



Greenpower
INSPIRING ENGINEERS

TECHNICAL & SPORTING REGULATIONS 2019


GREENPOWER EDUCATION TRUST

Global Partner
SIEMENS

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IET Education
The Institution of
Engineering and Technology

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SOLID EDGE

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OVERVIEW

All vehicles entered for any IET Formula 24 and IET Formula 24+ event in 2019 organised by Greenpower Education Trust will comply with the following Technical and Sporting Regulations. **All changes from 2018 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.



TECHNICAL

T1 - MOTOR

- T1.1. The vehicle will only be powered by one 24 volt DC electric motor supplied by Greenpower. No hybrid systems are allowed.
- T1.2. **The motor is sealed and must not be opened 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 unmodified 12v batteries supplied by Greenpower, referred to as main batteries, will be used on each vehicle. Only one set of two main batteries will be used in a race. No external energy source may be used. Energy recovery systems are permitted.
- 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 main 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 must be powered off the main batteries. If in doubt consult Greenpower.

- T2.3. Out of the car, the main batteries should be kept separate and lifted independently of one another.

Safety note - Due to their weight, appropriate safe manual handling practices should be observed when handling batteries. Batteries that are dropped may cause injury or suffer internal damage.

- T2.4. The presence and use of battery chargers at any time at events is prohibited.
- T2.5. The main 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.
- T2.6. The main batteries may be mounted upright or on any side but must not be inverted, i.e. terminals must not point towards the ground.
- T2.7. The main batteries must be separated from the driver by a bulkhead, sufficient to restrain the batteries from the driving compartment. This bulkhead must not be able to short circuit the battery terminals. Batteries must be located inside the vehicle's bodywork.
- T2.8. Batteries must have quick release connections to enable rapid disconnection in the event of an emergency. They must not be liable to disconnect or short against metal parts. Quick release connectors must be accessible and operable without the need for tools.
- T2.9. The main batteries in vehicles 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.

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 pairs, symmetrically about the longitudinal 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 main 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. See Fig. 1
- T4.2. The driver's seat including any padding must be at or below 100 mm from ground level. A six mm hole should be drilled through the base of the seat to allow height measurement. See Fig. 1

