WATERLOO | ENGINEERING

Waterloo High School
EV Challenge

2026 EVENT RULES

Updated September 2, 2025

1. Electric Vehicle Challenge

High School and College students, with the assistance of their technology teachers or other mentors, design and build battery powered vehicles capable of carrying a driver the maximum distance on a single charge. The Electric Vehicle (EV) Challenge consists of three endurance races: two heat races and a feature race.

1.1. Mission Statement

The Waterloo Electric Vehicle Challenge mission statement is to:

1. **Provide an accessible enrichment program**. The event organizers seek to reduce barriers to entry and keep a level playing field for all teams, regardless of their financial resources

2. **Provide a safe event for teams to celebrate their success**. The EV Challenge makes every effort to ensure its events are as safe as possible for teams.

3. **Support the growth of the EV Challenge community in Ontario**. The formation of new teams is actively encouraged, with the responsibility for mentoring and promoting new teams shared between the event organizers and established teams. The EV Challenge will actively seek financial support for new teams.

1.2. Race format

Starting in 2026 schools will be limited to bringing one car to the competition. This car will participate in one of two heat races in the morning, and cars that qualify will be entered in the feature race in the afternoon. Teams must use the same car for the heat race and feature race; switching cars between races is not permitted.

1. All races will use a single 12-volt battery and will be 70 minutes in duration.
2. Two 70-minute duration heat races will be run in the morning, and cars will participate in one of these two heat races.
3. Each heat race will have (approximately) the same number of cars, up to a maximum of 20 cars per heat race.
4. The cars competing in each heat race and their starting order will be randomly chosen from the list of pre-registered teams one week prior to the race. Any cars registered after this date will be placed at the end of the starting order.

The top 5 eligible cars from each of the heat races will qualify for the feature race held in the afternoon. The starting order for the feature race will be the finishing order of the two heat races

1.3. Eligible Vehicles to Enter Competition

The goal of the EV Challenge is to provide students with an opportunity to design and

build an electric vehicle according to specifications presented in the competition rules. This goal cannot be achieved when schools purchase and use pre-manufactured vehicle kits or bring the same vehicle back to the competition year after year. To encourage teams to provide design and fabrication experiences for their student members, the following rules will be enforced for all entries.

1. **The use of pre-designed vehicle plans, prefabricated vehicle kits or frames from other teams is prohibited.** The necessary engineering knowledge and technical information will be gained through research and experience and utilizing the fabrication knowledge and skills of the team members and their mentors.

    - The use of a pre-designed, purchased kit for an EV Challenge vehicle, including copying its dimensions or modifying it to meet competition specifications, is prohibited

    - Teams may not use a frame or a portion of a frame donated by another team to construct their vehicle.

    - Inspection / verification will be part of the Safety Inspection at the EV Challenge race. Ineligible cars will not be allowed to participate, and the judge's decision is final.

2. **All major vehicle components must be designed and manufactured by students.** The goal of the EV Challenge, *to provide students with an opportunity to design and build an electric vehicle,* cannot be achieved unless this work is done by students.

    - The frame must be fully designed and built by students. Teachers and mentors can provide support and guidance but the fabrication should be completed by students.

    - Major vehicle systems, such as steering, brakes, drivetrain, electrical and controls, must be fully designed and assembled by students with assistance from teachers and mentors. The use of off-the-shelf components is allowed, for example a steering rack or brake rotors and calipers

    - External fabricators can be used to machine or weld complex parts provided a) the parts are designed by students, and b) the parts comprise less than 5% of the overall mass of the vehicle

3. **A new vehicle built by a team, referred to as an eligible car, can be raced for a maximum of 3 competition seasons;** after this is will be considered a classic car and will not qualify for future competitions. For 2026, a car first raced in 2024 is an eligible car, a car first raced in or before 2023 is a classic car. The 3-year limit will be monitored and enforced by the race organizers as follows:

- A new vehicle has a chassis that has been designed and fabricated from basic materials. Steering, brakes, wheels, and drive system components from a previous vehicle can be reused when constructing a new car, provided the previous vehicle belongs to the team.

- Modifications to an existing car, such as a new steering or drive system, or remanufacturing a portion of the chassis, is not considered building a new car. Modifying a car does not change its 3-competition season limit.

