



GREENPOWER EDUCATION TRUST

TECHNICAL & SPORTING REGULATIONS 2015

Major Partners

SIEMENS

IET The Institution of
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FORMULA
24

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FORMULA
24+

SILVERLINEC
THE
CORPORATE
CHALLENGE

Greenpower
INSPIRING ENGINEERS

OVERVIEW

All vehicles entered for any IET Formula 24, IET Formula 24+, or Silverline Corporate Challenge event in 2015 organised by Greenpower will comply with the following Technical and Sporting Regulations. These must be read in conjunction with the accompanying Best Practice Guide. **All changes from 2014 Technical and Sporting Regulations are highlighted in red text.**

Remember that the project is for the benefit of the young people involved. It is important to ensure that they are as involved in as much of the design and build of the vehicle as possible, and that technology used is relevant and accessible to the age group of the category in which you are participating.



T1 - MOTOR

- T1.1. The vehicle will only be powered by one 24 volt, 240 watt, DC electric motor supplied by Greenpower. No hybrid systems are allowed.
- T1.2. The motor is sealed and must not be opened. No machining or drilling of the casing is allowed. The motor brushes supplied as standard cannot be changed or modified.
- T1.3. Motor cooling is only permissible using passive or forced air, without any prior energy input or power from batteries other than the main vehicle batteries.
- T1.4. The motor must be easily accessible for inspection. Greenpower reserve the right to remove motors for return to the manufacturers for inspection.

T2 - BATTERIES

- T2.1. Two 12 volt Greenpower approved and supplied unmodified batteries will be used on each vehicle. See Sporting Regulations for quantity allowed per race.
- T2.2. Auxiliary batteries for powering devices on the car must not exceed one PP3 or six AA cells per car. Coin or button cells are permitted as a power source for brake lights but also to allow control systems to retain settings whilst traction batteries are changed. Proprietary unmodified electronics with self-contained batteries, e.g. speedometers, watches, radios are permitted so long as they're not connected to any of the car control systems. All other devices including motor controllers and data loggers must be powered off the main batteries. If in doubt consult Greenpower.
- T2.3. Out of the car, batteries must be kept separate and lifted independently of one another.

- T2.4. The presence and use of battery chargers at any time at events is prohibited.
- T2.5. The batteries must be firmly secured to the chassis of the vehicle using rigid fixings – i.e. no webbing or elastic straps, and must not be able to move in any direction in those fixings. Plastic threads on fixings are not permitted. Over centre clips must be security pinned.
Safety Note – Refer to Best Practice Guide.
- T2.6. Batteries must be separated from the driver by a **solid** bulkhead or contained in a rigid, covered, ventilated box, which must not be able to short circuit battery terminals. Batteries must be located within the bodywork of the vehicle.
- T2.7. Where practice is allowed, additional batteries as specified in T2.1. may be used.
- T2.8. Batteries must have quick release connections that are not liable to disconnect or short against metal parts.
- T2.9. Any battery in cars at the start of practice sessions or races will not exceed 25°C or ambient temperature plus five Celsius when ambient is above 20°C as measured by Greenpower. Spot checks will be carried out and any car found to have batteries in excess of this temperature will have its race start delayed.
Safety Note – Batteries should be handled with care. Batteries that are dropped may sustain internal damage, fail and possibly cause injury.

T3 - WHEELS & TRACK

- T3.1. Tyres must not be less than 300 mm nor greater than 520 mm in diameter.
- T3.2. There must be four wheels located as a matching front and matching rear pair, symmetrically about the centreline of the vehicle.
- T3.3. The track of the vehicle must not be less than 500 mm front or rear. The track is deemed as the measured width between centres of tyres where they contact the ground. The track may vary front to rear.
- T3.4. Tyres must be pneumatic.
- T3.5. Plastic spoked wheels are not permitted.