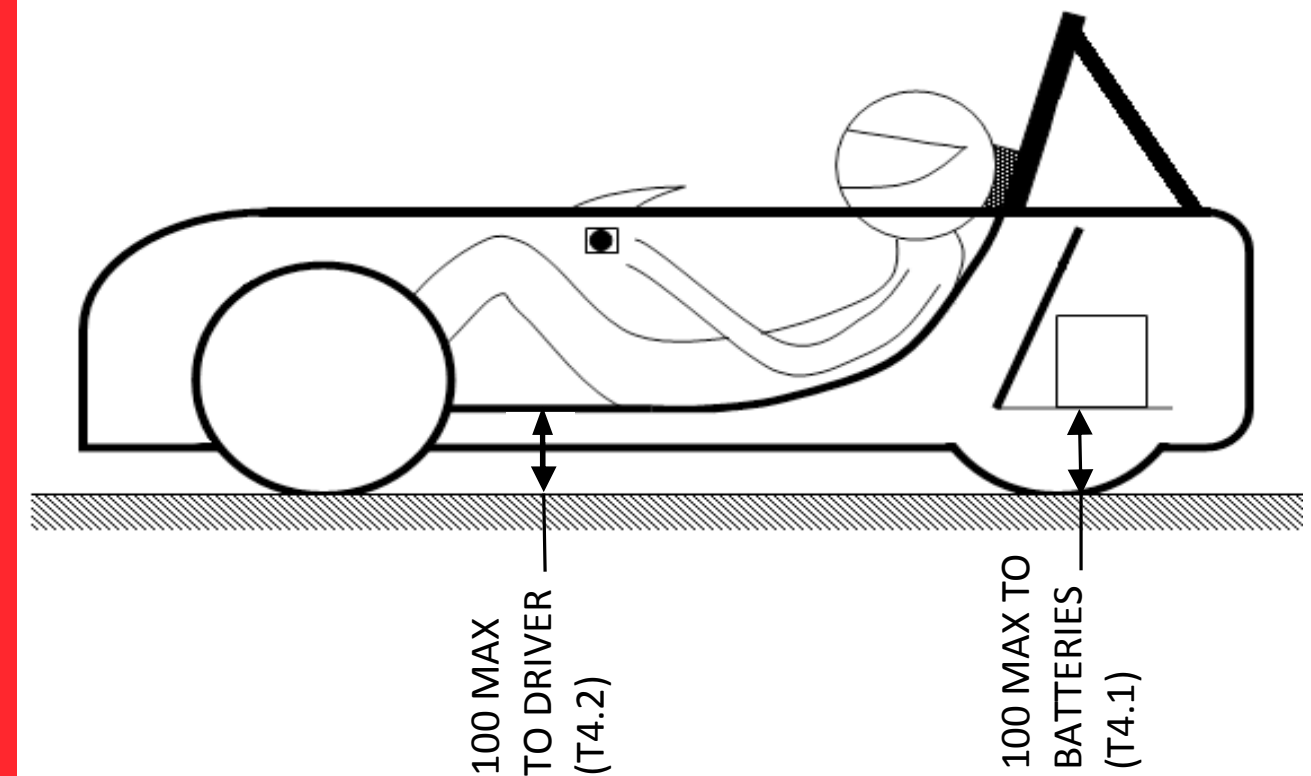
T5 - DIMENSIONS

- 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.
- T5.3. No part of the vehicle may extend more than 800 mm behind the centre point of the rear wheels.

T6 - DRIVER AND SEATING

- T6.1. The vehicle will have one seat for the driver firmly fixed to the vehicle chassis.
- T6.2. The driver must be seated in a feet forward, reclined 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 rapid and safe exit from the vehicle unaided.
- T6.4. There must be a solid floor under the whole of the driver, to prevent ingress of debris.
- T6.5. There must be a padded head rest behind the driver's helmet to prevent whiplash.
- T6.6. All parts of the vehicle's seat which are in contact with the driver must have some form of protective padding.

Figure 1



T7 - DRIVER'S CELL

- T7.1. There will be a solid, rigidly mounted bulkhead forward of the driver's feet. Securely attached to the front of this bulkhead will be a foam structure at least 200 mm long and with a compressive strength of 300 – 700 kPa. A means of access to this foam must be available at scrutineering.

Advance Notice – 2020 Regulations - T7.1 will be amended to read: There will be a solid bulkhead rigidly mounted forward of the driver's feet forming the front-most part of the driver's cell. This bulkhead must be vertical and parallel to the front axle centre-line. Securely attached to the front of this bulkhead will be a foam structure at least 200 mm long and with a compressive strength of 300 – 700 kPa. A means of access to this foam must be available at scrutineering.

- T7.2. There will be a rigid driver's cell extending from the bulkhead in T7.1 to the driver's back. Between the harness lap strap mounting points and the driver's back, it will extend to a height of 250 mm above the seat base or above the drivers elbows, whichever is greater. The driver's cell height, forwards of the lap strap mounting points, may be less than 250 mm but must exceed the highest part of the driver in this area.
- T7.3. The skin of the driver's cell in T7.2 must be constructed of rigid sheet material such as aluminium; rigid plastics; carbon fibre; glass reinforced plastic or other composites of at least 1.5 mm thickness. Plywood products must be at least 3 mm thick. The skin must form a continuous protective layer and be securely attached directly to the driver's cell so as to be unlikely to fail as a result of an impact.
- Note: Some materials such as corrugated plastic and high impact polystyrene (HIPS) are not suitable. If in doubt, please consult Greenpower.**
- T7.4. The driver's cell opening will accommodate a rectangle of at least 600 x 350 mm with no intrusions.
- T7.5. The driver's helmet must be positioned at the rearmost point of the opening in T7.4 to create a clear space in front of the helmet.
- T7.6. Inner faces of the driver's cell sides will be lined with a minimum of

25 mm thick closed cell foam from the floor to the driver's cell opening to protect a substantial part of the driver's body.

- T7.7. Any sharp edges or protrusions in the driver's cell must be padded.
- T7.8. There will be a bulkhead separating the driver from any accidental contact with the wheels.

