

24th ANNUAL SUPERMILEAGE CHALLENGE

May 2012

2011 - 2012 RULES



Overview of Competition:

The objective of the competition is to provide Industrial Technology/Technology Education students and MTEEA Clubs with a challenging project that allows practical experience in design, fabrication, and testing. This is exactly what the STANDARDS FOR TECHNOLOGICAL LITERACY from the International Technology and Engineering Educators Association are all about!

In an effort to increase support and promote Technology Education, public awareness in the area of fuel economy and student involvement, a fuel economy competition will be held every spring. Competing students and clubs will be challenged to build a one-person, fuel efficient vehicle powered by a single cylinder four stroke cycle engine. A new class of Plug-in Electric vehicles will also compete starting in 2012. The vehicles will run a specified course at a certain speed.

New schools to the competition are allowed only one vehicle entry their first year and they must compete in the Stock Class. Returning schools are allowed a maximum of two vehicle entries during their second year, and may compete in the Stock, Modified, Experimental, and/or E-85 Classes. Schools entering for the third time may enter three vehicles. Schools that are returning for a fourth year (or more), may enter four vehicles. Stock, Modified, Experimental, E-85 classes and Plug-in electric will not compete against each other. Each competes in a separate class.

This competition is open to entries from Industrial Technology Education classes and student clubs from Minnesota schools. **(Advisors must be a current MTEEA member)**

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2012

24th ANNUAL MTEEA SUPER MILEAGE CHALLENGE NOTICE OF INTENT TO ENTER

Our Tech-Ed class/club would like to enter the 2011-2012 MTEEA Super Mileage Challenge:

Name of School: _____ School District # _____

Materials will be sent to:

Name of Advisor/s: _____

Mailing Address: _____

City _____ State _____ Zip _____

E-Mail: _____

Phone Numbers: School (_____) _____ Fax (_____) _____

Home (_____) _____ cell phone (_____) _____

Number of vehicles entering: _____ **circle one class below for each car:**

Car #1.	Stock	Modified	E-85	Experimental	Plug-in Electric
Car #2.	Stock	Modified	E-85	Experimental	Plug-in Electric
Car #3.	Stock	Modified	E-85	Experimental	Plug-in Electric
Car #4.	Stock	Modified	E-85	Experimental	Plug-in Electric

New Schools or Advisors MUST run only one vehicle in the STOCK class.

Please return this form to: **Mike Sandell**
Chisago Lakes High School
29400 Olinda Trail
Lindstrom, MN 55045

E-mail: MTEAsupermileage@chisagolakes.k12.mn.us

THIS FORM AND \$60 ENTRY FEE (per car) MUST BE RECEIVED NO LATER THAN
December 15, 2011

All Late ENTRIES/MONEY that miss the deadline will cost \$90 per vehicle to compete!! (\$60 entry fees and \$30 late fee).

Teams with late proposals or waivers will not compete for trophies!!

PLEASE PLAN AHEAD. PLEASE BE SURE THE INFORMATION ABOVE IS ABSOUTELY CORRECT!!

"Please use the reverse side of this sheet to comment and tell us how we can improve this year's challenge!"

<http://MTEA.net/supermileage/smhome.htm>

2011 MTEEA Supermileage Proposed Schedule of Events

(subject to change, dates dependent on the availability of BIR)

Sunday, May 13:

7:00 pm Gates open

7:00–9:00 Team Check-In.

* Teams will find a pit area and then advisors will check in at Building B.

* Teams will be given a Technical Inspection line up number and Tech Inspection packets after they turn in their Team Check-In form.

* Tech inspection may be open Sunday evening until 10:00 pm.

* Tech inspection will be on a first come – first serve basis.

* Tech inspection will reopen at 8:00 am Monday morning.

7:00–9:00 Team pit area setup.

7:00 pm Competition Committee set-up

* Administration trailer setup

* Track setup

* Technical Inspection area setup.

* Tech Inspection training for officials.

Monday, May 14:

7:00 am Gates open.

8:00 am Tech Inspection opens!

11:00 am All teams must be on site and checked in! Late arrivals will not be allowed to participate in the competition!

11:00 am Required Advisors Meeting. All advisors must attend. If you miss this meeting, you and your team(s) will NOT be allowed to participate in the competition.

11:00 am Vehicle line up in track infield for group pictures

11:30 am Required Drivers Meeting and Sponsor recognition. All participants in the competition must attend!

11:00–12:30 Technical Inspection temporarily closed.

