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SIEMENS

Technical & Sporting Regulations 2011

Formula 24

Formula 24+

The Corporate Challenge

All vehicles entered for any Formula 24/Formula 24+/Corporate Challenge event in 2011 organised by Greenpower will comply with the following Technical and Sporting Regulations. These must be read in conjunction with the accompanying A-Z Technical Handbook.

All changes to regulations from 2010 are highlighted in red text.

T1 - Motor	
T1.1.	The vehicle will only be powered by one 24 volt, 240 watt, DC Fracmo 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.
T1.3.	Cooling of the motor is allowed, but not through the use of water or methods using prior energy input (e.g. ice), 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 MRT35T batteries supplied by Greenpower will be used on each vehicle. See Sporting Regulations for quantity allowed per race. Auxiliary batteries used for traction purposes and motor control are not allowed. Out of the car, batteries must be kept separate and lifted independently of one another.
T2.2.	The presence and use of battery chargers at any time at events is prohibited.
T2.3.	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. Over centre clips must be security pinned. Safety Note – Refer to A-Z Technical Handbook.
T2.4.	Batteries must be separated from the driver by a 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.
T2.5.	Where practice is allowed, additional MRT35T batteries may be used.
T2.6.	Batteries must have quick release connections that are not liable to disconnect or earth against metal parts.
T2.7.	Suitable battery trolleys must be used for transporting batteries around pits and paddock. Batteries must not be stacked more than one high on trolleys and must be strapped in place. Battery Trolleys or boxes can be insulated but must not contain any form of heating. Safety Note – Batteries should be handled with care. Batteries that are dropped or fall off trolleys may sustain internal damage, fail and possibly cause injury.

T3 – Wheels & Track

T3.1.	Tyres must not be less than 300mm or greater than 520mm 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 500mm 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 top of the batteries must be below 360mm from ground level. A 6mm diameter hole should be drilled through any solid floors adjacent to the batteries to allow height measurement.
T4.2.	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.

T5 - Dimensions

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

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 an exit from the vehicle in six seconds 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 some form of padded head rest behind or under the driver's helmet.

T7 – Bodywork

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| T7.1. | The vehicle will have bodywork reaching to at least the back of the driver, and at the sides must always cover the elbows of the driver. Bodywork must not prevent hand signals from being made. |
| T7.2. | 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. |
| T7.3. | Bodywork, including windscreens, to the front or sides of the driver's helmet may not be higher than the driver's eye level of every driver. This does not include front wheels or their coverings. |
| T7.4. | Parts of the bodywork may be removed during pitstops to aid battery removal. |
| T7.5. | Medium-high density energy absorbing flexible closed cell foam of minimum 25mm thickness must be attached down the cockpit sides to protect a substantial part of the driver's body, from the floor to the cockpit opening. |
| T7.6. | There must be a solid bulkhead forward of the driver's feet in the front of the cockpit, with 100mm depth of medium-high density energy absorbing flexible closed cell foam forward of this bulkhead, to protect the driver from frontal impact.

See A-Z Technical Handbook for list of suitable foams for regulations T7.5. and T7.6. |
| T7.7. | All cockpit edges and sharp edges/protrusions in the cockpit must be padded. |
| T7.8. | Bodywork must not prevent scrutineers being able to check the integrity of steering linkages, wheel bearings and wheel security. Vehicles must be presented at scrutineering with these items exposed. |

T8 – Brakes

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| T8.1. | The vehicle must have an effective braking system that will prevent it being pushed from standstill with the brakes applied. |
| T8.2. | A minimum of two brakes 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. |
| 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.