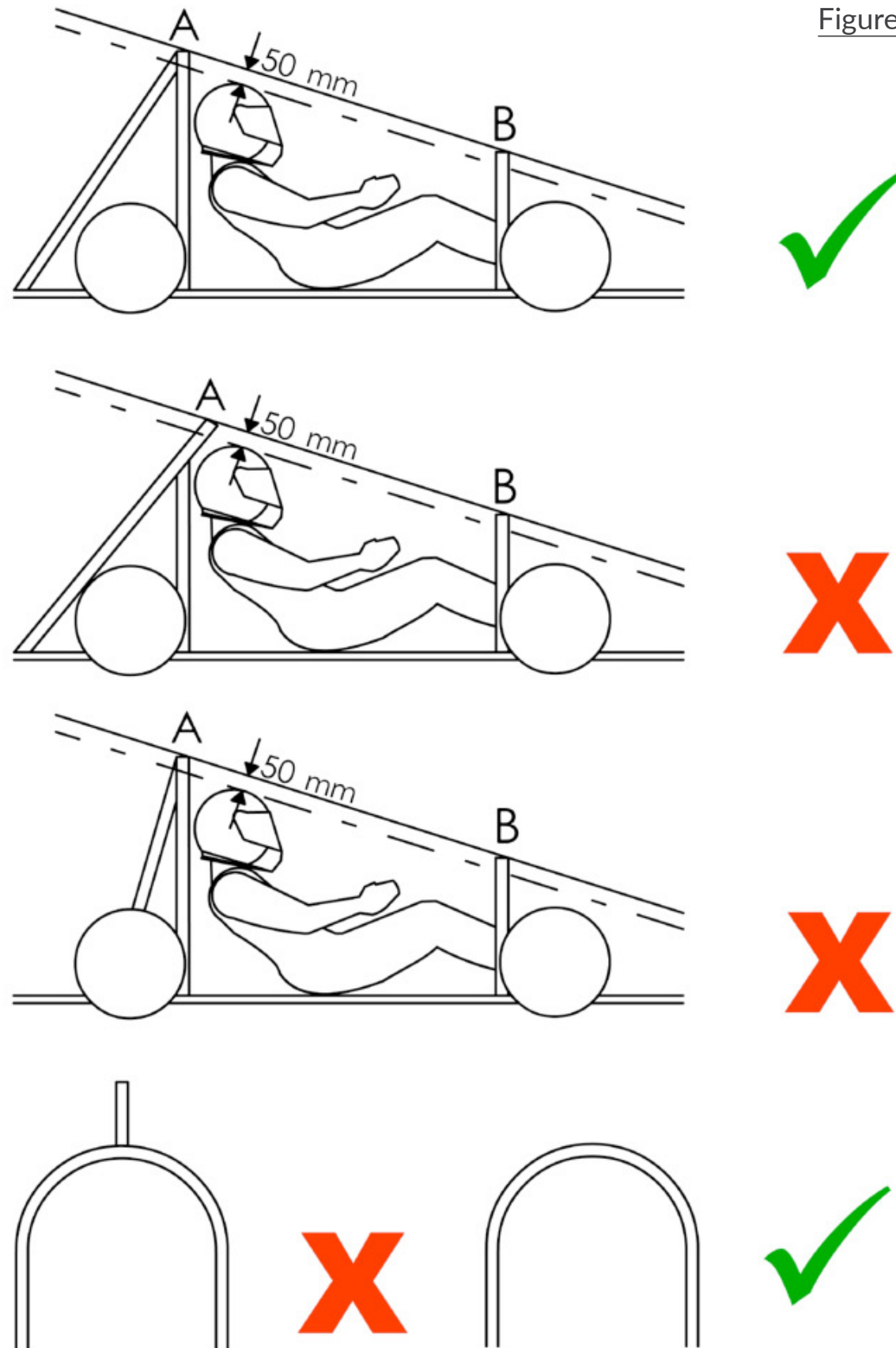
T8 - BODYWORK

- T8.1. Anything forward of the bulkhead in T7.1 must be easily deformable.
- T8.2. Bodywork to the front or sides of the driver's helmet will be lower than the bottom of the driver's helmet visor aperture.
- T8.3. No bodywork will be higher than 150 mm below the top of the rear roll hoop.