- All cars must have the year of completion permanently affixed (welded, embossed) on the frame in at least 3 different locations. Teams are expected to provide an honest, accurate disclosure of the age of the car. The car will retain these same year labels for all the times that it is entered in the competition.

- Inspection / verification of car year labels will be part of the Safety Inspection at the EV Challenge race. Cars that do not have year labels or are not eligible will not be allowed to participate and the judge's decision is final.

4. **Teams may continue to race a classic car at all EV Challenge events.** In order to allow participation by all schools and to consider situations where a school is unable to design, construct or complete a new vehicle, teams will be permitted to compete at the EV Challenge as follows:

   - A classic car is defined as a car that is more than 3 years old, counted from the first EV challenge event it has competed in. For 2026, a car first raced in or before 2023 is considered a classic car.

   - A team may enter a classic car in one heat race only

   - A classic car is eligible to win a first, second or third place award in the heat race

   - A classic car does not qualify to participate in the feature race regardless of position at the end of the heat race

   - Inspection / verification of cars (eligible and classic) will be part of the Safety Inspection at the EV Challenge race and the judge's decision as to a car competing or not is final.

1.4. EV Challenge Website

The EV Challenge website is available at uwaterloo.ca/evchallenge. It is kept up to date through the year and contains race results, registration instructions, and other important information for teams.

2. Registration

2.1. Online registration

Teams must complete an online registration to compete at the Waterloo EV Challenge. This is done on the EV Challenge website and must be completed prior to the competition date. A registration fee of $50 per team will be charged as part of the online registration process. The registration fee can be paid by debit or with credit card, or by cheque mailed to the event organizers.

2.2. Restriction of race entries

The race organizers reserve the right to restrict or refuse entry into any of the races based on safety requirements as follows.

- Registration for the Waterloo EV Challenge is limited to 40 teams, and teams that register after this will be put on a cancellation list
- If during inspection a design flaw or fabrication problem is identified by the safety inspector that would cause the car to be unsafe in operation, the race organizers may decide to restrict that car to participate in one of the heat races only.
- If during the heat race the marshals or scoring team identify a problem with the operation of the car that would cause it to be unsafe in the feature race, the race organizers may decide to not allow the car to compete in the feature race.

Each team must ensure they are designing and fabricating their car according to the design rules, and all cars should be tested prior to the race to ensure the car is stable and the critical safety components, including the steering and brakes, are working well.

2.3. Certificate of Insurance

A **Certificate of Insurance** will be required for any team that is not affiliated with an Ontario Secondary School or an Ontario Catholic Secondary School, such as College teams or community teams.

2.4. Early Vehicle Drop-off & Safety Inspections

Teams are permitted to drop off their vehicles on Friday afternoon prior to the race. Teams may also complete their safety inspections during this time. Secure storage for vehicles and trailers will be provided for all teams.

3. Competition Classes

There are two different classes in the competition: one for high school students and one for college students. Each class builds their vehicle and competes according to a different set of rules, as follows.

3.1. High School Team

A high school team is defined as a group of students that are currently enrolled in high school working together to design, build and race a vehicle. A team does not have to be associated with a particular school, but must have a teacher, parent or mentor acting as a supervisor for the team. All vehicles must be designed and built according to the Vehicle Design Rules.

3.2. College Team

A college team is defined as a group of students that are currently enrolled in a post-secondary college working together to design, build and race a vehicle. A college team must be associated with a particular college and must have at least one teacher or mentor from that college acting as a supervisor for the team. All vehicles must be designed and built according to the Vehicle Design Rules.

4. Vehicle Design Rules

All vehicles competing in the EV Challenge must conform to the following design guidelines. (These have been taken primarily from the *Electrathon America* design guidelines and adapted for use in the EV Challenge)

4.1. Dimensions

4.1.1 The distance between the tires must be at least 0.90 m, center to center.

4.1.2 The vehicle may be no wider than 1.2 m at its widest part.

4.1.3 The maximum vehicle length is 3.5 m.

4.2. Configuration

4.2.1 Vehicles must be three- or four-wheeled. All wheels must be load-bearing and must always remain in contact with the ground.

