers may **not** be positioned head forward in the vehicle.

B1.3.1 All rules describing the requirements for a vehicle driver pertain to all drivers for any competition vehicle regardless if the specific wording of the rule states "driver" or "all drivers" or other wording that implies all drivers.

B1.4 Forward Field of Vision

The driver must have adequate visibility to maintain control and have situational awareness. Forward field of vision not less than +/- 80° from the vehicle longitudinal axis is required. See **Figure 1**.

B1.4.1 Windscreens - Vehicle windscreens, if so equipped, must be treated with a water beading agent on the exterior and an anti-fogging agent on the interior.

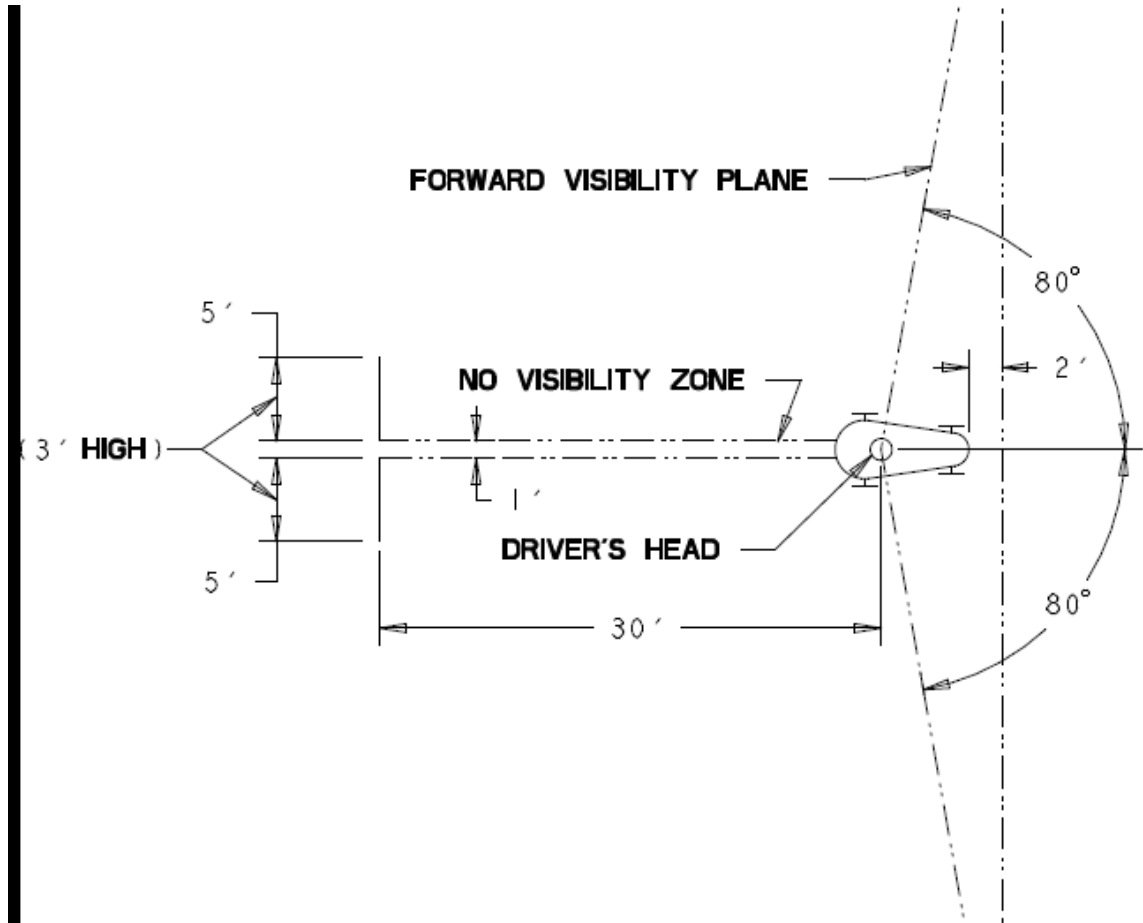


Figure 1 - MINIMUM VISIBILITY PLANE

B1.4.2 Forward Visibility

B1.4.2.1 When in the normal driving position, the driver must be able to readily see and recognize objects on the ground up to 1.5 m (5 feet) above the ground at a distance of 6.0 m (20 feet) in front of the vehicle.

B1.5 Maneuverability

B1.5.1 Each vehicle must have steering geometry capable of a 15.2 m (50 feet) maximum inside turning radius. Vehicle maneuverability will be evaluated during Technical Inspection using the maneuverability course described in Figure 2.