1:00 pm First competition run begins!

7:00 pm Technical inspection closed.

8:30 pm Last vehicle leaves start line.

9:00 pm All vehicles must be off the track.

Tuesday, May 15:

7:00 am Gates open.

8:00 am First run for day 2

2:30 pm Last vehicle run of the 2012 competition.

3:00 pm All vehicles must be off the track.

2:30-3:30 Pit area clean up

4:00 pm Awards ceremony

I. GENERAL RULES

A. **General Configuration**

1. The vehicle must have a minimum of three wheels touching the ground at all times.
2. Vehicle length, width, and height will not be regulated.
3. Teams must provide an 8½” wide x 11” high location on both sides of the vehicle for official vehicle numbers. **Number should be visible from front of vehicle.**
4. Body roll cage must protect driver. (2" above helmet of all drivers) * Detailed in section II-B.
5. NO head first vehicles will be allowed. Drivers are not allowed to operate a vehicle in a prone position.

B. **Engine Classifications**

If you have any questions or need clarification about any engine classification rules, please contact the MTEEA Supermileage Competition Committee.

1. **STOCK CLASS**

- a) The allowable base engines are an air cooled, four stroke cycle and must be Briggs & Stratton models 50032 (2.4hp), 93432 (3.5hp). The model 60102 (2 hp) is no longer considered a base engine and must compete in the Experimental Class. The Junior 206 engine will be used in the modified or E-85 classes only.
- b) The engine used on a stock vehicle must be box stock.
 - (1) No changes or modifications to the stock flywheel.
 - (2) No air filter removal or changes (including the stock filter canister)
 - (3) No changes in exhaust. The stock muffler must remain in place. *Detailed in section II-H.
 - (4) Governor mechanism must remain on the engine. The governor link may be removed
- c) Lengthening of the recoil rope is allowed to suit engine and driver positions.
- d) No other modifications to the engine (internal or external) are allowed in this class.

2. MODIFIED CLASS

- 1) The allowable base engines are an air cooled, four stroke cycle and must be Briggs & Stratton models 50032 (2.4hp), 93432 (3.5hp), or Junior 206 race engine. A NEW base engine for this class is the Junior 206 race engine. The model # 93432 L-head and 50032-0005-E1 Vanguard series engines will continue to be grandfathered in.
- 2) The block must remain stock from the main journals down.
- 3) An engine proposal for any modifications is required. *(outlined in Section III-J)
- 4) If no Engine Proposal is submitted, a vehicle must run in Exhibition Class!

3. E-85 CLASS

- a) This class will follow the same rules as the Modified class.
- b) Engines must be tuned to run a fuel mixture of an 85% Ethanol blend fuel.
- c) An engine proposal for any modifications is required. (outlined in Section III-J)
- d) If no Engine Proposal is submitted, a vehicle must run in Exhibition Class!

4. EXPERIMENTAL CLASS BRIGGS

- 1) This class will include any Briggs & Stratton engine other than base engines listed in the Stock Class. The allowable engines include Briggs prototypes, micro engines, Vanguard series, Intek series, or any other Briggs & Stratton engine new or old.
- 2) Any type of engine modifications (internal or external) are allowed as long as the base construction remains Briggs and Stratton.
- 3) The block must remain stock from the main journals down.
- 4) An engine proposal for any modifications or specifications is required. *(outlined in Section III-J)
- 5) If no Engine Proposal is submitted, a vehicle must run in Exhibition Class!

5. EXHIBITION CLASS

- a) The Competition Committee may reassign a vehicle into this non-competing class. Vehicles in this class must pass all Technical Inspection checks in order to participate.
- b) Only Briggs and Stratton engines are allowed in the competition.
- c) Performance Run calculations will be done but the vehicle will not be eligible for any awards.
- d) Reasons for reassignment into this class may include, but not be limited to:
 1. Failure to meet specified deadlines.
 2. Incorrect or inadequate Design/Engine Proposal.
 3. Not meeting vehicle requirements for a specific classification.
 4. Out of state entries.
 5. Other rulings made by a panel from the competition committee for unique circumstances that require a ruling on-site before/during the competition.

6. Electric Plug In vehicle class

Vehicles in this class must follow guidelines in the Electric Plug In vehicle section

C. Maneuverability

1. Each vehicle must have a steering geometry capable of a 35 foot minimum inside turning radius.
2. Drivers must have adequate visibility to avoid collision with other vehicles and maintain course direction.