4.3. Driver position

4.3.1 The driver must be in a seated, forward-facing position

4.3.2 Arms and legs must remain within the vehicle body structure during normal operation of the vehicle.

4.3.3 The driver must be able to see the track surface a minimum of 2 meters in front of the car

4.3.4 The driver must have at least 180 degrees direct visibility and up to 300 degrees visibility using mirrors. Convex mirrors should be used to eliminate blind spots

4.4. Frame

4.4.1 All vehicles must have a frame with sufficient strength and structural members that protect the driver as follows.

(1) The frame extends beyond the driver's feet and has sufficient height and structural strength to protect the driver in the case of a front end collision

(2) The frame has sufficient height and structural strength to offer side protection for the driver's legs and arms. Two horizontal members spaced at between 6 and 10 inches apart are required to protect the driver's legs.

(3) Frames must be constructed using steel or aluminum. Members may be joined by welding or with bolts or rivets. Non-structural frame members may be constructed using other materials, including wood, plastic, composites, etc.

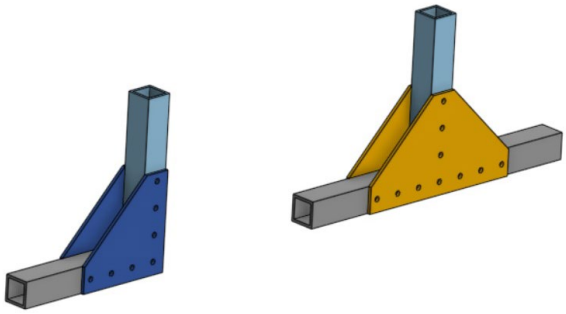
(4) For frames members joined by rivets the following minimum requirements must be met:

(i) Rivets can be steel or aluminum, with a minimum diameter of 3/16 inch

(ii) Two gusset plates with a minimum thickness of 1/8 inch must be placed on opposite sides of each joint

(iii) Gusset plates must be sized to allow a minimum of 3 rivets to be fastened in each part of the joint, with a maximum distance between rivets of 1 inch.

(iv) The following diagram shows examples of riveted joints that meet these requirements.



(5) If a team intends to fabricate a frame or any structural members using other materials such as wood, they should contact the event organizer for approval. The use of carbon fiber for any structural members is prohibited.

4.4.2 The first year when the chassis was raced must be permanently marked on the vehicle frame in 3 locations: at the front, the rear and on the roll bar. Valid marks include etching, welding or machining.

4.5. Roll bar

4.5.1 There must be a roll bar that extends 50 mm over the top of the helmet of the tallest driver. It must be constructed so that, in the event of a roll-over, the driver's head is fully protected throughout its full range of motion.

4.5.2 The roll bar must be made from steel or aluminum, either one piece or having separate pieces that are joined by welding or bolts. **Rivets may not be used to join roll bar members.**

4.5.3 The roll bar must be fastened to the frame using welding or bolts. **Rivets may not be used to attach the roll bar to the frame.** Bolts must be a minimum of 0.25 inch or 6mm diameter, with a minimum number of 2 per joint member for roll bar fabrication and mounting.

4.5.4 The roll bar must be triangulated, having at least 3 connection points to the frame

4.6. Vehicle body

4.6.1 Canopies that fully or partially cover the driver are not allowed

4.6.2 The body must have a floor to prevent the driver from contacting the ground.

4.6.3 The driver must be protected from contact with the tires or wheels.

4.6.4 The driver's legs and feet must be enclosed to prevent them from leaving the vehicle in the event of an accident.

4.6.5 Self-tapping screws are prohibited on vehicles as they can loosen, fall on the racetrack and cause tire failure. Machine screws or rivets are both suitable fasteners.

4.7. Steering

4.7.1 The vehicle's steering must allow for a turn within a radius of 5 m.

4.8. Brakes and axles

4.8.1 The braking system must be designed to provide stability (equal braking on both sides of the vehicle) and redundancy (vehicle can still be stopped in event of brake component failure). This is normally achieved using brakes fitted to two wheels of the same axle – either two on the front or two on the back, depending on vehicle configuration. The competition organizers should be consulted prior to construction in case of other configurations (differentials, front wheel drive, etc.)