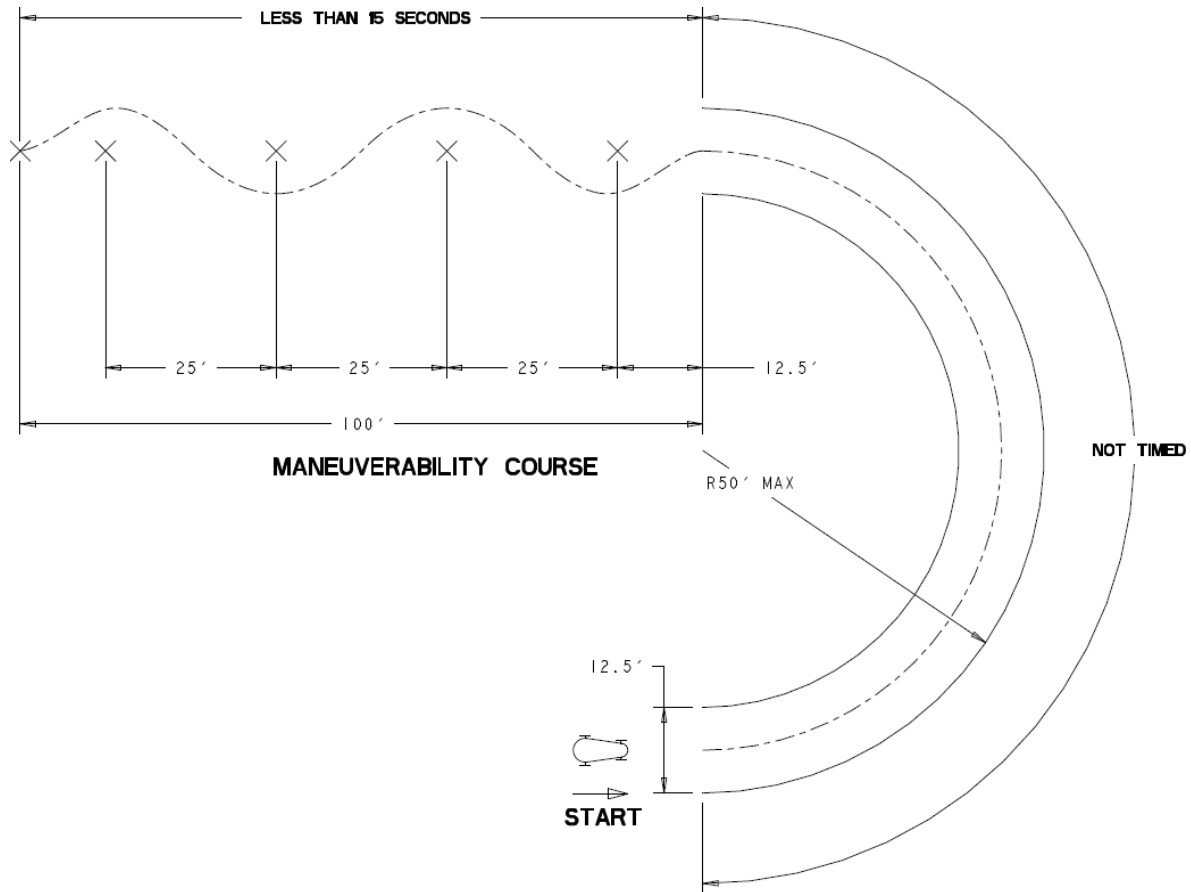


Figure 2 - MANEUVERABILITY COURSE

Slalom Section: Vehicle must traverse 30.5 meters (100 feet) slalom section in less than 15 seconds. Pylon spacing will be 7.6 meters (25 feet).

- B1.5.2 Steering must be through a “natural” response steering system: The driver will move the steering interface device to the right to make the vehicle turn right, and the driver will move the steering interface device to the left to make the vehicle turn left.

Examples of “natural” response steering systems would be conventional automobile steering wheels and traditional, front wheel steering handle bars for bicycles.

“Tiller” style steering is prohibited.

B1.6 Stability

- B1.6.1 Each vehicle will be required to demonstrate its lateral stability.

- B1.6.2 The vehicle, with every qualified driver for the team with all equipment necessary to meet the driver weight and safety regulations, must maintain full wheel contact with a ramp of **twenty (20) degrees** (measured from horizontal) when located statically on the ramp to the following configuration: one front wheel and one rear wheel of the vehicle must contact a horizontal line 2.4 m (8 feet) long on the ramp with the vehicle in full right and full left turn configuration. No supporting structure or wheel contact is

permitted on the ramp below the horizontal line. The ramp surface is a maximum of 1.2 m (4 feet) perpendicular from the 2.4 m (8 feet) horizontal line to the edge of the ramp.

B1.6.3 Vehicle stability will also be evaluated during Technical Inspection using the slalom part of the maneuverability course described in Figure 1 above.

B1.7 Minimum Driver Weight

B1.7.1 Minimum driver mass is 59kg (130 pounds) fully equipped and with a helmet. Drivers who do not meet the minimum weight requirements must provide ballast to bring their weight up to 59kg (130 pounds).

B1.7.2 Ballast attached to the driver cannot exceed 4.5kg (10 pounds). Diver's belt or similar weights are suggested but must not inhibit safe movement of the driver at any time. Other ballast not attached to the driver must be both (1) rigidly fixed to the vehicle when in operation and (2) removable for weighing.

ARTICLE 2: ENGINE AND POWERTRAIN

B2.1 Base Engine

All vehicles must use the same base engine built by Briggs & Stratton Corporation. The required base engine is the Junior 206, Model 124332 Type 8202-01. Changes to the base engine, which may be desired for improved efficiency, are acceptable but must satisfy the requirements of B2.3 "Engine Modifications".

The engine fee is US\$325.00. Information on the Model 124332 Type 8202-01 is available at <http://www.briggsandstratton.com/us/en/engines/racing-engines/junior-206>

B2.2 Engine Eligibility

Teams will be eligible to purchase a Briggs & Stratton engine every year. Teams **MUST** order the engine separately online once they have registered for the event. Engines will only be delivered to addresses in North America.

B2.3 Engine Modifications

The base Briggs & Stratton engine may be modified in any manner that otherwise complies with these rules with the following exceptions:

B2.3.1 Cylinder & Crankcase

The cylinder and crankcase must be identifiable as components of the base engine supplied by Briggs & Stratton to the entrant.

B2.3.2 Crankshaft Support Bearings

The crankshaft support bearings (journals) may be altered or replaced but must be retained solely by the Briggs & Stratton crankcase.

B2.3.3 Piston Friction Surface

The piston friction surface may be altered or replaced but must be retained solely by the Briggs & Stratton crankcase.

NOTE: Encapsulating another manufacturer's engine within the Briggs & Stratton cylinder/crankcase assembly is in violation of these rules.

B2.3.4 Crankcase Ventilation

Crankcase cannot be ventilated to engine intake air.

B2.4 Transmission and Clutch

Transmission and/or clutch design must be such that the engine can be disconnected from the driving wheels to allow the vehicle to be stationary with the engine running.

B2.5 Exhaust System

Engine exhaust must exit the body (if so equipped). Mufflers are not required. Exhaust pipe must be insulated or guarded to reduce the risk of burns.

The exhaust pipe must extend a minimum of 25 mm (1.0 inch) beyond the outside of the body of vehicle.

B2.6 Guards and Shields

B2.6.1 All moving powertrain components must be guarded to prevent damage to fuel carrying components and prevent injuries to the driver if breakage should occur. Shielding should also protect against any potential contact with the driver or support personnel when components are moving.

B2.6.2 If wheels are inside body shell, they must be shielded to prevent propulsion by the driver.

B2.6.3 All vehicles must have a belly pan that completely separates the driver from incidental contact with the pavement.

B2.6.4 All fuel system components must be guarded or restrained to prevent contact with moving parts.

B2.6.5 All electrical components must be guarded and/or restrained to prevent contact with moving parts and prevent abrasion of the insulation.

ARTICLE 3: FUEL AND FUEL BOTTLE

B3.1 Fuel

The fuel will be iso-octane (2,2,4 – Trimethylpentane) to provide uniform fuel composition.

B3.2 Fuel Bottle

B3.2.1 The fuel bottle must be mounted vertically to avoid fuel leakage from the vented cap. The bottle must be readily accessible with all body panels in place. Access doors are preferred. Person or persons installing or removing the fuel bottle will be required to wear eye protection to minimize potential contact of fuel with eyes.

B3.2.2 Figure 3 (next page) shows the fuel bottle that will be used in the competition. The competition organizer provides the competition fuel bottle for each fuel economy attempt. **Teams are required to provide their own fuel bottle for testing and inspection purposes.**

B3.2.3 The fuel bottle is permitted to have only a single connection to the fuel system; the single connection must be made through the opening at the lower most point on the fuel bottle below the petcock. The single connection must be compliant (soft) tubing that is no shorter than 50 mm (2 inches) long, rated for fuel, and the connection must be secured by a single hose clamp that can be tightened with a ¼” nut driver. Nothing inside nor outside of the fuel line is permitted for the last 25.4mm (1 inch) of the fuel

line. A fuel return line is not permitted to be plumbed directly into the fuel bottle.