D. Stability

1. Each vehicle will be required to demonstrate its longitudinal stability. The vehicle, with the qualified driver, must maintain full wheel contact on a ramp of 15 degree (measured from horizontal) when located statically on the ramp to the following configuration.
 - a) One front wheel and one rear wheel of the vehicle must contact a horizontal line (running the length of the ramp) on the ramp with the vehicle in full right and left turn positions. No supporting structure or wheel may contact the ramp below the horizontal line.
 - b) The steering wheel/wheels are to be turned lock to lock on the 15° angle ramp and the vehicle must demonstrate NO tipping.
 - c) This test must be performed without help to stabilize the vehicle from the pit crew.

E. Fuel

1. The fuel used for the Stock, Modified, Experimental, and Exhibition Class vehicles will be ethanol (10% Blend) so as to provide uniformity in the composition. It will be purchased on the first day of competition, for best results.
2. E-85 Class Fuel (85% Alcohol Blend) will be provided on site for the vehicles in the E-85 Class.
3. Fuel and fuel bottle for 2-cycle engines will be provided by the school. Bottles will be weighed in the same manner (before and after competition run) as other vehicles in the competition.

F. Driver Eligibility

1. All drivers must have a valid drivers license.

G. Electric Start Restrictions

1. The electric starter cannot be used to propel the vehicle forward in anyway (from a stopped position or while coasting).
2. Any vehicle found using an electric starter for forward propulsion will be eliminated from further competition and all previous successful runs will be forfeited. No exceptions.
3. Vehicles with electric start and using a centrifugal clutch must demonstrate that the clutch is not locked and will turn freely of the electric start!
4. Vehicles with electric start and using a belt drive system must have an electric start off switch connected to the belt drive system. Drivers must demonstrate to judges that when the belt drive system is engaged that the electric start is switched off and cannot be engaged in any way!
5. Stock engines may run electric starters, but the engine must not be changed in any way! (example: starters **are** allowed on the output shaft or drive train parts on Stock Class vehicles but the flywheel or recoil cannot be modified in any way).

H. Additional On-Board Equipment

1. In gas engine powered classes, batteries can be carried in each vehicle, and in no way can they be used to propel the vehicle.
2. The sole source of vehicle propulsion must be from the engine. This means no human power system, sails, etc.
3. If any inertial system is used, it must be at rest prior to the start of any performance runs.
4. Any vehicle found in violation of these rules will be eliminated from competition and any completed runs will be forfeited.

I. ELECTRIC (PLUG IN) VEHICLE CLASS

Vehicle construction: All of the rules that apply to all super mileage cars apply to plug in electric, (turning, safety, body panels, guarding, 2 kill switches, etc. etc.)

- a) For safety reasons, the maximum voltage provided by batteries is limited to 48V; this includes batteries connected in series, parallel or combination circuits. If an AC inverter is used, the voltage output of the inverter must not exceed 240V
- b) Any battery type may be used with some exceptions.
 - i. If Lithium-Ion or Lithium polymer batteries are used a battery monitoring system must be used for charging and a cut out circuit must be employed to ensure that the batteries are not drained too low. If you are not comfortable or knowledgeable about Lithium batteries do not use them, they can catch fire and can explode.
 - ii. Lead acid batteries must be factory sealed cells, no batteries that can leak.
- c) All batteries must be short circuit protected by fuses that are lower amperage than the wire size and the max battery current. Your fuses should be chosen to be 20% higher than the max acceleration current of the motor, and lower than the short circuit current of the motor (stalled motor).
- d) The propulsion battery should not operate any other electrical devices on the car (horn, lights, 2 way radio, etc). The sole source of forward propulsion should be the batteries that are being monitored by the meter listed below.
- e) A second battery system can be used to power non propulsion devices (horn, lights, 2 way radio, etc).
- f) All batteries and high current drive circuitry should be outside the driver's compartment.
- g) Competitors must provide in your design proposal electrical schematics that include all electrical components (batteries, switches, fuses, etc.).
- h) Power consumption will be measured by an Astroflight Super Wattmeter. Each competitor will be required to install this meter that you must purchased, between the motor drive circuit and the electric motor. If you are using an AC inverter, you must install the device between the battery and the inverter. This device is used to measure voltage and current and display Killowatt hours of electrical energy used. This can be purchased through "The Robot Market Place." Go online Google Robot Market Place. They currently cost \$55.
- i) At least one student will need to explain the electrical schematic drawing and point out the components in the car to a judge during the technical inspection. They should be able to describe what happens in the event of a stalled motor or short circuit.