T4 - CENTRE OF GRAVITY

- T4.1. The base of the batteries must be at or below 100 mm from ground level. A 6 mm diameter hole should be drilled through any solid floors adjacent to the batteries to allow height measurement.
- T4.2. The driver's seat including any padding must be at or below 100 mm from ground level. A 6 mm hole should be drilled through the base of the seat to allow height measurement.
- T4.3. In the event of a vehicle overturning it will not be allowed to continue competing that day and furthermore until it can be proved that stability has been improved.
Safety Note – See Best Practice Guide for suggested height/width ratios for good stability.

T5 - DIMENSIONS

- T5.1. The vehicle must not exceed 2800 mm in length, 1200 mm in width, and 1200 mm in height.
- T5.2. Ground clearance must not be less than 30 mm.

T6 - DRIVER AND SEATING

- T6.1. The vehicle will have one seat firmly fixed to the vehicle chassis for the driver who will remain seated at all times whilst racing.
- T6.2. The driver must be seated in a conventional feet forward, head to the back position. Drivers may not kneel, sit astride a seat, or lie down in any way such that their chests and head are forward of their waist.
- T6.3. The driver must be able to demonstrate a clear exit from the vehicle unaided.
Safety Note – Drivers must be dressed and securely strapped in at scrutineering as if they were about to join the track.
- T6.4. There must be a solid floor under the whole of the driver.
- T6.5. There should be a padded head rest behind the driver's helmet to prevent whiplash.

T7 - BODYWORK

- T7.1. There must be a rigid structure around the driver extending from the front bulkhead to the back of the driver. It will have a minimum height of 250 mm from the seat base and must cover the elbows. Next to the legs, i.e. forward of the lap strap, it may be less than 250mm high provided it reaches the top of the cockpit. It shall be of rigid material such as aluminium, rigid plastics, carbon fibre, glass reinforced plastic or other composites of at least 1.5 mm thickness. Plywood needs to be a minimum of 3 mm thick. Corroflute type material or foam on its own is not permitted for this area.
- T7.2. There must be a suitable bulkhead between driver and wheels to prevent any accidental contact.
- T7.3. There must be a permanent cockpit opening, large enough for the driver to exit the vehicle, without the use of doors or the movement or removal of any panels or coverings.
- T7.4. The cockpit opening, when viewed from directly above must be able to accommodate a rectangle 600 mm in length and 350 mm wide with no intrusions, e.g. helmet fairings, instrument covers, etc. must not overhang this area. The drivers' helmet must be positioned at the rearmost point possible of the cockpit, creating a clear space in front of the drivers' helmet.
- T7.5. Bodywork, including windscreens, to the front or sides of the driver's helmet may not be higher than the eye level of every driver. This does not include front wheels or their coverings.
- T7.6. During routine driver change pitstops all bodywork must remain in position.
- T7.7. Medium-high density energy absorbing flexible closed cell foam of minimum 25 mm thickness must be attached down the inside of the cockpit sides to protect a substantial part of

the driver's body, from the floor to the cockpit opening.

- T7.8. There must be a solid, rigidly mounted, bulkhead forward of the driver's feet, with 100 mm depth of medium-high density energy absorbing flexible closed cell foam **affixed to the front side of this bulkhead**, to protect the driver from frontal impact.
- See Best Practice Guide for list of suitable foams for regulations T7.7. and T7.8.
- T7.9. Any sharp edges/protrusions in the cockpit must be padded/protected.