T9 - BRAKES

- T9.1. Brakes will be subject to a force test of 300 N 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.
- T9.2. A minimum of two independent brake systems must be fitted, such that there is still some braking if one system were to fail. These systems may be operated by a single dual system lever.
- T9.3. 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.
- T9.4. The driver must be able to operate the brakes without removing either hand from the steering mechanism.
- T9.5. Braking systems must be operated by hand only. Foot operated brakes

Figure 2



are prohibited.

T10 - ROLL BARS

- T10.1. 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. See Fig 2.
- T10.2. Roll bars must be firmly secured to the chassis of the vehicle using mechanical fixings or welding. **Roll bar to chassis mountings and points on the chassis to which roll bars connect must be suitably strong and where necessary reinforced to prevent failure in the event of a roll over incident.** Gluing/bonding of roll bars to chassis with no mechanical fixings or welding is not permitted.
- T10.3. One central triangulated brace or two side triangulated braces must **connect the rear roll bar to the chassis.** These braces **must** 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, must be capable of taking loading in all directions **and must be rigidly mounted.**
- Advance Notice - 2020 Regulations** - T10.3 will be extended to include: The angle between roll bar and brace(s) must be at least 25 degrees.
- T10.4. All rear roll bars & braces must be produced from circular section steel, with minimum outside diameter of, main hoop - 25 mm, braces - 19 mm and minimum wall thickness of 1.5 mm.
- Safety note** - Greenpower reserves the right to drill a 4 mm diameter hole in any roll bar for the purpose of inspection. Teams should avoid drilling roll bars as it weakens the structure.
- T10.5. Non-structural bodywork along with front and rear wheels must not be regarded as part of the roll protection. The top 150 mm of the roll bar must not have any fairing or other aerodynamic aid. See Fig 2.
- T10.6. The rear roll bar and bracing structure must extend down into the car to at least the level of the driver's shoulder strap mounting points.

T11 - SAFETY EQUIPMENT

T11.1. Two mirrors, each with a minimum area of 2250 mm² will be fitted in clear air outside the bodywork and must be able to be adjusted with a wide field of view. Fairings are permitted, but must only be attached to the reverse (non-reflective) side of the mirror itself. Camera systems to replace rear view mirrors are not permitted.

T11.2. The vehicle must have a clearly audible single-tone horn.

T11.3. A 24 volt, minimum 100 amp, rated isolation switch must be fitted. It must be clearly visible and be easily accessible to the driver, and from outside the vehicle. Two switches may be fitted if needed. On/Off positions must be clearly marked. Indirect operation of the isolator is not permitted.

T11.4. 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.

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.

T11.5. Where the seat back has an angle of 45 degrees or more a minimum 4 point harness is required. See Fig. 3.1

Where the seat back has an angle of 30 degrees or more combined with a front lip of 15 degrees or more a minimum 4 point harness is required. See Fig. 3.2

Where the seat back has an angle of less than 45 degrees with a front lip of less than 15 degrees a minimum 5 point harness is required. See Fig. 3.3.

If in doubt, use a 5 point harness.