4.8.2 The two braking systems must have separate actuation systems (cables or master cylinders). If both brakes are actuated by a single hand or foot lever, then both actuation systems should be attached to the lever.

4.8.3 The vehicle must not roll if the brakes are applied.

4.8.4 Axles supported at both ends must have a diameter of at least 10 mm.

4.8.5 Axles supported only on one end must have a diameter of at least 12 mm.

4.8.6 Safety wire or cotter pins must be used to secure all wheel axle nuts. Nylon lock nuts and double nuts alone are not acceptable.

4.9. Tires

4.9.1 Tires must be inflatable.

4.10. Batteries

4.10.1 The required battery for all races is the Interstate MTX-35 battery. No other type of battery may be used.

4.10.2 Batteries must not be modified or heated.

4.10.3 The battery must be securely attached to the vehicle. The base of the battery must be restrained on all sides by metal brackets secured to the vehicle frame, and the battery must be held in place by a ratchet strap or a bracket with bolts

4.11. Isolation switch

4.11.1 An isolation (kill switch) is required on all vehicles. This switch must have a break current rating that exceeds the maximum current draw of the vehicle.

4.11.2 The switch must be in the main positive power cable, between the battery and any motor controller.

4.11.3 The driver must be able to actuate the switch while in the driving position, without reaching outside the vehicle. Race officials must be able to actuate the switch from outside the vehicle without reaching in. Two separate switches may be used.

4.11.4 The switch must be in a color contrasting the rest of the vehicle, preferably red.

4.11.5 A circuit breaker may be used as the isolation switch.

4.12. Electrical system and wiring

4.12.1 A fuse or circuit breaker is required in any electrical circuit between the battery and any electrical device. It should be mounted as close as practically possible to the source of power and sized to protect the wiring to which it is connected.

4.12.2 Wiring must be sized to have sufficient capacity. Low current wires must have have a minimum size of 18 gauge (1 mm). High current wires (between the battery, controller and motor) must have a minimum size of 2 gauge (6.5 mm)

4.12.3 Wiring must be well-insulated and securely attached to the frame or body. All wiring must be visible for inspection for the entire length of the wiring runs. All wiring must be kept free from moving parts and protected from chafing.

4.12.4 Wiring that passes through a hole with sharp edges or through sheet metal must be protected by an insulating grommet or other suitable device.

4.12.5 No part of the system may use the vehicle frame as a conductor. The frame must not be grounded.

4.13. Motor and transmission

4.13.1 All vehicles must only be powered by electric motors.

4.13.2 All gears, chains, and sprockets must be covered. Strong material, i.e., steel, aluminum, or Lexan must be used in constructing the guards. The guards should cover all moving parts in such a way that a finger or hand cannot reach them.

4.14. Motor controller

4.14.1 Any type of power controller is allowed.

4.14.2 Power to the motor must be controlled by the driver and turn off automatically when the driver releases the accelerator ('dead man' cut-off).

4.14.3 Remote control of a vehicle is not permitted.

4.14.4 Computers are permitted on the vehicle if they present information or collect data only. The driver must have complete manual control of the vehicle.

4.15. Mirrors

4.15.1 Vehicles must be equipped with at least 8 square inches of usable mirror surface area. Mirrors are required on both sides of the vehicle

4.15.2 The mirrors must allow the driver to see clearly to the rear on both sides of the vehicle.

4.15.3 Electronic sensing devices, such as video cameras and monitors, may not be used as a substitute for rear-view mirrors.

4.16. Safety belts

4.16.1 All vehicles must be equipped with a five-point racing style seat belt system.

4.16.2 Seat belts must be mounted to a structural point at least 3 inches below the top of the driver's waist.

4.16.3 The shoulder harness must be attached to a structural point at least 3 inches below the driver's shoulder.

4.17. Helmets

4.17.1 The driver must wear a helmet that is DOT approved for motorcycles. Eye protection – shield, googles or safety glasses – is always required.