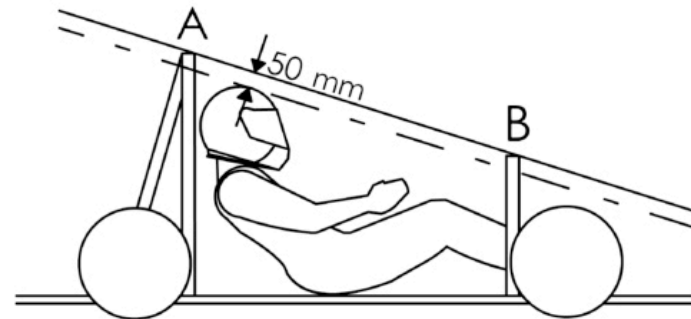
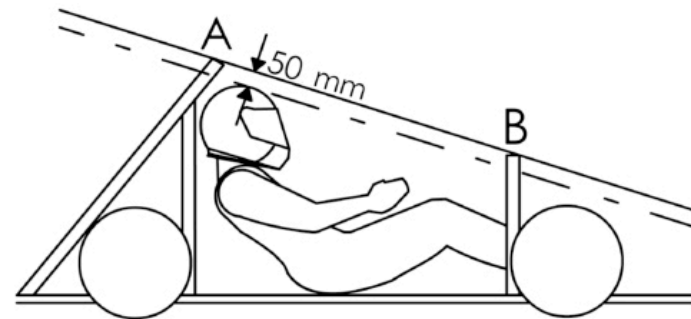
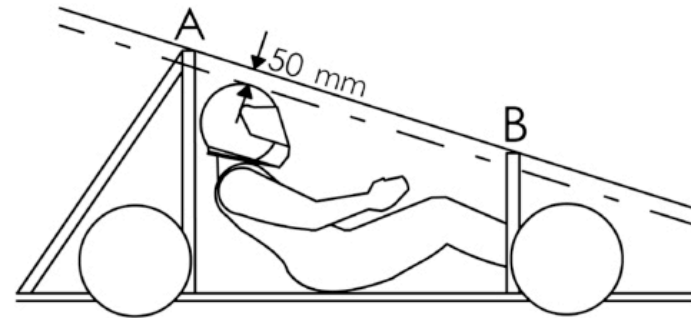
T8 - BRAKES

- T8.1. Brakes will be subject to a force test of 300N applied horizontally forwards from the top of the roll bar with the car situated on a flat tarmac/concrete surface. There must be no movement of the car. All drivers must be capable of producing this braking force. This will be subject to spot checks outside of scrutineering.
- T8.2. A minimum of two independent brake systems must be fitted. Both wheels on either front or rear axles must have the same type of brake such that the car brakes in a straight line. This is in addition to any electrical braking system that might be incorporated.
Safety Note – Refer to Best Practice Guide for acceptable braking system layouts.
- T8.3. The driver must be able to operate the brakes without removing either hand from the steering mechanism. Using two hands on one lever is not allowed.
- T8.4. Braking systems must be operated by hand only. Foot operated brakes are prohibited.
Safety Note – Refer to Best Practice Guide regarding brakes.



T9 - ROLL BARS

- T9.1. The vehicle must have front and rear roll bars offering protection in accordance with the diagrams shown here – the helmeted head of all drivers must be at least 50 mm below the line A-B as shown.
- T9.2. Roll bars must be firmly secured to the chassis of the vehicle using mechanical fixings **or welding**. Gluing/ bonding of roll bars to chassis with no mechanical fixings **or welding** is not permitted. **One central triangulated brace or two side triangulated braces** must be fitted to the rear roll bar. **These braces** should attach to the chassis of the vehicle at one end, to not more than 200 mm from the top of the roll bar at the other, and must be capable of taking **loading in all directions**.
- T9.3. Aluminium or steel roll bars are to be used and must be strong enough and of sufficient dimensions to perform satisfactorily. If in doubt check material suitability with Greenpower before construction. Composite roll bars are not permitted.
- T9.4. Non structural bodywork along with front and rear wheels must not be regarded as part of the roll protection.
Safety Note – Refer to diagrams here and Best Practice Guide for roll bar recommendations.
- T9.5. The top 150 mm of the roll bar must not have any **fairing or other aerodynamic aid attached**.