Safety Note – Refer to A-Z Technical Handbook regarding brakes. |

T9 – Roll Bars

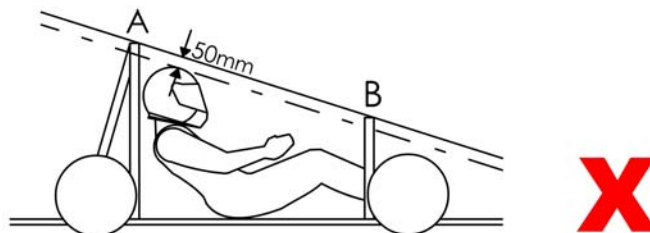
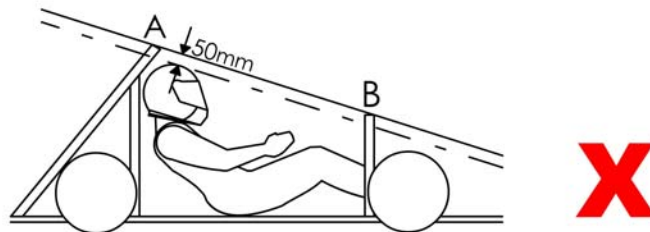
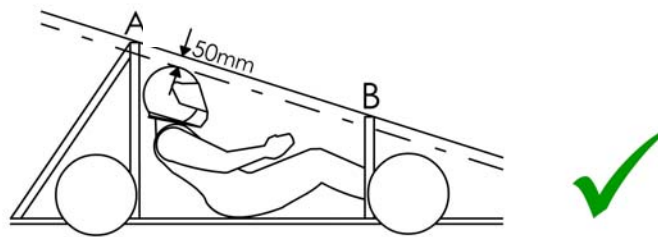
T9.1. The vehicle must have front and rear roll bars offering protection in accordance with the diagrams below – the helmeted head of all drivers must be at least 50mm below the line A-B as shown.

T9.2. Roll bars must be firmly secured to the chassis of the vehicle. At least one triangulated brace must be fitted to the rear roll bar. This brace should attach to the chassis of the vehicle at one end, to not more than 200mm from the top of the roll bar at the other, and must be capable of taking forward and rearward loadings.

T9.3. Aluminium, steel or composite roll bars can be used but must be strong enough and of sufficient dimensions to perform satisfactorily. If in doubt check material suitability with Greenpower before construction.

T9.4. Non structural bodywork along with front and rear wheels must not be regarded as part of the roll protection.

Safety Note – Refer below and A-Z Technical Handbook for roll bar recommendations.



T10 – Safety Equipment

T10.1.	Two rear view mirrors, each with a minimum area of 2250mm ² (e.g. 75mm x 30mm convex) will be fitted and able to be adjusted by the driver. The visibility provided for the driver by these mirrors will be checked.
T10.2.	The vehicle must have a clearly audible warning device.
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.	<p>The vehicle must be fitted with a minimum four fixing point, 50mm 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. Thought should be given to the design of the seat and harness to prevent submarining in the event of frontal impact and lap straps must be able to be fully tightened before shoulder straps. Lap straps must fully tighten around the driver's waist without additional padding in front of the driver.</p> <p>Safety Note – Refer to A-Z Technical Handbook for guidance on safety harness fitting. Avoid drilling roll bars at shoulder height as it weakens the structure.</p>
T10.5.	A clearly visible, non-flashing, red brake light will be fitted. It can incorporate its own battery.
T10.6.	<p>The drive train must be guarded to prevent fingers, hair and clothing becoming trapped.</p> <p>Safety Note – Refer to A-Z Technical Handbook regarding drive train guards.</p>

T11 - Steering

T11.1.	<p>Steering systems must have minimal play in joints. Control rod geometry must not be able to over centre.</p> <p>Safety Note – Refer to A-Z Technical Handbook for clarification of over centre in steering.</p>
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

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| 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. |
| T12.2. | A fused link/cut-out must be in place in the main power circuit, rated between 60 and 100 amps. |
| T12.3. | Battery isolator(s) must be fitted as specified in regulation 10.3. |
| T12.4. | All wires on the vehicle must be neatly run and secured away from moving parts, and be rated correctly. |