Figure 3.1

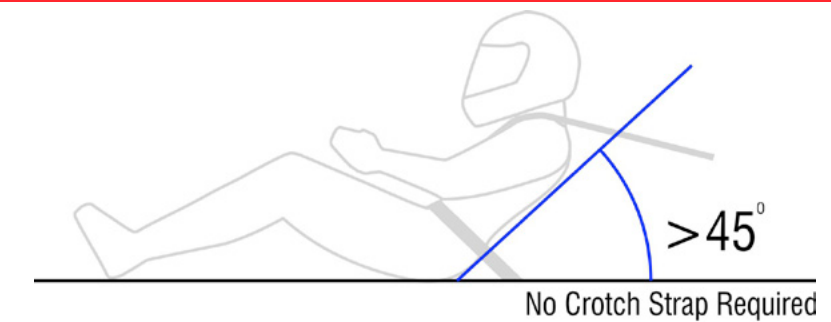


Figure 3.2

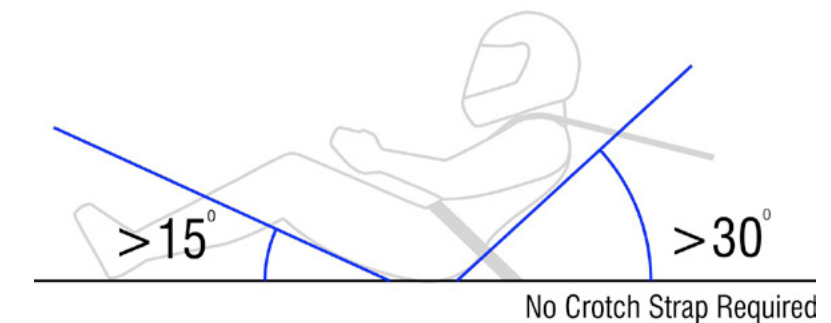
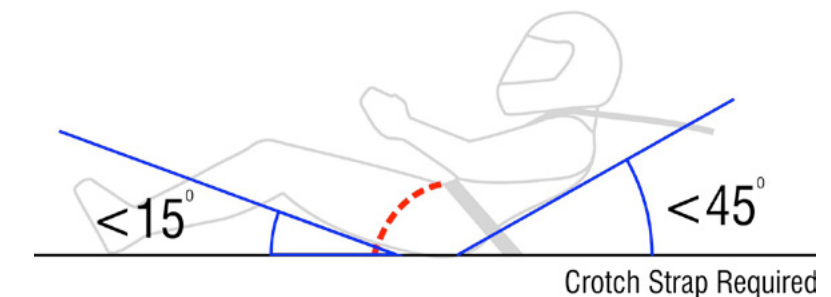