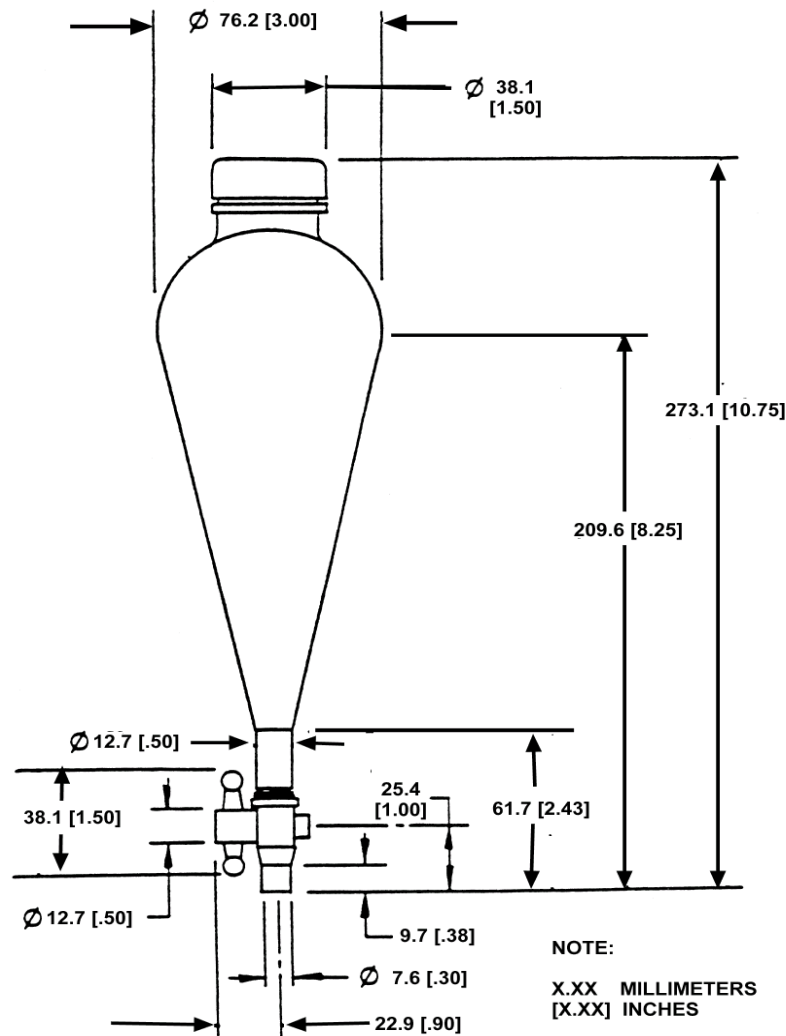


FIGURE 3 – FUEL BOTTLE

Separatory Funnel 250 ml

Cole-Parmer Instrument Company Catalog

Number AP-06125-20 (Teflon Fep) or Number AP-06126-20 (Polypropylene)

B3.3 Fuel Bottle Retainment

The fuel bottle must be positively retained. The fuel bottle cannot be retained in its holder using adhesive tape. The bottle must be rigidly retained to prevent fuel spillage. Fuel bottle provided by the competition organizers for fuel economy runs are vented in the threaded portion of the top cap of the bottle. Figure 3 shows the fuel bottle that will be used in the competition.

B3.4 Access Door(s)

B3.4.1 Access door(s) for fuel bottle installation and removal must be of a sufficient size to permit easy insertion and placement of the fuel bottle.

- B3.4.2 The existing fuel bottle must be able to be replaced with a new bottle within 45 seconds. The 45 seconds includes placement of the bottle, fuel line attachment, and securing of all body features to achieve a state of “ready to run.”
- B3.4.3 Rear body sections of the vehicle that are hinged on the engine-side of the firewall are acceptable. Complete removal of the access door, complete removal of a body panel from the vehicle, or access panels and doors hinged on the driver-side of the firewall are unacceptable.
- B3.4.4 Experience has shown that access doors in the shape of a square with a minimum side length of 20 cm (8 inches) allow sufficient access for placement of the fuel bottle.
- B3.4.5 Participants will be required to demonstrate the 45 seconds compliance during Technical Inspection.

B3.5 Fuel System Drainage

Fuel and lube system shall be designed so that loss of fluids will not result in a fire hazard. Positive drainage away from the driver and out of the vehicle is required in all areas where fuel is present or could leak.

B3.6 Fuel Line and Connections

All fuel line components (hoses, tubing, fittings, connectors, etc.) must be explicitly approved for use in fuel systems. Proof will be required to be shown during Technical Inspection that fuel line components are rated appropriately for system pressure and fuel. All fuel hose connections must be properly clamped, including all push-on type fittings, to prevent fuel leakage.

ARTICLE 4: PRESSURIZED FUEL SYSTEM

B4.1 Pressurized Fuel Tanks – Prohibited

Pressurized fuel tanks are prohibited.

B4.2 Pressurized Fuel Systems

Pressurized fuel systems are permissible. The following requirements are for pressurized fuel systems only:

B4.2.1 Hose

Tubing pressure rating (or specification designation) must be clearly marked by the tubing manufacturer on tubing. Pressure rating must be suitable for the pressure being used.

B4.2.2 Markings

Vehicles using pressurized fuel must mark the vehicle with the letters “**EFI**”. The lettering must be at least 25mm (1 inch) high and clearly visible on the outside of the vehicle adjacent to the fuel door.

B4.2.3 Pressure Gauge

A pressure gauge must be installed as part of the fuel system to display fuel system pressure. The gauge must be clearly visible and pressure readings legible through the fuel access door during fuel bottle insertion and removal.

B4.2.4 Dump Valve

A dump valve must be provided for depressurizing the fuel system before and after fuel bottle

replacement. The valve must be visible and easily accessible through the fuel access door.

B4.2.4.1 Dump valve must be labeled with letters at least 13mm (0.5 inches) high.

ARTICLE 5: ELECTRICAL SYSTEMS

B5.1 Batteries

Batteries can be carried in each vehicle but are limited to starting systems, ignitions, instrumentation, and the like. Batteries must in no way be capable of propelling the vehicle.

B5.1.1 All batteries must be securely and rigidly mounted to the vehicle. Note: Batteries are not considered to be ballast for the purpose of meeting the required driver weight (Rule B1.7)

B5.1.2 All battery cells or battery packs (groups of battery cells) other than those based on lead acid chemistry, must be separated from the driver by a firewall and protected from any heat sources.