T13 – Other

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| T13.1. | 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 250mm diameter. |
| T13.2. | Lifting points must be clearly marked for use by recovery marshals. |
| T13.3. | Roll bars should have an area on them where it is possible to tie the car forward to Greenpower recovery trailers without removal of bodywork or streamlining detail. |
| T13.4. | Provision must be made for the positioning of a timekeeping transponder, which will be provided at events complete with a mounting bracket, and must have a clear line of sight to the ground. |

T14 – Team Clothing

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| T14.3. | Drivers must wear a suitable motor cycle or motor racing specification full face crash helmet including chin protection. Drivers must know how to adjust and fasten the strap securely. |
| T14.4. | If the crash helmet does not have a visor, goggles must be worn. |
| T14.5. | Sensible full overalls must be used whilst driving. They must be of a suitable thickness to provide protection. Paper overalls are not acceptable. |
| T14.6. | Full protective gloves, preferably leather, must be worn. |
| T14.7. | Any team members handling batteries must wear stout footwear, ideally with toe protection. |
| T14.8. | All team members must be clearly identifiable by their clothing. |

15 - 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.
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Formula 24 Sporting Regulations

F24 S1 – Race Regulations

S1.1.	Three pairs of MRT35T batteries may be used during a four hour race.
S1.2.	Vehicles qualifying for the National Final must remain substantially the same between the regional heat where they gain a place and the National Final.
S1.3.	The top three vehicles from each regional heat will qualify automatically for the National Final. 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.	Each circuit will have a minimum lap time set by the organisers. 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 S1-S4).
S2.2.	Year 7 pupils joining the team in September are not permitted to drive at the National Final without completing one qualifying heat or dedicated test session beforehand.
S2.3.	Five drivers must take part in the four hour race. Each driver must drive for a minimum of 20 minutes and up to a maximum of 90 minutes. Drivers may only drive one car and for one team.

F24 S3 – Team Regulations

S3.1.	There will be a maximum of six further team members acting as mechanics and pit crew.
S3.2.	Two persons must be designated as battery handlers, and no other team members will be allowed into the race Battery Quarantine Area.
S3.3.	Adults will not be allowed to assist in pitstops unless by specific arrangement beforehand with Greenpower.
S3.5.	Team members (including drivers) who start the project in Year 11 and qualify for the National Final can continue with the team for the event.
S3.6.	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.
S3.7.	Drivers must always bring with them to events their up to date Greenpower Drivers Licence.

Formula 24+ Sporting Regulations

F24+ S1 – Race/Championship Regulations

S1.1.	Two pairs of MRT35T batteries may be used during a 90 minute race.
S1.2.	To be eligible for the Formula 24+ Championship, teams must enter a minimum of three races, including 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.	Where a total entry of less than 8 vehicles is received for a Championship round, half points will be awarded.

F24+ S2 – Driver Regulations

S2.1.	Drivers must be aged 16-25 years (inclusive).
S2.3.	There is no limit to the number of drivers that may be used during a 90 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.
S3.3.	Drivers must always bring with them to events their up to date Greenpower Drivers Licence.

The Corporate Challenge Sporting Regulations

The Corporate Challenge S1 – Race Regulations

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| S1.1. | Three pairs of MRT35T batteries may be used during the four hour race. |
| S1.2. | The top 15 school teams from the 2010 National Final, plus two wild cards, will be eligible to race at the 2011 Corporate Challenge and must adapt or build vehicles to current regulations. |

The Corporate Challenge S2 – Driver Regulations

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| S2.1. | Drivers must be aged 16 or over on the day of the event, or have competed in a minimum of one National Final or Corporate Challenge previously. There is no maximum age limit. |
| S2.3. | Three drivers must take part in the four hour race. Each driver may drive for a maximum of 90 minutes. |

The Corporate Challenge S3 – Team Regulations

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| 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 the event. |
| S3.3. | Drivers must always bring with them to events their up to date Greenpower Drivers Licence. |

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.
- Vehicles 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 A-Z Technical Handbook 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 Event 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.

In the event of any queries about these regulations or other related matters please contact Greenpower for assistance. Greenpower has a Duty of Responsibility to all those competing in its events and will do everything reasonable in its power to ensure that all Regulations are followed and adhered to at events.