T10 - SAFETY EQUIPMENT

- T10.1. Two rear view mirrors, each with a minimum area of 2250 mm² (e.g. 75 mm x 30 mm convex) will be fitted and able to be adjusted by the driver. The visibility provided for the driver by these mirrors will be checked. Camera systems to replace rear view mirrors are not permitted.
- T10.2. The vehicle must have a clearly audible single-tone horn. It can incorporate its own battery as specified in T2.2.
- T10.3. A 24 volt rated isolation switch must be fitted, and will be switched to off at all times when the vehicle is not moving. It should be clearly visible and be easily accessible to the driver, and from outside the vehicle. Two switches will be fitted if needed. On/Off positions must be clearly marked.
- T10.4. The vehicle must be fitted with a minimum four fixing point, 50 mm width safety harness, with secure fixing points on the roll bar or chassis. Harness shoulder strap fixing points should be close to shoulder height and neck width (approx. 150 mm). Lap straps must be able to be fully tightened before shoulder straps and must fully tighten around the driver's lap without additional padding in front of the driver.
- T10.5. Drivers in low reclined seating positions with a raking angle of less than 45 degrees if the seat has a flat base, or 30 degrees with a front angle of 15 degrees will require a five or six point safety harness.
Safety Note – Refer to Best Practice Guide for guidance on safety harness fitting. Avoid drilling roll bars at shoulder height as it weakens the structure.
Safety Note – Harness ends should protrude at least 100 mm beyond the buckle for all drivers, and be folded and sewn at the ends to act as a stopper.

T10.6. A non-flashing, red brake light will be fitted **so it is clearly visible from the rear of the vehicle**. It can incorporate its own battery as specified in T2.2.

T10.7. The drive train must be guarded to prevent fingers, hair and clothing becoming trapped at any time, including during pitstops. This protection may be removable for maintenance in the paddock during a race but must be reinstated before rejoining the track.

Safety Note – Refer to Best Practice Guide regarding drive train guards.

T10.8. The use of locking nuts on safety critical components is mandatory, from which a minimum of one thread must protrude.

T11 - STEERING

T11.1. Steering systems must have minimal play in joints. Control rod geometry must not be able to over centre.
Safety Note – Refer to Best Practice Guide for clarification of over centre in steering and information on correct steering geometry.

T11.2. Steering must be by mechanical linkages only.

T11.3. Steering must be by front wheels only.

T11.4. Steering must be operable by hand only.

T12 - ELECTRICS

T12.1. The motor can be controlled by a simple On/Off or speed controller method. This must be spring loaded to the Off position. Electronic motor controllers must not be capable of “boosting” battery voltage, i.e. at any time the voltage across the motor terminals may not exceed the voltage across the battery terminals.

T12.2. A fused link/cut-out must be in place in the main power circuit, rated at 70 amps or less.

T12.3. Battery isolator(s) must be fitted as specified in regulation T10.3.

T12.4. All wires and terminals on the vehicle must be neatly run, secured and unable to chafe, away from moving parts.

All wiring must be correctly rated for its use. See Best Practice Guide for correct ratings.

T12.5. Low current ancillary circuits must have their own fuse (normally 5A or less).

T13 - OTHER

T13.1. Transmission of any form of electronic data to the car/driver by whatever means is prohibited. Communication with the car/driver is only allowed via verbal (e.g. radio) or visual (pit board) means.

T13.2. Telemetry and all communication systems must operate at UK legal frequencies and power levels.

T13.3. Audio communication systems must be hands free.

T13.4. Three racing numbers will be provided by Greenpower at the

event. These must be located on the front and clearly visible on both sides of the vehicle, midway between wheels. The stickers are black numbers with a white circular background of 250 mm diameter.

- T13.5. Lifting points must be clearly marked for use by recovery marshals.
- T13.6. Roll bars should have an area on them where it is possible to tie the car forward to recovery trailers without removal of bodywork or streamlining detail.
- T13.7. Provision must be made for the positioning of a timekeeping transponder, which will be provided at events complete with a mounting bracket. This must be mounted on the side of the vehicle on the outside of the bodywork in the front half of the vehicle and have a clear line of sight to the ground. No fairings are permitted.