B5.1.3 Battery packs based on Lithium Chemistry other than LiFePo:

- a. must be commercially manufactured items
- b. must have over voltage, under voltage, short circuit and over temperature protection
- c. 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

B5.2 Starting Systems, Lights

Batteries used for starting systems can be of any size and voltage. They must be electrically separate from all other systems. They can only be used for starting the engine and powering lights.

B5.3 Other Vehicle Electrical Systems

All other electrical items (fuel pumps, injectors, ignition, instrumentation, etc.) must use a 12V battery with a C20 rated capacity no larger than 1.4 Ah. An engine driven generator may be required to keep the battery charged if power consumption is high.

B5.4 Fuse Requirements

All electrical connections to any batteries MUST be fused with an appropriately rated fuse.

B5.5 Self Contained Devices

Team communication, stopwatches, bicycle computers, or similar devices that have self-contained battery sources are permissible and are not governed by the above battery restrictions.

B5.6 Kill Switch (es)

B5.6.1 Three (3) kill switches grounding the engine ignition are required. One must be mounted within easy reach of the driver. The other two switches must be mounted with one on each side of the vehicle.

B5.6.2 All kill switches must be of a positive action, toggle type - toggle lever arm must be a minimum 19.0 mm (0.75 inches) long. Momentary contact or rocker type switches are prohibited.

B5.6.3 The external kill switches must be securely mounted on the frame or a rigid body section. Switches must be mounted on the body between the front wheel and the rear of the vehicle at least 76.2mm (3 inches) above the ground.

B5.6.4 To ensure that the kill switches remain intact in the event of a lost body element, the external kill switches may not be mounted on removable, or flexible, body panels or sections. In addition, switches must not be mounted on surfaces curving under the vehicle.

NOTE: All kill switches must also shut off any installed electric fuel pump(s).

B5.6.5 All kill switches must be clearly labeled with "run" and "kill" positions in a color which contrasts with the mounting surface to allow immediate identification of the switches by any support personnel. External switches must use lettering at least 38.1 mm (1.5 inches) high and internal switches must use lettering at least 12.7 mm (0.5 inches) high.

B5.6.6 Kill switches will not disable the brake light.

B5.6.7 Throttle Control by Wire

B5.7.1 The engine throttle can be controlled electrically. Provided at least one (1) of the following conditions is met:

- (1) The system will immediately return to a closed throttle condition if any part of the system fails.
- (2) The kill switch circuit must leave the engine inoperable if any portion of the kill circuit fails. This includes wire breakage and electrical short to chassis.

B5.6.8 Automatic Engine Starting – Prohibited

An electric starter may not be initiated by any means other than the driver. An automatic system may be used to signal the driver when to start the engine but may not initiate any part of the start sequence.

ARTICLE 6: VEHICLE STRUCTURE

B6.1 Roll Hoop

A "roll hoop" is required and must be made of substantial material. The device must extend a minimum of 5 cm (2 inches) above the tallest driver's helmet. Also, in the driving position, some portion of the driver's helmet must be within 10 cm (4 inches) of this device - as also shown in Figure 4B.

B6.2 Roll Hoop Width

The roll hoop must extend wider than the shoulders of any driver of the vehicle and must be at the height of or above the driver's shoulders – an example of which is shown in Figure 4A.

B6.3 Roll Hoop Strength

The roll hoop, as fitted to the vehicle, must be able to withstand a 114 kg (250 lb.) force applied to it. The location and direction of the 114 kg (250 lb.) force may come from any of the directions shown in Figure 4C. The roll hoop also cannot deflect so much as to cause noncompliance with the above roll protection device requirements.

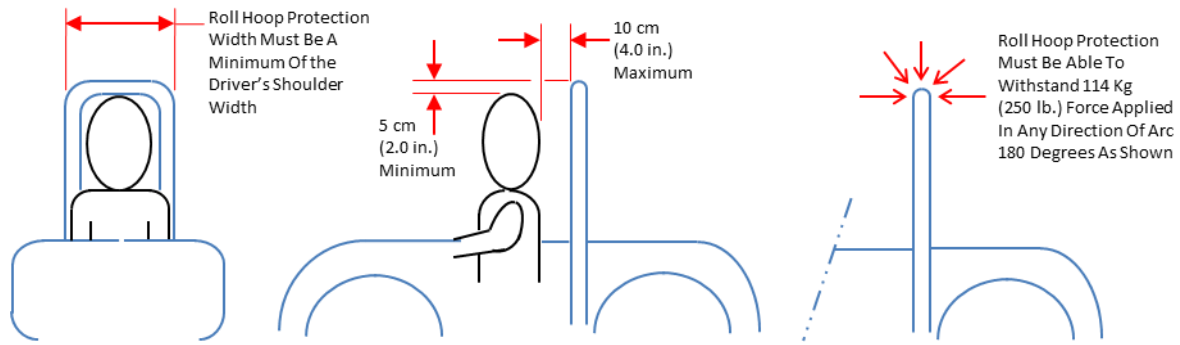


Figure 4A

Figure 4B

Figure 4C

B6.4 Fire Wall

- B6.4.1 A wall of steel or aluminum material of 0.813 mm (0.032 inches) minimum thickness must completely separate the operator from the engine. Furthermore, the firewall must not interfere with the operation and use of the fire extinguisher. The firewall must extend to top of driver's helmet.
- B6.4.2 No openings larger than 13 mm (0.5 inch) in diameter will be permitted in the firewall. This includes gaps between the firewall and body.
- B6.4.3 Any wires/lines passing through the firewall must be provided with effective protection against abrasion through the use of grommets, thick tape around sharp edges, etc.
- B6.4.4 In the event of a fuel leak/spill, the firewall must prevent fuel from entering the driver compartment.

B6.5 Exit ability

- B6.5.1 The driver must be able to exit the vehicle within 15 seconds, unassisted, in case of an emergency. A maximum of two support personnel must also be able to quickly extract a driver from a vehicle without assistance from the driver within 20 seconds. Exit ability will be tested during tech inspection. Exit ability for every driver for the team will be tested during Technical Inspection.
- B6.5.2 Any latches, catches, removable parts or similar items that are used to assist driver removal by support personnel must be (1) clearly marked "Access" and (2) color coded with a minimum of 6.5 cm² (1 inch²) of fluorescent orange and be readily visible from outside the vehicle.

All loose wires/hoses/lines within the driver's compartment must be retained to eliminate interference with exit ability or driver movement during the operation of the vehicle.

- B6.5.2 Body panels that enable the exit of the driver from the vehicle may not be secured with tape or other devices that potentially inhibit the driver's independent, rapid escape from the vehicle.

ARTICLE 7: BRAKE SYSTEM

B7.1 Brake Requirement

Each vehicle must be equipped with a brake system which is capable of stopping the vehicle containing any team driver within 4.0 meters (13.12 feet) in a reasonably straight line when traveling at 24kph (15mph).