4.18. Driving attire

4.18.1 Drivers must wear long-sleeved shirts, pants, closed toe shoes and gloves.

4.18.2 Hair must be contained so that it is unable to reach the drivetrain.

4.19. Numbers

4.19.1 Vehicles must display numbers at least six inches in height using contrasting colors to the vehicle.

5. Safety

Pursuant to the mission of the EV Challenge, safety is of utmost importance during the event. Any cars or drivers deemed to be unsafe will not be allowed to participate in the race.

5.1. Safety inspection

The safety inspection will verify that the car has been constructed according to the

Vehicle Design Rules and that the driver has the required safety equipment. If a car fails the safety inspection, that car will not be allowed to compete. All rulings by the judges are final. If a car is repaired, a second safety inspection will be conducted. The race will not be delayed for this process.

The requirements to pass the inspection are as follows.

1. The vehicle must have a minimum of three road wheels. All wheels must be in contact with the ground. The vehicle must be inherently stable at rest and in operation.

2. The frame must be fabricated in such a way to protect the driver in a collision. The design and fabrication must be structurally sound

3. The roll bar is constructed using metal and is fabricated and fastened to the chassis by welding or bolted connections. The bar must be at least 50 mm above the top of the tallest driver's helmet when seated in race position and it must be braced either forward or rearward to the frame of the vehicle.

4. The first year when the chassis was raced must be permanently marked on the vehicle frame in 3 locations: at the front, the rear and on the roll bar

5. A five-point safety harness is properly mounted.

6. All wiring must be visible for inspection for the entire length of the wiring runs. All wiring must be insulated and neatly secured and terminated. Wiring must be sized to have sufficient capacity.

7. Batteries must be firmly secured to the chassis. The base of the battery must be restrained on all sides by metal brackets secured to the vehicle frame, and the battery must be held in place by a ratchet strap or a bracket with bolts

8. There must be an Emergency Power Off switch on the vehicle, accessible to the driver and emergency workers outside the car.

9. The braking system must be designed to provide stability (equal braking on both sides of the vehicle) and redundancy (vehicle can still be stopped in event of brake component failure). This is normally achieved using brakes fitted to two wheels of the same axle – either two on the front or two on the back, depending on vehicle configuration. The two braking systems must have separate actuation systems (cables or master cylinders). The vehicle must not roll if the brakes are applied.

10. Cotter pins or safety wire must be used to secure all wheel axle nuts.

11. All chains, sprockets, belts or pulleys in the vehicle drivetrain must be safeguarded to prevent injury to the driver or any member of the team. Strong

material i.e. steel, aluminum, or Lexan must be used in constructing the guards. The guards should cover all moving parts in such a way that a finger or hand cannot reach them.

12. The driver must wear a helmet that is DOT approved for motorcycles. Eye protection – shield, googles or safety glasses – is required at all times

13. The driver must be able to see the track surface a minimum of 2 meters in front of the car

14. The driver must have at least 180 degrees direct visibility and up to 300 degrees visibility using mirrors

Please note that this is not a complete set of rules to be followed and additional inspection items may be applied as necessary. These rules represent the most significant hazards teams will face. For a full set of rules, see Section 4 Vehicle Design Guidelines.

5.2. Event safety

During the event, extensive arrangements are made to promote the safety of all participants. These include

5.2.1 Dedicated first-aid trained personnel will be on-site throughout the event.

5.2.2 A fire extinguisher will be on-site with a trained operator.

5.2.3 Marshals will be present to monitor the race and respond to emergencies. Race organizers and marshals will be in continual radio communication regarding overall event progress and safety. Marshals will use horns and other visuals aids to stop the race when conditions merit.

5.2.4 Race marshals and other track workers will wear high-visibility vests.

5.2.5 The race area will be secured with various levels of crowd control/barricades. For any area where there is potential for a vehicle to leave the racecourse and cause an injury, a metal barricade will be used. A combination of wood barricades and barricade tape will be used to secure other areas. Volunteers will be stationed around the course to provide a secure perimeter at all times

5.2.6 The race organizers have the right and authority to remove from the competition any driver, vehicle or team that has demonstrated a lack of respect for the rules of the competition or poses a safety risk for themselves or others.