II. REQUIRED SAFETY ITEMS:

In order for the vehicle to pass Technical Inspection, the following are the minimum safety items required of all vehicles. Failure to comply with these specifications at any time will result in removal from the competition until such infractions are corrected. **The Competition Committee reserves the right to call questionable vehicles to the Officials Building to re-inspect and determine if a said vehicle violates any competition rules.**

A. ***Kill Switches***

1. A minimum of two kill switches grounding the engine ignition are required. One must be mounted in easy reach of the driver, and one must be accessible from outside the vehicle (for pit crew). The factory mounted engine kill switch does not count as one of the required kill switches.
2. All kill switches must be a toggle type with a minimum of a 1/2" metal paddle. Plastic switches or doorbell type, or other momentary action switch style will not be allowed.
3. For all Stock Class vehicles, the existing switch in the shroud of the engine must remain as an additional functioning kill switch.
4. **The exterior kill switch must be marked with a bright color marking, the switch plate no less than 2" x 2" square. RUN and KILL positions with 1/2" tall letters (minimum).**
5. All kill switches on the vehicle (for driver, pit crew, and on engine shroud) must be functional and capable of stopping the engine at all times.

B. ***Roll cages and body panels***

1. The purpose of the required cages, panels, and shields is to maintain student safety in case of an accident.
2. The driver's body (including arms and legs) must be substantially enclosed by body/frame/rollcage at all times while driving.
3. Roll cages are required. They must be substantial and prevent accidental contact between the ground and the driver's arms & legs. If vehicle is a frame covered with shrink wrap, frame must be first point of contact in case of a roll over.
4. The required roll bar must be located directly above the highest point of the driver's helmet in the driving position. The roll bar must extend at least 2" above the driver's helmet.
5. All drivers, when belted in, must not be able to extend their head over the roll cage.

C. ***Body***

1. The driver must be shielded from the ground using a substantial material.

2. Plastic film such as shrink wrap is not an acceptable material for protecting the driver from contact with the ground.

D. Driver attire

1. The driver must wear a motorcycle type (DOT approved or Snell rated helmet). A hard shell bicycle type helmet will NOT be allowed.
2. Eye protection must be worn by the driver at all times. It may be a full-face visor shield, prescription glasses, and sun glasses or approved safety glasses.
3. Shoes are required to be worn during the performance run. Sandals are not allowed.
4. Drivers must be wearing minimum standard short sleeved shirt and shorts.

E. Fuel and Lubrication Systems

1. Fuel and lubrication systems should be designed so that any loss of fluids will not result in a fire hazard. The entire fuel bottle must be mounted below and behind the vehicle firewall.
2. Pressurized bottles will not be allowed, with special exception to modified engines using fuel injectors.
3. All push-on fuel lines fittings must be clamped. Secure loose lines to the vehicle.
4. Care should be taken to provide a readily accessible mounting location for the fuel tank.
5. All fuel bottles must stand straight up. No tilting of tanks in any way will be allowed.
6. All fuel lines must be **clear and colorless plastic, 1/4" I.D.**
7. Fuel lines must have a total length no longer than 24 inches but be long enough, and in clear view, to remove all air bubbles between the carburetor and the fuel bottle.
8. Fuel filters are optional. They must be clear to visibly remove any bubbles that may occur during any runs. They must be installed within 6 inches of the fuel bottle. Filter must be installed prior to Tech. Inspection. (note: be sure to install the filter in the correct direction for proper fuel flow).

F. Brake System

1. The brake system must be adequate for safely stopping the vehicle in a reasonably straight line.
2. Brakes must hold the vehicle and driver on the 15 degree ramp in a fully-stopped static position when the vehicle is aimed in a downhill position.

G. Fire Extinguishers

2. A multipurpose (min. 2 lb.) ABC dry chemical fire extinguisher, rating No. 1A10BC or equivalent must be provided.
3. The extinguisher must be securely mounted so that the driver can direct the extinguishing agent on the fuel tank and engine area.
 - a) If the driver has sufficient freedom of movement in the event of a fire to remove the extinguisher from its bracket and direct it on the above mentioned areas, the design will be allowed.
 - b) If the driver does not have sufficient freedom of movement, some method must be provided to accomplish the desired result (example: a system of tubing and remote actuation).
4. Alternate delivery systems will be allowed but only if actual test result documentation is available through a faculty advisor.
5. All fire extinguishers must be equipped with a manufacturers installed pressure/ charge gauge. Gauge must be readable for Tech Inspection.
6. All teams are required to have in their pits a large (minimum 5 pound) ABC fire extinguisher. This must be with you when going through Technical Inspection.