B7.2 Brake Actuator Location

The brake actuator must be mounted to the interior of the vehicle. The brake actuator may not be mounted to any body panel. The driver must have access to the brake actuator at all times.

B7.3 Brake Test

The brake system will be tested to determine if it is capable of decelerating the vehicle from 24 kph (15 mph) at a rate greater than 0.25 g (gravity). Brake system performance will be evaluated at Technical Inspection using the course shown in Figure 5.

- Acceleration Zone: There will be a minimum of 50m (164 feet) available for the vehicle to accelerate to a minimum speed of 16 kph (10mph).
- Coast Zone: The vehicle must traverse the Coast Zone in less than 1.5 seconds. No braking allowed.
- Brake Zone: The vehicle must engage brakes and come to a complete stop within the Brake Zone.

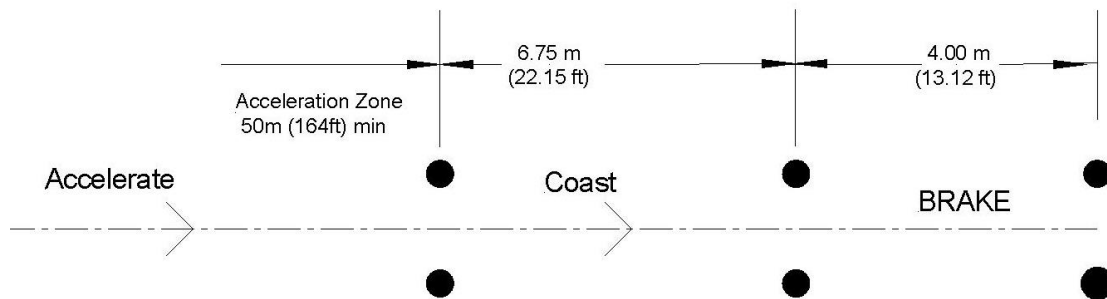


Figure 5 - BRAKE EVALUATION

B7.4 Brake Light

The vehicle must be equipped with an adequate brake light (Reference only SAE J586. Brake not required to comply with SAE J586.). The brake light must be clearly visible to the driver of any vehicle entered into the Supermileage competition under all lighting and potential weather conditions.

The referenced standard will be available online once individuals have registered for the competition. Only those who have their name registered to a team will have access to the standard. See Rule A2.6.

The brake light must still be functional even if a “Kill Switch” has been activated.

ARTICLE 8: DRIVER EQUIPMENT

B8.1 Driver Restraint Harness

A minimum 3-point driver harness is required. This 3-point harness must include two lap belt points and one point connecting a belt (or two belts) supporting the upper body. The use of one upper body support would need to be a cross-belt (similar to a passenger vehicle), whereas two shoulder belts could be used attached at the uppermost point as well.

B8.2 4, 5 or 6 Point Harnesses

The use of a 4-point, 5 point or 6-point harnesses, or any belt system that exceeds the minimum

requirement is allowed.

B8.3 Single Release

All driver restraint belts must use a single release common to the lap belt(s) and upper body belt or harness using a metal to metal quick release latch.

B8.4 Belt Attachment Points

The belt attachment points must be strong enough that the vehicle with seated vehicle driver included can be lifted off ground with a lifting device secured to the driver restraint harness. Belt attachment points to the vehicle must contain redundant locking systems (cotter pins, thread lock, safety wire, etc.) to prevent loosening of the belt attachment anchoring system. The redundant locking systems must be visibly obvious to Technical Inspectors.

B8.5 Driver's Gear

The following equipment must be worn anytime a driver is seated in the vehicle when the engine is running, the engine is being started, or the vehicle is in motion:

B8.5.1 Helmet

Acceptable helmet standards are:

- a) Snell: K2005, K2010, K2015, M2005, M2010, M2015, SA2005, SA2010, SAH2010, SA2015, EA2016
- b) SFI Specs: 31.1/2005, 31.1/2010, 31.1/2015, 41.1/2005, 41.1/2010, 41.1/2015
- c) FIA Standards: FIA 8860-2004, FIA 8860-2010, FIA 8860-2018, FIA 8859-2015

Full face helmets are not required.

Hard-shell bicycle helmets are not allowed.

B8.5.2 Goggles/Eye Protection

Goggles or face shields, made of impact resistant materials, must be worn. Regular glasses or sunglasses are not acceptable.

B8.5.3 Shoes

Shoes or boots of durable material, free from any holes, must be worn by the driver during the competition.

ARTICLE 9: EQUIPMENT REQUIREMENTS

B9.1 Fire Extinguisher

B9.1.1 A multipurpose minimum 0.9 kg (2 pounds) ABC dry chemical fire extinguisher, rating no. 1A 10BC or equivalent must be provided. (An ABC rated fire extinguisher is without exception required since vehicle construction materials are not specifically regulated by the rules.)

B9.1.2 Extinguisher must be securely mounted such that the driver can direct the extinguishing agent on the fuel tank and engine area. If the driver can demonstrate sufficient freedom of movement in the event of a fire to rapidly remove the extinguisher from its bracket and rapidly direct it on the above-mentioned areas, the design will be allowed; demonstration of the rapid, ease of use of the fire extinguisher by the driver will receive a very high level of scrutiny by the Technical Inspectors. If the driver cannot demonstrate sufficient freedom of movement, some method must be provided to accomplish the desired

result (i.e., a system of tubing, remote actuation, etc.).

- B9.1.3 Remote actuation of the fire extinguisher is preferred; if a tubing delivery system is used, 12.7 mm (0.5 inches) inside diameter tubing of no more than 1.2 meters (48 inches) length must be used. Tubing must direct extinguishing agent toward engine and fuel tank. Locking mechanisms that prevent fire extinguisher use must be removed prior to any operation of the vehicle engine by a vehicle driver.
- B9.1.4 Alternate delivery systems will be allowed only if actual test result documentation is available through the faculty advisor. Halon fire extinguishers are not allowed.
- B9.1.5 Pressure Gauge
All fire extinguishers must be equipped with a manufacturer installed pressure/charge gauge; the gauge must be readable to the Technical Inspectors.
- B9.1.6 Fire Extinguisher Position
The fire extinguisher must be mounted such that the valve is above the bottom of the canister.

B9.2 Transponder

- B9.2.1 A transponder will be attached to the front of the vehicle for lap timing purposes. The transponder will be smaller than 13 cm x 8 cm x 4 cm (5 inches x 3 inches x 1.5 inches) and weigh less than 230 grams (0.5 pounds).
- B9.2.2 The transponder must be mounted within 45 cm (18 inches) of the road surface, usually on the outside of the body.
- B9.2.3 The transponder can be mounted inside the body ONLY if it is not obstructed by any conductive materials such as metal or carbon fiber. The transponder will be mounted with a piece of industrial strength, self-adhesive, hook and loop material supplied by the competition organizer at the event.