6. Race Rules

6.1. Race schedule

All races will use a single, 12 volt battery and will be 70 minutes in duration. Each race will end when the time is complete or when none of the cars are able to continue. Time

is kept by the race organizers and will be broadcast to teams via a web-based application

Time	Item
7:30 – 8:30am	Teams arrive, set up in pits
8:30 – 10:00am	Safety inspections, award judging Transponder set-up and inspection
9:45am	Driver's meeting in pits – mandatory attendance by all drivers and teachers / mentors
10:00am	Opening ceremonies, heat race #1 cars on track
10:15am – 11:30am	Heat Race #1
11:45am – 1:00pm	Heat Race #2
1:00– 2:00pm	Lunch break and prep for Feature Race
2:00 - 3:15 pm	Feature Race
3:30 pm	Awards ceremony

6.2. Track rules

Track rules must be adhered to at all times, as follows.

6.2.1 **Driver change area access**. The driver change area will be accessible only to a maximum of six students and two teachers/mentors per car during the race. No spectators will be allowed in the driver change area during the race.

6.2.2 **Driver change area safety**. The driver change area is a no power zone. All cars must stop completely at the entrance to the driver change area and be pushed by the pit crew. When the car is moving in the no power zone, at least one person (other than the driver) **must** have a hand touching the car at all times.

6.2.3 **General vehicle safety**. Drivers must operate their vehicle safely. Their speed and control of the vehicle must be appropriate for the track conditions, including weather conditions, the number of vehicles on that part of the track, and their position in the course.

6.2.4 **Flag controls**. Drivers must obey all flag instructions of the marshals as follows:

Green - GO!
Red – STOP! Wait for Marshal to wave Green Flag.
Black - Report to pits on the current lap for penalty or repairs.

6.2.5 **Yielding to a faster vehicle**. Slower cars must hold their line. Weaving across the track to block a passing vehicle is not permitted

6.2.6 **Passing a slower vehicle**. It is the responsibility of the faster cars to pass in a safe manner. Never pass in a no-passing area.

6.2.7 **When a vehicle stops operating** Remain in the vehicle until direction is received from a race marshal or until the race has been stopped. The marshal and race organizers will decide whether your car will be returned to the pits for repairs or whether it will be removed from the race track. No team member is to go onto the track to retrieve a broken-down car. If required, the track workers will push the car to the pits when it is safe to do so.

6.2.8 **Mechanical issues**. Cars that have mechanical issues will be allowed to make repairs and continue racing; however, they must drive with care, not exceeding a reasonable safe speed, and they must yield to passing cars at all times.

6.3. Race procedures

Races will be conducted and scored according to the following procedures

6.3.1 **Starting position.** Starting position for the heat races will be determined by lottery one week prior to the race. Starting position for the feature race will be the finishing order of the two heat races

6.3.2 **Cars in starting position.** When the signal is given (approx. 15 minutes before the race begins) the track will be opened and teams will move their car to its starting position, which will be marked on the track

6.3.3 **Standing start.** Once the cars are on the track in their starting order the green flag waves and all cars will move forward at race speed past the start-finish line and around the track

6.3.4 **Race timer.** When the green flag waves to start the race the race timer will be started. The timer will run continually throughout the race and will only be stopped during a red flag.

6.3.5 **Transponder failure.** If a transponder fails during the race, the number of laps will be counted manually from that point forward. Note that this may affect the race results as the exact elapsed time between the first and last time the car crosses the start-finish line cannot be determined.

6.3.6 **Last lap in the event of power failure.** If a car runs out of electrical power and it pulls off the track into a safe area, it will only be scored based on the number of laps it has completed and not the lap that it is on.

6.3.7 **End of elapsed time.** The checkered flag will be shown to all cars when the timer indicates the total race time has elapsed

6.3.8 **Completion of the race.** When the checkered flag is shown indicating that the total race time has elapsed, all cars will continue to race until they cross the start-finish line to complete their last lap. Once all cars have completed their last lap, operation of the scoring system will be stopped.

6.3.9 **Race results.** The data from the scoring system will be used to determine the results for the race as follows.

(1) Finishing order is determined based on the number of laps completed by each car as recorded by the scoring system

(2) If two (or more) cars complete the same number of laps, they will be ranked based on the total elapsed time between the first and last time they cross the start-finish line, as recorded by the scoring system

6.3.10 **Review of race results.** Schools/organizations may request a review of the race results, either immediately following the race or afterwards.