T14 - TEAM CLOTHING

- T14.1. Drivers must wear a suitable motor cycle or motor racing specification full face crash helmet including chin protection. All team members must know how to adjust and fasten the strap securely. Drivers must ensure the helmet is correctly fastened before they get into the car.
- T14.2. If the crash helmet does not have a visor, goggles must be worn.
- T14.3. Sensible full overalls must be used whilst driving. They must be of a suitable thickness to provide protection. Paper overalls are not acceptable.
- T14.4. Full fingered protective gloves, preferably leather, must be worn.
- T14.5. All team members must wear stout closed toe footwear, ideally with toe protection.
- T14.6. Team members in the pit lane must wear overalls or at a minimum long trousers.
- T14.7. All team members must be clearly identifiable by their clothing.

T15 - LOGBOOKS

- T15.1. Each team already has or will be issued with a vehicle logbook on Confirmation of Entry. This must be brought to scrutineering at every event. Any Scrutineer's requirements must be completed before your next event; otherwise the vehicle will not be allowed to participate.

IET FORMULA 24 SPORTING REGULATIONS

F24 S1 - RACE REGULATIONS

- S1.1. One pair of regulation batteries as specified in T2.1. may be used during a 90 minute race.
- S1.2. Vehicles qualifying for the International Finals must remain substantially the same between the regional heat where they gain a place and the International Finals.
- S1.3. The top three vehicles from each regional heat will qualify automatically for the International Final. Automatic qualification is only available to teams competing in their local heat, defined as geographically the closest event attended. The remaining places will be awarded on best mileages covered from across all regional heats, with three vehicles gaining wild card entries at Greenpower's discretion.
- S1.4. At Greenpower's discretion a minimum lap time may be set at some circuits. This is likely to be around 15% less than the fastest expected lap based on the new batteries capacity. This is to prevent the possibility of excessive speeds if a team have been off the track for some time and have battery capacity to spare. For example if the organisers decided a minimum average lap time was 5.00mins then 15% less would be 4.15mins.

F24 S2 - DRIVER REGULATIONS

- S2.1. Drivers must be in years 7-11 only (ages 11-16) (Scotland P7, S1-S4) (Northern Ireland Year 8-11).
- S2.2. Drivers are not permitted to drive at the International Final without completing one qualifying heat or dedicated test session beforehand.
- S2.3. A minimum of three drivers must take part in the 90 minute race. Drivers may only drive one car and for one team and each driver must drive for a minimum of 15 minutes in each race.

F24 S3 - TEAM REGULATIONS

- S3.1. There will be a maximum of six further team members acting as mechanics and pit crew.
- S3.2. Adults will not be allowed to assist in pitstops unless by specific arrangement beforehand with Greenpower.
- S3.3. Team members (including drivers) who start the project in Year 11 and qualify for the International Finals can continue with the team for the event.
- S3.4. Drivers must be fully conversant with the Supplementary Regulations for each event, must be knowledgeable about their vehicle, and must attend the Team Briefing at events.

IET FORMULA 24+ SPORTING REGULATIONS

F24+ S1 - RACE/CHAMPIONSHIP REGULATIONS

- S1.1. One pair of regulation batteries as specified in T2.1. may be used during a 60 minute race.
- S1.2. To be eligible for the IET Formula 24+ Championship, teams must enter a minimum of three races, including the final round of the season. Teams that have not entered at least two events during the year will not be eligible to enter the final round of the season.
- S1.3. Points will be awarded on the following basis at each round: 1st – 10 points; 2nd – 8 points; 3rd – 6 points; 4th – 5 points; 5th – 4 points; 6th – 3 points; 7th – 2 points; 8th – 1 point.
- S1.4. Teams may enter more than the three compulsory events, but only their three highest scores will be counted, one of which must be from the final round of the season.
- S1.5. Cars must be able to start under their own power. Push starts for vehicles are not permitted.

F24+ S2 - DRIVER REGULATIONS

- S2.1. Drivers must be aged 16-25 years (inclusive).
- S2.2. There is no limit to the number of drivers that may be used during a 60 minute race.

F24+ S3 - TEAM REGULATIONS

- S3.1. There will be a maximum of six further team members acting as mechanics and pit crew.
- S3.2. Drivers must be fully conversant with the Supplementary Regulations for each event, must be knowledgeable about their vehicle, and must attend the Team Briefing at events.