B9.3 Mirrors

- B9.3.1 Vehicles must be equipped with a mirror or mirrors to ensure adequate rearward visibility.

Camera systems used to support rearward visibility will be disabled prior to Technical Inspectors evaluation of the driver's rearward visibility.

- B9.3.2 The driver must be able to see a 45 cm (18 inch) square object on a vertical plane 1.52 m (5 feet) wide by 0.91 m (3 feet) high located 9.14 m (30 feet) behind and to each side of the vehicle. See **Figure 1** "Minimum Visibility Plane" in Rule B1.4 for a visual representation of this requirement.
- B9.3.3 Mirrors must be securely mounted and adjustable.
- B9.3.4 Mirrors may not be attached to removable panels.
- B9.3.5 Mirrors must be adjustable by the driver while the driver is seated normally in the vehicle.

ARTICLE 10 - NOTICE OF POSSIBLE FUTURE RULE CHANGES

This section is intended to provide teams with advance notice of possible changes to the SAE Supermileage rules that are being considered by the Supermileage Rules Committee. Only changes that may have a significant



impact on the team's engineering design, manufacturing decisions or event preparation are listed. This section is provided only for information and is not intended to provide final text for any rules.

The following rules changes are under discussion:

Driver Shielding – The driver shielding requirements may be expanded.

Alternate Fuels - Use of alternative fuels may be introduced for future events

PART C – STATIC EVENTS

ARTICLE 1: DESIGN REPORTS

C1.1 The review of the design will require both (1) written and (2) verbal design reports.

The total design report points will be the sum of the points from the written design report and the verbal design report.

C1.2 Written Design Reports – General – 300 Points Maximum

C1.2.1 The written design report must be submitted to the Board governing the Supermileage® Competition by the date indicated on the Action Deadline in the appendix. Slight variations between the vehicle brought to the competition and the vehicle described in the design report are permitted to reflect final design refinements. However, the team should be prepared to discuss and justify those differences with the Design Judges.

C1.2.2 The written design report serves three purposes: (1) the report is a **proposal** that documents the design intent and goals of the team, (2) the report serves as a record of the design and (3) the report is an information document to show how the vehicle adheres to the rules.

C1.2.3 The written report must be limited to a maximum of twenty-five (25) pages not including supporting data in an appendix. Material in an appendix will only be reviewed if referenced in the report body.

C1.2.4 A maximum of three hundred (300) points will be awarded to the Written Design Report, and late reports will be assessed a penalty of twenty-five (25) points per day for each day the report is late.

C1.2.5 NOTE: Any team not submitting a written report that is received by the organizers within 10 days of the report submission deadline will be considered by the competition organizers as withdrawn from the competition, and the team will not be eligible to compete further in the present year's event.

C1.3 Verbal Report – 150 Points Maximum

C1.3.1 Each team will present a verbal design report to panel of judges in a question and answer format. No prepared materials, other than the vehicle itself, are allowed.

C1.3.2 Vehicle Presentation – Teams that bring their vehicle with them during the verbal report will receive a twenty-five (25) point bonus.

C1.3.3 Three (3) team members must be present for the verbal design report. The event organizer may select the team members who participate in the verbal design report. Teams with less than three members are

required to have the entire team participate in the verbal design report.

- C1.3.4 The verbal design report should demonstrate the team's understanding and application of the engineering principles that support their design.
- C1.3.4 The verbal design report will only be presented on the first day of the competition as scheduled by the organizer. Teams that fail to give their report during the scheduled verbal report period will receive zero (0) points for their verbal report.
- C1.3.5 Teams may schedule a time for their verbal design report after they have completed on-site registration.
- C1.3.6 Verbal design reports will be scored to a maximum of one hundred fifty (150) points.

C1.4 Design Report Contents

- C1.4.1 The design report must show the focus of the team on determining the goals for the design and the design effort to reach the established goals. The goals stated should be those of the team and hence will reflect the team members, financial resources, laboratory access, and involvement of the team.
- C1.4.2 Areas of re-design must be specifically documented. The various sections of the report should indicate where design decisions are made, the basis for making the decisions, and the consequences of the decisions on the performance of the vehicle. Records of make/buy decisions are expected, as are decisions regarding performance parameters and compromises.
- C1.4.3 The report should include drawings and written descriptions. Changes in design between report submission and competition date will be allowed. Design reports will be held in strict confidence.
- C1.4.4 The following topics must be covered – in the order listed below and clearly labeled - in the design report:
 - a) **Acknowledgement of Rules**
A statement must be included that the entirety of the Rules has been read by all current team members prior to the submission of the report. The Team Captain must sign the statement as testament that all team members, both current and future members that join the team after the report is submitted, will have read the rules prior to participating at the Host Site.
 - b) **Basic Vehicle Configuration**
This topic should include general arrangement, physical dimensions, location of components, etc.
 - c) **Body/Aerodynamic Shell**
This topic includes decisions made on the basis of aerodynamic considerations as well as safety issues.
 - d) **Engine**
This topic must include a discussion of all modifications to the base Briggs & Stratton engine including the engineering principles that support those modifications and the team's design considerations.

The report must also include an itemized list of all engine modification. Finished, or altered, parts from some other engine, or of another manufacturers design, must be listed with the manufacturers name and part description.

- e) **Powertrain Configuration**
This topic includes a discussion of the transmission of power to the wheels.
- f) **Suspension, Running Gear, and Steering**
This topic includes the tires, axles, and other associated equipment that concerns rolling, handling, and steering of the vehicle.
- g) **Brake System**
This topic should discuss the vehicle's top speed capability, brake system design, energy capacity of the system, and calculated stopping distance.
- h) **Performance**
This topic should include calculations on vehicle top speed and any calculations on fuel economy. Driving strategies are also appropriate for discussion.
- i) **Driver Safety Features**
The report is to include detail descriptions of all aspects of the design intended to protect the safety of the driver.
- j) **Cost Estimate and Manufacturing Methods**
The design report is to include a discussion of the manufacture and cost of the vehicle. Where parts, services, or materials are donated, a fair market-value of the donation must be included in the cost breakdown of the vehicle. Professional machine and fabrication services are to be included in the cost breakdown, including appropriate cost for work performed by university technicians even if the team budget is not charged directly.

Manufacturing methods and equipment used by the team should be discussed in the design report, generally as associated with the parts of the vehicle using that manufacturing method.
- k) **General Information**
Any additional information which has not been discussed in the above items should be included here.
- l) **Re-entered Vehicles**
Areas of redesign must be specifically documented (See Rule A5.3 “Re-Entered Vehicles/Engines”).

C1.5 Faculty Advisor Signature

The design report must include the signature of the team/project faculty advisor verifying that the design report has been reviewed by the advisor and if the vehicle is being re-entered that significant redesign has been completed. Faculty advisor telephone number and e-mail address must be supplied with the report for approval confirmation.