H. Exhaust System

1. Engine exhaust must exit the vehicle body (exhaust cannot be enclosed).
2. Tail pipes must be added to the muffler to clear the body.
3. The muffler must remain in the factory position in Stock class.

I. Fire Wall

1. A wall of steel, aluminum or aluminum composite material of 0.032" minimum thickness must separate the driver from the engine.
2. Firewalls must extend from the belly pan of the vehicle to the top of the roll bar. They must also extend to the sides of the width of the vehicle frame or body
3. Vehicles with an enclosed body must have a firewall that completely separates the driver's area from the engine compartment.

4. The fire wall cannot interfere with the operation and use of the fire extinguisher.

J. Exitability

1. The driver must be able to exit the vehicle in less than 15 seconds, unassisted, in case of an emergency.

K. Rear View Mirrors

1. All vehicles must be equipped with at least two (2) rear view mirrors that have a minimum of 7 square inches each. Mirrors must give the driver a clear view to the track area behind the vehicle. Convex mirrors are not recommended.
2. Rear view camera system will be allowed in lieu of mirrors if the viewing screen is at least 2" x 1½" and the image is displayed for the driver at all times.
3. Drivers must correctly identify an 8" geometric object at a distance of 15 feet behind the vehicle, while the engine is running!

L. Visibility

1. The driver must have good visibility forward and to each side from 90 degrees from dead ahead.

M. First Aid Kit

1. Each team is required to have with them, a large TEAM first aid kit. This must be with you when going through Technical Inspection.
2. The contents will be left up to the discretion of each school and team. It is good to have burn ointment and large gauze pads.
3. Large (school type) first aid kits are very good.

N. Seat Belts

1. A minimum 4-point harness is required, including lap and shoulder belts. **Starting with the 2013 Challenge, a minimum 5 point harness will be required. (Cost for 4 point and 5 point is the same, if buying new, buy a 5 point harness)**
2. Each driver is required to be belted in using an automotive type seat belt.
3. No tape or rope type harnesses will be allowed.
4. Five point parachute or Jr. Dragster type harnesses are superior, but not required.

O. Vehicle Marker Flag

1. It has been requested by BIR that each vehicle have a Safety flag attached to each vehicle while operating in the pit and test area.
2. The flag will be a 5' rod (1/4" diameter) with an orange flag similar to a children's bicycle flag. The flag will be provided to each team at Technical inspection. (flags will identify the car number)
3. Each team is responsible to have a method of mounting the flag in place at the time of Technical inspection. Flag must be attached vertically on the vehicle.
4. The flag can be removed upon entering the start area and must be re-attached before leaving the finish area.

III. DESIGN PROPOSAL:

(Please read instructions carefully)

A Design Proposal is required of every vehicle entered in the competition.

The design proposal serves two purposes. First, it is an information document to determine how a vehicle adheres to the rules. Second, it ensures that the entry is a result of a genuine design effort.

The competition committee will review all vehicle drawings and documents submitted as part of the Design Proposal approval process. Teams are responsible for preparing and submitting documentation to describe how they intend to construct their vehicle to follow all of the rules and maintain driver safety.

The first section of the Design Proposal is the Vehicle/Power Train Design Proposal which covers items **III-A through III-I** below and must be received by February 28, 2012.

The second section is the Engine Design Proposal for Modified Vehicles which covers item III-J and must also be received by February 28, 2012. Engine Proposals are required if the vehicle is intended to compete in the Modified, Experimental, or E-85 Class. Vehicles entering the Stock Class do not require an Engine Proposal.

The third section is the Re-Entered Vehicle Proposal which covers item III-K and must also be received by February 28, 2012. This is required for any vehicle which is being re-entered from a previous competition to document the changes that will be made to the vehicle by the team.

Design Proposals must be submitted to the competition committee governing the Supermileage Challenge.