6.4. Driver requirements

6.4.1 All drivers must be high school age and members of the team (for high school teams, college team drivers must be college students)

6.4.2 A minimum of two drivers must be registered for each race. To qualify for the feature race, teams must have at least 4 drivers, 2 for the heat race and 2 other drivers for the feature. If a team doesn't have sufficient drivers they will not be allowed to participate in the feature race, regardless of their finishing order in the heat race.

6.4.3 Teachers/advisors must disclose hearing or uncorrected vision impairments, including colour-blindness (particularly red/green), of their drivers to the organizers at least one week prior to the race. Race controls (i.e., flags) are colour-coded and this can present a safety hazard if unaddressed. Every effort will be made to allow the driver to participate if participation can be done safely.

6.5. Mandatory driver change stops

Each team must make two stops during the race to change the driver of the car, as follows.

6.5.1 Each driver must complete one full lap before performing another driver change.

6.5.2 Teams are allowed to change the driver if they have stopped in the driver change area to repair a mechanical problem.

6.5.3 If a team chooses to have only two drivers, they must still perform two driver changes during the race. The driver who is re-entering the race must completely exit the car and place both feet on the ground before re-entering the car.

6.6. Cell phones & communication devices

Compliance with the following sections may require additional design changes to the vehicle. Communication devices must not distract the driver.

6.6.1 Push to talk radios are permitted as long as the driver is not distracted by them.

6.6.2 Cell phones are permitted, so long as the line is kept open through the duration of the competition (i.e., no dialing).

6.6.3 Texting is prohibited.

6.7. Scoring System

Scoring for all races will be done using an electronic scoring system.

6.7.1 **Assignment of transponder**. Each car will have an assigned transponder that will be used to track its progress during the race. Every time the car crosses the finish line, the scoring system will increment the completed laps for that car.

6.7.2 **Transponder mounting and operation.** The transponder will be provided prior to the start of the race and should be attached to the outside of the body shell in an area near the front of the vehicle where it can point upwards. All teams are required to prepare their vehicle for the transponder, as follows:

(1) **Location**. Identify the location where the transponder will be located. This should be a flat area near the front of the vehicle where the transponder can "see" the scoring loop above it without obstruction. The transponder can be attached using Velcro, two-sided tape or cable ties.

(2) **Power**. The transponder must be wired directly to the vehicle battery and not through the vehicle electrical system, including the main power switch or E-stop. It may not be powered using a separate battery pack. It is the team's responsibility to provide wiring from the battery to the transponder and attach to the connector provided to the team prior to the competition. Proper transponder wiring will be checked by inspection and must be approved before a car will be allowed to compete.

(3) **Operation**. Once connected to a 12 V battery, transponder function can be verified by a brief flash of a red or white LED light, visible at the top of the transponder. Once a transponder is connected and functioning prior to the race, it should be left plugged in – a transponder only draws a few milliamps to operate so it will not affect the number of laps that a car will complete during the race.

(4) **Checking**. Transponder function will be checked prior to the start of the race. Any non-functioning transponders will be repaired or replaced prior to the start of the race if possible.

6.7.3 **Transponder failure**. The race will not be stopped in the case of a transponder failure. It is the responsibility of the team to ensure that the transponder is correctly wired and functioning properly before the start of the race. In the case of a transponder failure, the number of laps the car has completed will be manually scored for the remainder of the race.

7. Awards

The EV Challenge provides awards as follows

7.1. Race Awards

Awards for 1st, 2nd and 3rd place for both the heat races and the feature race are presented to teams as follows:

(1) Awards are presented to the teams that completed the most laps during each race, as recorded by the scoring system

(2) If two (or more) cars complete the same number of laps, the award will be given to the team with the lower total elapsed time between the first and last time they cross

the start-finish line, as recorded by the scoring system

(3) Separate race awards will be presented to college teams if 3 or more teams attend the competition. The number of awards will be based on the number of teams participating.