PART D – DYNAMIC EVENT

ARTICLE 1: PERFORMANCE RUN

- D1.1** The performance run will consist of each vehicle running six laps around a 2.6 km (1.6 mile) oval test track.
- D1.2 Minimum Speed**
The vehicle must achieve a minimum six lap average speed of 24 kph (15 mph). This means that each vehicle will be required to travel a total distance of 15.5 km (9.6 miles) in a maximum of 38.4 minutes.
- D1.3 Maximum Speed**
The vehicle must not exceed a single lap average speed of 40 kph (25 mph) (40.23km). This means a vehicle must take longer than 3 minutes 50 seconds to complete each lap.
- D1.4 Track Grade**
Vehicles must be capable of ascending a 1 percent grade and descending a 7 percent grade.
- D1.5 Slow Speed Penalty**
- D1.5.1 If the minimum average speed of 24 kph (15 mph) is not maintained, a penalty will be assessed by subtracting from the km/liter (mpg) achieved.
- D1.5.2 The penalty will be 4.25 km/liter (10 mpg) per second of time that the minimum average speed requirement is not met. For instance, if 39 minutes was the elapsed time for six laps, the minimum allowable time, without penalty (38 minutes 24 seconds) was exceeded by 36 seconds. The actual mileage achieved would be reduced by 153.1 km/liter (360 mpg).
- D1.6 Maximum Speed Penalty**
- D1.6.1 If the maximum lap average speed of 40 kph (25 mph) is exceeded, a penalty will be assessed by subtracting from the km/liter (mpg) achieved.
- 1.6.2 The penalty will be 4.25 km/liter (10 mpg) per second of time that the maximum average lap speed requirement is not met.
- D1.6.3 Competition organizer will issue one warning for excessive speed or “hot laps” that is viewed as a potential hazard for teams to rectify the issue; team may also be penalized by disqualification of completed fuel economy run at official’s discretion. Repeated offenses will be viewed as unsportsmanlike conduct and ultimately resulting in expulsion of individual driver and/or vehicle.
- D1.7 Start**
- D1.7.1 Prior to the performance run, an official fuel tank (supplied by the competition organizers) will be filled, weighed and installed on the vehicle. A member of the vehicle team will perform the installation of the fuel bottle into the vehicle. Team member installing fuel bottle must wear eye protection.
- D1.7.2 The start of the performance run will begin with the vehicle being placed on the track starting line by team members. Placement of the vehicle in the ready-to-start position requires the direction of the vehicle to be pivoted 180 degrees in order to face the correct direction for starting the fuel economy run. The vehicle engine is then started, either by the driver or team pit crew. Timing for the minimum speed requirement starts when the vehicle crosses the starting line. Teams will be allowed a maximum of eight

(8) starts for the competition; placement of a vehicle at the start line constitutes a “start” even if the engine is unable to start or the vehicle is unable to complete the fuel economy run successfully.

D1.7.3 Vehicles cannot be push started.

D1.8 Finish

D1.8.1 Upon completion of the six-lap performance run, 15.5 km (9.6 miles), the timers will record the elapsed time. The individual team is responsible for counting the number of laps for a vehicle on a fuel economy attempt. The team is also responsible to end the fuel economy attempt by exiting the track at the finish area. The fuel bottle will be removed by a member of the vehicle team; the team member must wear eye protection, and the member must de-pressurize any pressurized fuel systems. The removed fuel bottle will be weighed by the competition organizers.

D1.8.2 The kilometer per liter (miles per gallon) calculation for the vehicle will then be computed, dividing the 15.5 km (9.6 mile) distance by the amount of fuel used.

D1.8.3 If the maximum or minimum allowable elapsed time has been exceeded, the penalty will be computed and subtracted from the kilometer per liter (miles per gallon) calculation.

ARTICLE 2: GENERAL CONDUCT AND REGULATIONS

D2.1 Organizer Authority

The organizer(s) of the competition reserve the exclusive right to revise the schedule of the competition and/or to interpret the competition rules at any time and in any manner, which is in their sole judgment, required for efficient operation or safety of the competition. In the case of a violation of the rules or regulations stated in this document, organizer(s) of the competition reserve the right to refuse participation by any individual or team or school from future competitions.

D2.2 Unsportsmanlike Conduct

In the event of unsportsmanlike conduct, the team will receive a warning from an official. A second or repeated violation(s) will result in expulsion of the team member(s) and/or vehicle from the competition.

D2.3 Arguments with Officials

Argument with, or disobedience to, any official may result in the team being eliminated from the competition. All members of the team may be immediately escorted from the grounds.

D2.4 Rule Violation

Violation of the rules may result in the team being eliminated from the competition. All members of the team may be immediately escorted from the grounds.

D2.4.1 Violations of Intent

The violation of intent of a rule will be considered a violation of the rule itself.

D2.4.2 Questions about the intent or meaning of a rule may be addressed to the SAE Supermileage Rules Committee or to the individual competition organizers as appropriate.

D2.5 Right to Impound

SAE and the competition organizing body reserve the right to impound any on-site registered vehicles at

any time during a competition for inspection and examination by the organizers, officials and Technical Inspectors.

- D2.5.1 Any vehicle condition that could compromise vehicle integrity, the track surface or could pose a potential hazard to all participants, e.g. broken brakes or steering components, fluid leaks or excessive speed will be a valid reason for exclusion by the competition officials until the problem is rectified.

D2.6 Alcohol and Illegal Material

No alcohol, illegal drugs, weapons or other illegal material will be permitted on all areas and properties of the event site's host corporation. Corporate property starts upon leaving the public roadway and entering through the security station. This rule will be in effect during the entire competition. Any violation of this rule by a team member will cause the expulsion of the entire team. This applies to both team members and faculty advisors. Any use of drugs, or the use of alcohol by an underage individual, will be reported to the local authorities for prosecution. Visitors to the competition who are affiliated with a team are considered members of the team for purposes of this rule.

D2.7 Tobacco-Free Venue

The competition site is a tobacco-free venue. The tobacco ban applies to all areas and properties of the host corporation. Corporate property starts upon leaving the public roadway and entering through the security station. Violation of this rule may lead to expulsion of the participant **and** the expulsion of the team from the competition. Visitors to the competition who are affiliated with a team are considered members of the team for purposes of this rule.

ARTICLE 3: COMPLAINTS AND PROTESTS

D3.1 Complaints

Contest officials, as designated by the local organizer, will be available to listen to any complaints about errors in the scores or any other aspect of the competition, except the rules.

D3.2 Protests

D3.2.1 Cause of Protest

If a faculty advisor or team captain feels that a complaint was not properly addressed by the competition officials, he/she may protest.