Mail to:

**Mike Sandell
Chisago Lakes High School
29400 Olinda Trail
Lindstrom, MN 55045**

email: MTEEAsupermileage@chisagolakes.k12.mn.us

**All Late ENTRIES/MONEY/PROPOSALS/WAIVERS that miss the deadlines
will cost \$90 per vehicle to compete!!! (That's \$60.00 per vehicle PLUS a \$30.00 late fee.)
DON'T BE LATE THIS YEAR!!**

A. General Information:

These proposals should be in the form of **drawings and written descriptions**. Changes in design between date of submission and competition date will be allowed; however, information regarding the **changes must be presented in writing** at the competition or re-submitted to the Competition Committee beforehand as a modified Design Proposal. If a team has built their vehicle to compete in a different class than they have listed in their Design Proposal, they must declare that to the Official when they enter the Technical Inspection area and bring with them a revised design proposal and be prepared to explain their changes from their original design. **If a revised Design Proposal is not submitted, the vehicle must run in the Exhibition Class.**

All design proposals will be held in strict confidence. The following subjects must be covered in the design proposal and all Design Proposal submissions must follow the format listed below:

B. Cover Page (REQUIRED)

The cover page must include the following information:

1. School Name,
2. Vehicle Class (Stock, Modified, E-85, Experimental)
3. Indication of “New” or “Re-entered” vehicle
4. Team Name (and/or) Car Name
5. Participating Students
6. Advisor(s) Name
7. Advisor(s) contact information (phone & email)

C. Section 1: Basic Vehicle Configuration Drawings

1. These drawings should show basic vehicle layout. This section of the design proposal should be in Orthographic Projection form and include all important information and dimensions.
 - a. Drawings showing the front, top, and side view of the vehicle (minimum requirements). Drawings may be done by CAD and/or traditional drafting techniques.
 - b. General arrangement and location of components identified on drawings:
 1. Wheels
 2. Engine
 3. Steering
 4. Firewall
 5. Roll bar
 - c. General dimensions
 1. Length
 2. Width
 3. Height

D. Section 2: Vehicle Description

1. A written description must detail the vehicle layout and components. This section of the design proposal should be in paragraph or bulleted form and must include the following important

information:

- a. General written description of vehicle describing chassis material, type and size, body components, and any other specific details unique to the vehicle.
- b. Driver position while driving the vehicle.

E. Section 3: Power Train Configuration

1. This section should include a written discussion of how the engine is connected to the drive wheel/wheels. Additional drawings or pictures of drive system are suggested.

F. Section 4: Performance Calculations

1. This section should include:
 - a. Information (calculations) on projected vehicle speeds using gear ratio of drive train.
 - b. Braking and mileage estimates or testing / previous competition data.

(Performance calculation resources are available at the MTEEA Supermileage website)

G. Section 5: Brake System

1. This section must include written description of the braking system. Additional drawings or pictures of braking system are also very helpful.
 - a. Brake operation and characteristics for each vehicle will be different. Vehicle speed and weight should be taken into careful consideration when designing a brake mechanism.

H. Section 6: Cost Estimate

1. An estimate of the total cost of the vehicle must be provided with the Design Proposal.
2. Itemized list and prices of all materials and components purchased or donated is required.
3. List must include purchase cost of reused components.
4. Re entered vehicles must include original cost estimate and cost estimate for vehicle updates.

I. Section 7: Safety Items

1. Written description of all safety items in Part II Safety Items. (pages 12-16)
2. Clearly describe your vehicle design will meet the requirements of each item II A through II O.

J. Section 8: Engine Proposal (not required for Stock Class)

1. An engine design proposal must be received by February 28, 2012 if the vehicle is entered in the Modified, Experimental, or E-85 class.
2. This proposal must itemize all planned engine modifications from the base engine, including the model number of the engine being used.
3. A list of all altered parts must be included in the proposal.

K. Re-entered Vehicles

Because of the increasing expenses of the vehicles and their parts, the Competition Committee will allow vehicles to be run year after year, with the stipulation that modifications must be performed by the team each year. Vehicles can not be entered "as is". They must reflect an effort to improve the vehicle, its efficiency and safety. The MTEEA Supermileage Competition Committee strongly suggests that all reentered vehicles be completely disassembled by the new team using it. This would allow team members to become familiar with the vehicle, its original design, safety features and to make an educated evaluation regarding redesign/modifications/changes to improve overall fuel efficiency, performance and safety. Schools have the option to reenter vehicles as long as the reentry follows challenge criteria.