SILVERLINE CORPORATE CHALLENGE SPORTING REGULATIONS

SILVERLINE

THE
CORPORATE
CHALLENGE

CC S1 - RACE/CHAMPIONSHIP REGULATIONS

- S1.1. One pair of regulation batteries as specified in T2.1. may be used during the 60 minute race.
- S1.2. Cars must be able to start under their own power. Push starts for vehicles are not permitted.
- S1.3. Entries are accepted from registered companies and universities only.

CC S2 - DRIVER REGULATIONS

- S2.1. Drivers must be aged 16 + on the day of the event. There is no maximum age limit.
- S2.2. There is no limit on the number of drivers that may be used during the 60 minute race.

CC S3 - TEAM REGULATIONS

- S3.1. There will be a maximum of six further team members acting as mechanics and pit crew.
- S3.2. Drivers must be fully conversant with the Supplementary Regulations for each event, must be knowledgeable about their vehicle, and must attend the Team Briefing at events.

TERMS OF ENTRY

- Published regulations may be subject to change. In the event of this happening, notification will be sent to all entered teams and posted on the Greenpower website.
- All vehicles will be subject to pre-event and possible post-event scrutineering to ensure compliance.
- The vehicle and driver must be presented at scrutineering in the configuration it will be raced.
- Supplementary Regulations specific to each event will be published approximately three weeks beforehand and sent by email to all entrants for that event.
- Greenpower's scrutineers and officials accept no responsibility for damage caused to cars whilst performing safety checks or recovery during an event if the Technical and Sporting Regulations have not been adhered to.
- Whilst these regulations, the scrutineers and other officials endeavour to ensure vehicles are safe to compete, ultimate responsibility lies with the team.
- Whilst compliance with the Technical and Sporting Regulations should result in a compliant vehicle, scrutineers reserve the right to prevent a vehicle racing or make logbook comments if it is deemed that it is not safe to race for reasons other than those published in this document, including if recommendations in the Best Practice Guide have been ignored.
- It is understood that all persons participating in events under these rules are doing so at their own risk and the entrant will ensure that all competitors under the age of 18 will have disclaimers signed by their parents or guardians prior to competing.
- Greenpower ensure that Public Liability and Personal Accident Insurance is always in place for events under their control and accept no liability for events organised by third parties or team practice sessions.
- As part of communications activity, Greenpower regularly uses photography for publicity purposes. Entrants must ensure all participants are aware of this and the necessary permission is obtained. If permission is not granted, Greenpower must be notified prior to every event in which the participant takes part.

2015 REGULATION NOTES

Changes to regulations from 2014 are highlighted in red text, and explanations for each are as follows:

T7.4 - To improve accessibility for marshals to check security of harnesses; ensure drivers can exit a car in a reasonable time; make it easier for medical staff/marshals to remove a helpless driver in an emergency; introduce a small aerodynamic inefficiency to control speeds; reduce the advantage of very small drivers so promoting inclusivity.

T8.1 - This is to provide a consistent test across the entire field and does not imply that 300N is a safe braking force, teams should aim to exceed this value by as great a margin as possible.

T9.2. Bonding/gluing of roll bars to chassis is not satisfactory and so mechanical fixings/welding must be used for this purpose.

T9.5 - Provides a strong point for brake testing and securing cars to recovery vehicles, introduce a small aerodynamic inefficiency to control speeds.

T10.4. Addition of guidance on width between harness shoulder straps of 150 mm.

T13.7. Transponders must now be mounted on the outside of vehicles for best possible signal.