D3.2.2 Protest Format

All protests must be filed in writing to the Chief Steward by the faculty advisor or team captain only. To have a protest considered, a team must be willing to put up one hundred (100) points which will be forfeited if their protest is rejected.

D3.2.3 Protest Period

Protests concerning any aspect of the competition must be filed within thirty (30) minutes of the end of the round or event to which the protest pertains to.

D3.2.4 Decision

The decision of the Competition Protest Committee is final. Any argument with, SAE staff, the Chief Steward or with any event official after a decision is rendered may result in immediate expulsion of all team members from the competition. Depending on the circumstances, individual team members or the entire team may be immediately escorted from the grounds.



APPENDIX A

2019 SAE Supermileage - Action deadlines

Eaton Vehicle Group Proving Grounds, 19218 B Drive South, Marshall, Michigan, 49068, USA
June 6-7, 2019

All submissions must be received by the deadline.

Registration

Registration opens on-line at: www.sae.org

10:00 AM EDT, Thursday, October 4, 2018

Registration fee

\$900.00 USD

Registration closes

11:59 pm EST, Monday, November 12, 2018

Engine Orders

Order engines on-line upon completion of registering

Engine order fee

\$325.00 USD

Engine order deadline

TBD

Design Report

Due by March 30, 2019

One (1) hardcopy of the Design Report MUST be post-marked on or before March 30, 2019, and sent to:

Supermileage Competition
Eaton
13100 E. Michigan Ave
Galesburg, MI 49053

An e-copy of the Design Report in Adobe Acrobat “pdf” file format MUST be sent prior to 11:59 PM, Eastern Time Zone, on March 30, 2019. Email to: Supermileage@Eaton.com

Subject line must read: [“School Name”] Supermileage Design Report

NOTE: Electronic files larger than 5 megabytes must be broken into smaller messages. Add identifier to message subject line and to electronic file indicating “Part 1,” “Part 2,” etc.

NOTE: Both the electronic copy and one hard copy of the design report MUST be submitted.

Rules Inquiries concerning SAE Supermileage

Questions about registration should be sent to CollegiateCompetitions@sae.org.

Any inquiries regarding the on-site event, rules, or general event questions specific to 2019 SAE Supermileage should be sent via e-mail to Supermileage@Eaton.com

Official 2019 SAE Supermileage Website: <http://www.sae.org/students/supermw.htm>



Appendix S

SAE Technical Standards

The SAE Technical Standards Board (TSB) has made the following SAE Technical Standards available on line, **at no cost**, for use by Collegiate Design teams. Standards are important in all areas of engineering and we urge you to review these documents and to become familiar with their contents and use.

The technical documents listed below include both (1) standards that are identified in the rules and (2) standards that the TSB and the various rules committees believe are valuable references or which may be mentioned in future rule sets.

All Collegiate Design Series teams registered for competitions in North America have access to all the standards listed below - including standards not specific to your competition.

See Supermileage Rule A2.7 “Technical Standards Access” for the access procedure.

SAE Technical Standards included in the CDS Rules

Baja SAE

J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width

J759 - Lighting Identification Code

J994 - Alarm - Backup – Electric Laboratory Tests

J1741 - Discriminating Back-Up Alarm Standard

Clean Snowmobile Challenge

J192 - Maximum Exterior Sound Level for Snowmobiles

J1161 - Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle

Formula Hybrid

J1318 - Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance and Service Vehicles

J1673 - High Voltage Automotive Wiring Assembly Design

Formula SAE

SAE 4130 steel is referenced but no specific standard is identified

SAE Grade 5 bolts are required but no specific standard is identified

Supermileage

J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width

SAE Technical Standards for Supplemental Use

Standards Relevant to Baja SAE

J98 – Personal Protection for General Purpose Industrial Machines – Standard

J183 – Engine Oil Performance and Engine Service Classification - Standard

J306 – Automotive Gear Lubricant Viscosity Classification - Standard

J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard

J512 – Automotive Tube Fittings - Standard



J517 – Hydraulic Hose - Standard
J1166 – Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle
J1194 – Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors
J1362 – Graphical Symbols for Operator Controls and Displays on Off-Road Self-Propelled Work Machines - Standard
J1614 – Wiring Distribution Systems for Construction, Agricultural and Off-Road Work Machines
J1703 - Motor Vehicle Brake Fluid - Standard
J2030 – Heavy Duty Electrical Connector Performance Standard
J2402 – Road Vehicles – Symbols for Controls, Indicators and Tell-Tales - Standard

Standards Relevant to Clean Snowmobile Challenge

J44 – Service Brake System Performance Requirements – Snowmobiles - Recommended Practice
J45 – Brake System Test Procedure – Snowmobiles – Recommended Practice
J68 – Tests for Snowmobile Switching Devices and Components - Recommended Practice
J89 – Dynamic Cushioning Performance Criteria for Snowmobile Seats - Recommended Practice
J92 – Snowmobile Throttle Control Systems – Recommended Practice
J192 – Maximum Exterior Sound Level for Snowmobiles - Recommended Practice
J288 – Snowmobile Fuel Tanks - Recommended Practice
J1161 – Operational Sound Level Measurement Procedure for Snowmobiles - Recommended Practice
J1222 – Speed Control Assurance for Snowmobiles - Recommended Practice
J1279 – Snowmobile Drive Mechanisms - Recommended Practice
J1282 – Snowmobile Brake Control Systems - Recommended Practice
J2567 – Measurement of Exhaust Sound Levels of Stationary Snowmobiles - Recommended Practice

Standards Relevant to Formula SAE

J183 – Engine Oil Performance and Engine Service Classification - Standard
J306 – Automotive Gear Lubricant Viscosity Classification - Standard
J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard
J452 - General Information – Chemical Compositions, Mechanical and Physical Properties of SAE Aluminum Casting Alloys – Information Report
J512 – Automotive Tube Fittings - Standard
J517 – Hydraulic Hose - Standard
J637 – Automotive V-Belt Drives – Recommended Practice
J829 – Fuel Tank Filler Cap and Cap Retainer
J1153 - Hydraulic Cylinders for Motor Vehicle Brakes – Test Procedure
J1154 – Hydraulic Master Cylinders for Motor Vehicle Brakes - Performance Requirements - Standard
J1703 - Motor Vehicle Brake Fluid - Standard
J2045 – Performance Requirements for Fuel System Tubing Assemblies - Standard
J2053 – Brake Master Cylinder Plastic Reservoir Assembly for Road Vehicles - Standard

Standard Relevant to Formula Hybrid

J1772 – SAE Electric Vehicle and Plug in Hybrid Conductive Charge Coupler

Standard Relevant to all CDS Competitions

J1739 – Potential Failure Mode and Effects Analysis in Design (Design FMEA) Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA) and Potential Failure Mode and Effects Analysis for Machinery (Machinery FMEA)