In lieu of the traditional Design Proposal, a re-entered vehicle must submit a “Re-entered Vehicle Design Proposal” that covers all of the following items:

1. Teams must submit a copy of the previous Design Proposal for any re-entered vehicle.
2. Any modifications from the previous design must be documented by drawings and written descriptions following the Design Proposal format of items III-A through III-J.
3. Changes/modifications from the previously entered vehicle design must be documented in the Re-Entered Vehicle Design Proposal by including digital photos to demonstrate that substantial changes will be made for this year’s entry.
4. Changes must be explained clearly as to what improvements were made as part of the Design Proposal, as well as during Technical Inspection. This process will be left up to the integrity of the teams and advisors. However, many returning vehicles use parts from previous years, which is OK (such as engines wheels, mirrors, fire extinguishers, switches, gears, etc.).
5. Teams will need to indicate on Technical Inspection forms that the vehicle is a “re-entry”.

Inspectors will ask for, and expect to receive, detailed information regarding vehicle modifications from the previous entry. Competitors will need to demonstrate clear knowledge of vehicle modifications and the purpose of those modifications.

6. Modifications can be: (may be any or all listed below)
 - a. Structurally
 - b. Drive train and components
 - c. Aerodynamically
 - d. Technology applications
 - e. Safety features
 - f. AND consists of a new team creating the changes and operating the vehicle
7. A record will be maintained of all vehicle re-entries.
8. Any re-entered vehicles/engines must reflect major vehicle improvement modifications that were made to improve performance, aerodynamics or economy. Vehicles that are re-entered and do not reflect a genuine effort to modify and improve the overall vehicle will be reassigned to the Exhibition Class at the conclusion of a successful vehicle inspection. Again, competitors will need to demonstrate clear knowledge of vehicle modifications and the purpose of the vehicle modifications.

IV. COMPETITION PROCEDURES:

A. Team Check-In

1. All teams must turn in a Team Check-In form immediately after entering the BIR facility to inform the event officials of the following items: advisor(s), on-site contact information, team waiver verification, and pit locations.
2. Teams will be dropped from the competition if the team has not turned in their Check-In form to the officials by 11:00 am Monday.

B. Technical Inspection

1. Teams will be given Tech Inspection packets after they turn in their Team Check-In form.
2. Technical Inspection **may** begin Sunday evening or Monday at 8:00 am. Inspection will be on a first vehicle in line- first serve basis.
3. Safety flags will be given out upon completion of technical inspection.
4. A vehicle will not be allowed on the racetrack until after it has passed all sections of the Technical Inspection and received an official car number has been installed on the vehicle.

C. Advisors Meeting

1. All team advisors must attend the Advisors Meeting to receive specific event details.
2. Attendance will be taken at this meeting and the team(s) will NOT be allowed to participate in the competition if they are not present for the Advisors Meeting.

D. Drivers Meeting

1. All team members and advisors must attend the Drivers meeting to receive specific instructions, rules clarifications, and other important information.
2. Attendance will be taken at this meeting and the team(s) will NOT be allowed to participate in the competition if they are not present for the Drivers Meeting.

E. Start Line Area

1. Prior to the performance run an official fuel tank (provided by MTEEA) will be filled and weighed for each vehicle.
2. One of the team's pit crew will be required to attach the official fuel bottle to the car under the supervision of a competition official.
3. The start of the performance run will begin with the vehicle being placed just behind the start line.

The vehicle engine is then started, either by driver or pit crew.

4. Timing for the minimum mph requirement starts when the vehicle crosses the start line. **VEHICLES CANNOT BE PUSH STARTED.**
5. Transmission design must be such that the engine can be disconnected from the driving wheel/wheels so as to allow the vehicle to coast or remain stationary with the engine running.

F. Performance Runs

1. Maximum speed limit is 30 MPH while on the track.
2. Speed limit is 5 MPH while in the pit area.
3. Helmet and eye protection is required any time the vehicle is being operated on track or in pit and test area..
4. Each vehicle will be required to complete two (2) laps around the 3 mile track area.
5. All vehicles will be required to maintain an overall minimum speed of 15 mph (24 Km/hr.). This would give each driver 24 minutes maximum to complete the two (2) laps (average of 12 minutes per lap) without a penalty.
6. Cars coasting are required to stay to the right hand side of all track areas.
7. Cars accelerating are required to keep to left side track areas.
8. Drivers must always look for other cars while driving, especially during accelerating!
9. Teachers/Advisors will not be allowed to work on the vehicles in the pits during testing and competition except to supervise student progress.
10. Teachers/Advisors will be assigned jobs upon completion of Technical Inspection. These tasks are during competition activities such as timers, spotters, or fuelers.
11. Advisor is responsible for all members of their team. Other students or parents may attend as spectators.
12. Once a driver has started a run he/she is the only person that can make repairs while the vehicle is on the track - pit crew members can get tools but cannot assist in any repair work!
13. Vehicles will be allowed to coast during mileage runs. Coasting vehicles must have a system for the driver to restart the engine.
14. Assigned judges will monitor vehicle speed during competition. Any vehicle that is driving excessively fast or recklessly will receive a warning and that driver will be suspended from anymore

driving (including testing in pit areas), wrist band will be removed. A second violation will suspend a vehicle or team from any further competition!