Figure 3.3

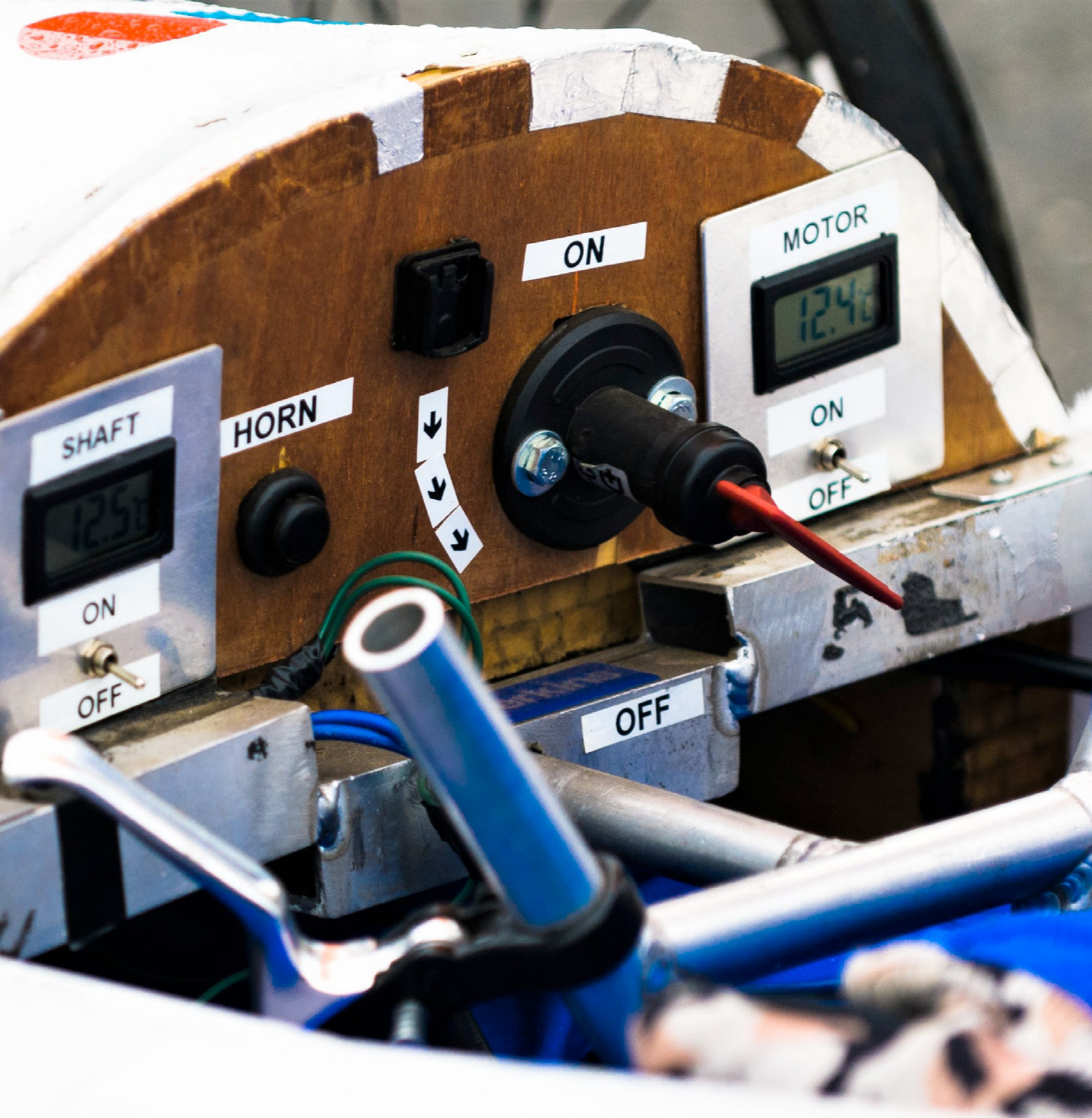


T11.6. A non-flashing, red brake light will be fitted so it is clearly visible to following vehicles.

T11.7. The drive train must be guarded to prevent fingers, hair and clothing becoming trapped at any time.

T11.8. The use of locking nuts on safety critical components is **mandatory**, including but not limited to: safety harnesses, roll bars, wheels, steering and braking systems.

Safety note - if in doubt, use locking nuts.



T12 - STEERING

- T12.1. Steering systems must have minimal play.
- T12.2. Steering must be able to operate smoothly from lock to lock, without wheels making contact with bodywork.
- T12.3. Steering must be by mechanical linkages only.
- T12.4. Steering must be by front wheels only.
- T12.5. Steering must be operable by hand only.