7.2. Interstate Batteries Rookie Team Award

The Interstate Batteries Rookie Team Award is given to the team competing for the first time at the EV Challenge whose vehicle scored the highest number of laps in the 12 V race. If two (or more) cars complete the same number of laps, the award will be given to the team with the lower total elapsed time between the first and last time they cross the start-finish line, as recorded by the scoring system

7.3. Multimatic Engineering Design Award, in memory of Dennis Weishar

The Multimatic Engineering Design Award will be presented to the school that demonstrates the best overall design innovation, use of engineering calculations, and/or design for ease of assembly, maintenance, ergonomics and safety in their competition vehicles.

The Engineering Design Award is judged in two parts: an engineering report submitted one week prior to the competition, and an interview with qualified teams during the time between registration and the first race, approximately 8:00 – 10:00am. Only teams that submit an engineering report will qualify for the award, and interviews will only be conducted with these teams.

Teams should indicate during online registration if they intend to qualify for the Engineering Design Award. Details of the Engineering Design Award, including the requirements for the report, may change slightly from year to year. These will be provided for teams approximately 1 month prior to the competition date.

7.4. Toyota Fabrication & Manufacturing Award

The Toyota Fabrication & Manufacturing Award will be presented to the school that demonstrates the best examples of manufacturing and fabrication in the vehicles that their team brings to the competition.

To qualify for this award, teams must be able to provide examples of manufacturing and fabrication that have been completed in the current year. These examples can include new vehicles or new systems (powertrain, steering, etc.) adapted to existing vehicles. Teams should indicate during online registration if they intend to qualify for the Toyota Fabrication and Manufacturing Award.

During the time between registration and the first race, approximately 8:00 – 10:00am, Judges will visit each qualified team and will conduct a 5-minute interview, focusing on the different manufacturing and fabrication techniques that were used in building your vehicle or vehicle system.

8. Safety Inspection Checklist

CAR #

Requirement	Initial
☐ The vehicle must have a minimum of three road wheels. All wheels must be in contact with the ground at all times. Vehicle must be inherently stable at rest and in operation.	
☐ The frame must be fabricated in such a way to protect the driver in a collision. The design and fabrication must be structurally sound.	
☐ The roll bar is constructed using metal and is fabricated and fastened to the chassis by welding or bolted connections. The bar must be at least 50 mm above the top of the tallest driver's helmet when seated in race position and it must be braced either forward or rearward to the frame of the vehicle.	
☐ The first year when the chassis was raced must be permanently marked on the vehicle frame in 3 locations; at the front, the rear and on the roll bar	
☐ Mirrors are required on both sides of the vehicle to permit the driver a clear view behind.	
☐ A five-point safety harness is properly mounted.	
☐ All wiring must be visible for inspection for the entire length of the wiring runs. All wiring must be insulated and neatly secured and terminated. Wiring must be sized to have sufficient capacity.	
☐ Batteries are of the correct type: Interstate MTX-35	
☐ Batteries must be firmly secured to the chassis. The base of the battery must be restrained on all sides by metal brackets secured to the vehicle frame, and the battery must be held in place by a ratchet strap or a bracket with bolts	
☐ There must be an Emergency Power Off switch on the vehicle, accessible to the driver and emergency workers outside the car.	
☐ The braking system must be designed to provide stability (equal braking on both sides of the vehicle) and redundancy (vehicle can still be stopped in event of brake component failure). This is normally achieved using brakes fitted to two wheels of the same axle – either two on the front or two on the back, depending on vehicle configuration. The two braking systems must have separate actuation systems (cables or master cylinders). The vehicle must not roll if the brakes are applied.	
☐ Cotter pins or safety wire must be used to secure the wheel axle nut.	
☐ All chains, sprockets, belts or pulleys in the vehicle drive train must be safeguarded to prevent injury to the driver or any member of the team. Strong material i.e. steel, aluminum, or Lexan must be used in constructing the guards. The guards should cover all moving parts in such a way that a finger or hand cannot reach them.	
☐ The driver must wear a helmet that is DOT approved for motorcycles. Eye protection – shield, googles or safety glasses – is required.	
☐ The driver must be able to see the track surface a minimum of 2 meters in front of the car	
☐ The driver must have at least 180 degrees direct visibility and up to 300 degrees visibility using mirrors	