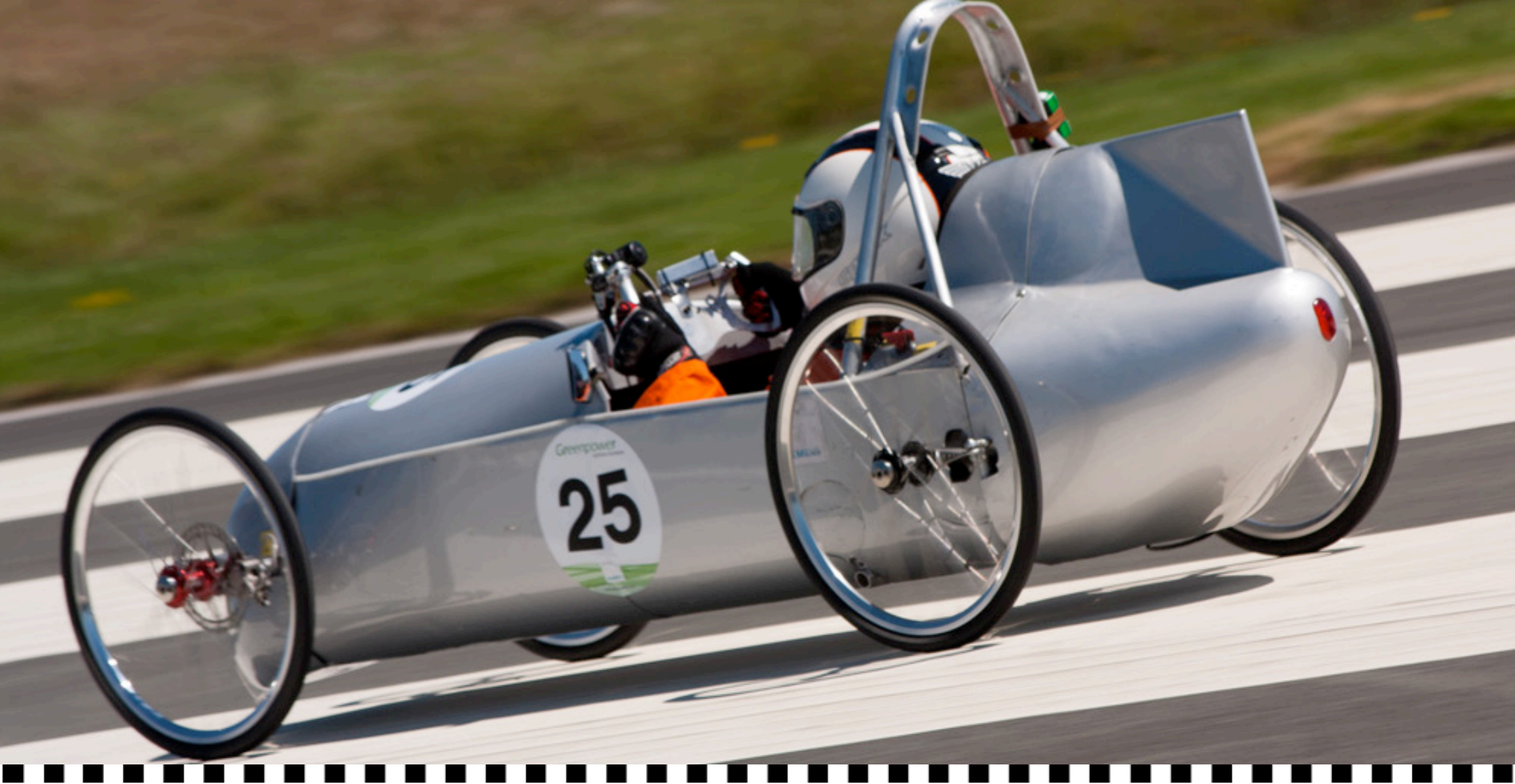
2016 REGULATION NOTES

For 2016:

No part of the car may extend more than 800 mm behind the centre point of the rear wheels.

Roll bars must be made from either round or square tubing, with no fairing or other aerodynamic aid of any kind attached to the top 150 mm.

T7.8 will be amended to read: There must be a solid, rigidly mounted, bulkhead forward of the driver's feet, with 200 mm depth of medium-high density energy absorbing flexible closed cell foam affixed to the front side of this bulkhead, to protect the driver from frontal impact. Any material forward of the bulkhead must be easily deformable. Greenpower reserve the right to specify an alternative energy absorbing material at a later date.



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