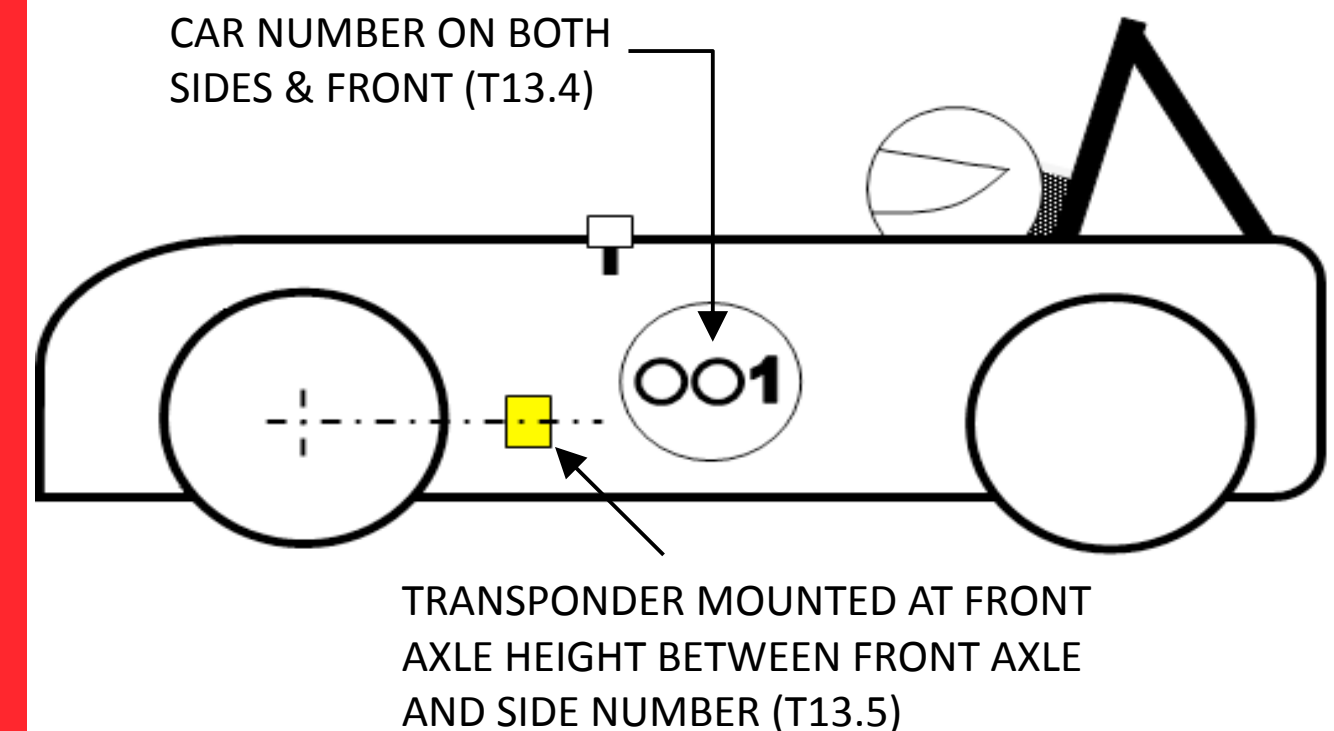
T13 - ELECTRICS

- T13.1. The accelerator must be spring loaded to the Off position.
- T13.2. 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.
- T13.3. A fused link/cut-out must be in place in the main power circuit, rated at 70 amps or less.
- T13.4. All wires and terminals on the vehicle must be neatly run, secured and unable to chafe, away from moving parts.
- T13.5. All wiring and electrical components must be correctly rated for their use.
- T13.6. Low current ancillary circuits must have their own fuse (normally 5A or less).

T14 - OTHER

- T14.1. 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.
- T14.2. Telemetry and all communication systems must operate at national legal frequencies and power levels.
- T14.3. Driver to pit audio communication systems must be hands free. **Any item, other than primary vehicle controls, in the driver's cell must be adequately and securely restrained. No items shall be attached to the safety harness.**
- T14.4. Three racing numbers will be provided by Greenpower at the event. These must be located on the front and be clearly visible on both sides of the vehicle, midway between wheels. The stickers provided are black numbers with a white circular background of 250 mm diameter. See Fig 4.
- T14.5. 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 vertically on either side of the vehicle, on the outside of the bodywork. It must be located between the front axle and the race number, at axle height, and have clear line of sight to the ground. No fairings are permitted. See Fig 4.
- T14.6. Cameras must not be attached to the crash helmet. Cameras must be attached to the car with secure mechanical fixing. Suction mounted cameras are not permitted.
- T14.7. Greenpower will supply national partner stickers which must be applied to the vehicle in a prominent position.

Figure 4



T15 - KIT CAR REGULATIONS

- T15.1. The main Kit Car chassis frame must remain unmodified other than those permitted modifications identified below.
- T15.2. Sheet metal that forms the seat may be removed/modified or adapted.
- T15.3. Battery retaining posts and sheet metal forming the battery tray may be removed/relocated/modified.
- T15.4. Upper and lower motor mounting tabs and stud may be modified/removed.

Note:

Notwithstanding T1 & T2, any items other than the main Kit Car chassis may be modified/replaced/discarded.

Greenpower race officials reserve the right to prevent any modified Kit Car chassis that is deemed unsafe from taking part in an event.



SPORTING REGULATIONS

S1 - TEAM CLOTHING

- S1.1. Drivers must wear helmets with visor or goggles at all times during practice and competition. It is the responsibility of the driver and team manager to ensure helmets fit properly and are in serviceable condition. In use helmets must be securely fastened. Helmets must be full face style compliant with one of the following standards:

British Standard BS 6658:1985 (BSI Kite marked)
UNECE Regulation 22.05 (E marked)
FIA 8860-2004 (Not valid after 31.12.2020)
FIA 8860-2010
FIA 8859-2015
SNELL SA2010 (Not valid after 31.12.2023)
SNELL SA2015 (Not valid after 31.12.2023)
SNELL SAH2010 (Not valid after 31.12.2023)
SNELL K2005
SNELL K2010
SNELL K2015
SNELL – FIA CMR2007
SNELL – FIA CMS2007

- S1.2. Full overalls must be used whilst driving. They must be of a suitable thickness to provide protection. Paper overalls are not acceptable.
- S1.3. Full fingered gloves must be worn.
- S1.4. All team members must wear stout closed toe footwear, ideally with toe protection.
- S1.5. Team members in the pit lane must wear overalls or long trousers.