15. No radar detectors will be allowed on vehicles.
16. The Competition Committee reserves the right to call questionable vehicles to the Officials Building to re-inspect and determine if a said vehicle violates any competition rules. If a vehicle is in violation of competition rules, it will be eliminated from the competition and any completed runs will be forfeited. The Competition Committee members reserve the right to tear an engine down and inspect it!

G. Finish Line Area

1. Upon successful completion of the performance run the timers will record total elapsed time.
2. The fuel system cannot be touched until approval is given by an official.
3. An event official must approve a team pit member to remove the official fuel bottle so the team can bring it to the Official's Trailer for weighing.

H. Performance Run Calculations

1. The miles-per-gallon rating for the vehicle will be computed by dividing the distance traveled by the amount of fuel used for each performance run.
2. If the maximum allowable elapsed time has been exceeded, the team will be assessed an "over-time penalty" of "-10 mpg" for each second that the vehicle was over the allowed time (24 minutes).
3. Teams best six (6) runs will be averaged for the challenge to determine class champions for each of the classes (Stock, Modified, Experimental, and E-85).
4. Exhibition class vehicles are not eligible for any awards.

I. Cheating

1. Any team, or students, cheating, will be dropped from the challenge and all rights forfeited.

J. Alcohol, Drugs, & Tobacco

1. We follow all MSHS League rules regarding Alcohol, Drugs, & Tobacco.

K. Appeal Process

1. Any team who has a dispute with an Official's ruling/ scoring/ performance data decision will be required to create a written letter of appeal and submit it to a member of the competition committee in

the Administration Trailer within 30 minutes of the ruling.

2. Any appeal must include the following items:
 - a. Name of school
 - b. Car number
 - c. Detailed description of the dispute the team is appealing
3. The competition committee will consult to make a final ruling within 30 minutes of receiving any appeal letter.

The fullest appreciation is expressed to the Society of Automotive Engineers for the rules used for this challenge!

ELECTRIC PLUG IN CLASS **these items could be listed under I-B-6**

Vehicle construction: All of the rules that apply to all super mileage cars apply to plug in electric, (turning, safety, body panels, guarding, 2 kill switches, etc. etc.)

- a) **For safety reasons, the maximum voltage provided by batteries is limited to 48V; this includes batteries connected in series, parallel or combination circuits. If an AC inverter is used, the voltage output of the inverter must not exceed 240V**
- b) **Any battery type may be used with some exceptions.**
 - i. **If Lithium-Ion or Lithium polymer batteries are used a battery monitoring system must be used for charging and a cut out circuit must be employed to ensure that the batteries are not drained too low. If you are not comfortable or knowledgeable about Lithium batteries do not use them, they can catch fire and can explode.**
 - ii. **Lead acid batteries must be factory sealed cells, no batteries that can leak.**
- c) **All batteries must be short circuit protected by fuses that are lower amperage than the wire size and the max battery current. Your fuses should be chosen to be 20% higher than the max acceleration current of the motor, and lower than the short circuit current of the motor (stalled motor).**
- d) **The propulsion battery should not operate any other electrical devices on the car (horn, lights, 2 way radio, etc). The sole source of forward propulsion should be the batteries that are being monitored by the meter listed below.**
- e) **A second battery system can be used to power non propulsion devices (horn, lights, 2 way radio, etc).**
- f) **All batteries and high current drive circuitry should be outside the driver's compartment.**
- g) **Competitors must provide in your design proposal electrical schematics that include all electrical components (batteries, switches, fuses, etc.).**
- h) **Power consumption will be measured by an Astroflight Super Wattmeter. Each competitor will be required to install this meter that you must purchased, between the motor drive circuit and the electric motor. If you are using an AC inverter, you must install the device between the battery and the inverter. This device is used to measure voltage and current and display Killowatt hours of electrical energy used. This can be purchased through "The Robot Market Place." Go online Google Robot Market Place. They currently cost \$55.**
- i) **At least one student will need to explain the electrical schematic drawing and point out the components in the car to a judge during the technical inspection. They should be able to describe what happens in the event of a stalled motor or short circuit.**