S2 - LOGBOOKS

- S2.1. 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.

S3 - TEAM MEMBERS REGULATIONS

- S3.1. Drivers must be aged:
IET Formula 24, 11-16 years (inclusive) at the start of the race season.
IET Formula 24+, 16-25 years (inclusive) at the start of the race season.
- S3.2. (F24) - Drivers are not permitted to drive at the International Final without completing one regional event beforehand.
- S3.3. (F24) - 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.
- S3.4. (F24+) - There is no limit to the number of drivers that may be used during a 60 minute race.
- S3.5. All 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.
- S3.6. It is the responsibility of the team manager to ensure all drivers are able to drive safely with adequate all round visibility.
- S3.7. (F24) - Adults must not participate in pit stops unless by specific arrangement beforehand with Greenpower.

S4 - IET FORMULA 24 AND IET FORMULA 24+ CHAMPIONSHIP REGULATIONS

- S4.1. (F24+) - Teams must participate in two regional events to be eligible to be included in the championship points.
- S4.2. (F24+) – IET Formula 24+ Championship points will be awarded on the following basis at each round: 1st place – 25 points; 2nd -18; 3rd - 15; 4th -12; 5th - 10; 6th - 8; 7th - 6; 8th - 4; 9th - 2; 10th – 1.
- S4.3. (F24+) – The championship points will be the sum of the two highest scores of the season up to the final round, plus the score from the final round.
- S4.4. (F24 and F24+) - Cars must be able to start under their own power. Push starts for vehicles are not permitted at the start of the race.



TERMS OF ENTRY

By entering for any Greenpower Education Trust organised event in any category, the team are agreeing to the following Terms of Entry.

- 1) 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.
- 2) **All team members must sign on at Race Administration prior to entering the controlled race area.**
- 3) All vehicles will be subject to pre-event and possible post-event scrutineering to ensure compliance.
- 4) **The vehicle, tallest and shortest drivers must be presented at scrutineering in a race ready configuration.**
- 5) Supplementary Regulations specific to each event will be published approximately two weeks beforehand and sent by email to all entrants for that event.
- 6) Greenpower's scrutineers and officials accept no responsibility for damage caused to cars whilst performing safety checks, recovery or rescue during an event.
- 7) Whilst these regulations, the scrutineers and other officials endeavour to ensure vehicles are safe to participate, ultimate responsibility lies with the **team**.
- 8) Whilst compliance with the Technical and Sporting Regulations should

result in a compliant vehicle, race officials reserve the right to prevent a vehicle racing. **A vehicle deemed unfit may, following modification and further inspection be permitted to race.**

- 9) 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 (as provided by Greenpower) signed by their parents or guardians prior to competing.
- 10) Greenpower **ensures** that Public Liability and Personal Accident Insurance for participants is always in place for events under their control and accept no liability for events organised by third parties or team practice sessions.
- 11) 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.

Team leaders with less able students wishing to participate, who may have special requirements with regard to the regulations, should contact Greenpower who will be pleased to assist in any way possible.



DEFINITIONS

Adult

A person aged 18 or over.

Controlled Race Area

That area of the venue designated for racing to include the pit lane.

Driver

A participant registered at Race Administration intending to operate a vehicle at an event.

Event

An event organised by Greenpower for which supplementary regulations have been issued.

Entrant

A person who, acting on behalf of a team, applies to enter an event.

Official

Officials of the meeting are identified in the Supplementary Regulations and may be contacted via Race Administration.

Participant

Any member of a team present at an Event.

Race Administration

A designated, permanently manned location at an event. May also be known as Race Admin or Race Control.

Team

An organised group comprising at least one responsible Adult identified as Team Leader, registered with Greenpower. A team may be associated with one or more Vehicles.

Team Leader

The nominated Adult responsible for a team and registered with Greenpower. A deputy may attend an Event but must register with Race Administration.

Vehicle

An assembly of components compliant to the rules set out in this document which the entrant intends to race. A vehicle may also be referred to as a car.

SOCIAL MEDIA

For Greenpower Social Media updates please follow these handles:



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/company/greenpower-education-trust

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MORE INFORMATION

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Greenpower
INSPIRING ENGINEERS