2011 Regulation Notes

For 2011 the regulations for the Formula 24, Formula 24+ and Corporate Challenge categories have been consolidated for clarity and separated into Technical and Sporting Regulations. The Technical Regulations are the same for all categories, whilst the Sporting Regulations relate specifically to each category. Changes to regulations from 2010 are highlighted in red text, and explanations for each are as follows:

T1.3. Amended to prohibit the use of water for motor cooling. There are a number of risks associated with water cooling including gravity fed systems raising the CofG of vehicles. The lower current draw available from the 2011 specification batteries will make cooling less of an issue.

T2.1. Amended in line with the change of battery specification as previously notified. The batteries must be kept separated and not strapped together otherwise the combined weight negates the benefit of the new lighter specification batteries for safe handling.

T2.2. The presence of battery chargers at events was noted in the 2010 season. It is not necessary and is against the spirit of the regulations. From 2011 the presence of battery chargers at events anywhere in pit or paddock areas will result in disqualification.

T2.3. Amended to include the security pinning of over centre clips which have been known to fail without them.

T2.4. Removal of wording 'For acid containment purposes' as the new specification battery does not contain wet acid.

T2.5. Amended in line with the change of battery specification as previously notified.

T2.7. Battery trolleys and boxes can be insulated to reduce windchill effects on the batteries especially during events at the start and end of the season. Battery temperatures below the recommended operating temperature can reduce performance.

T3.5. Previously a safety recommendation, and now a full regulation, plastic wheels have been known to fail on numerous occasions.

T4.1. Amended in line with the new battery specification. In addition a new requirement to allow measurement of battery height by drilling a 6mm hole adjacent to the batteries where there is a solid floor.

T5.1. Increase in allowed length for the Formula 24 category from 2500mm to 2800mm to allow for the difficulty associated with the new for 2010 front bulkhead ruling and taller drivers.

T5.2. Reduction in minimum ground clearance from 40mm to 30mm as the circuits now used for Greenpower events are deemed to be smooth enough to cater for lower vehicles. It also assists in keeping the centre of gravity as low as possible.

T6.5. A new regulation for safety reasons to help minimise whiplash in the event of a collision.

T7.2. Addition of word 'movement' in sentence to prevent flexible covers.

T7.5. Broadening of regulation to allow additional types of suitable foam other than polyethylene. A-Z Technical Handbook must be followed.

T7.6. Amended in line with regulation T7.5. Various unsuitable foams (rigid and spray types) have been noted in use during the 2010 season and will not be permitted in 2011. See A-Z Technical Handbook for clarification.

T9.2. Addition of capability of bracing being able to take forward and rearward loading.

Also in Section 9, addition of roll bar recommendation diagrams. Specifically forward leaning roll bars, shallow angle bracing, and spikes joined to the top of roll bars are not satisfactory. Roll bars of any other design must be cleared by Greenpower in advance of manufacture or events.

T10.1. Minimum size of mirror introduced, and ability to be adjusted by the driver.

T10.4. Addition of highly important wording 'Lap straps must fully tighten around the driver's waist without additional padding in front of the driver.'

T11.4. New regulation introduced to prevent vehicles being steered by foot or means other than by hand.

T13.3. Addition to regulation. Where vehicles are recovered from the circuit at events, it is crucial that they can be tied quickly and safely onto recovery vehicles which has proved difficult on some vehicles in 2010.

T14.3. Addition of wording 'including chin protection' for clarity.

Formula 24 Sporting Regulations:

S1.1. Amended in line with new battery specification previously notified.

S1.4. Previously regulated by 2010 Regulation 13.5. and applicable to Formula 24 only, regulation S1.4. is to prevent extreme speeds occasionally seen where vehicles are in a catch-up scenario following a period of time off track and have excess energy available.

S2.3. Reduction of allowed driving time from 120 to 90 minutes for driver fatigue/safety reasons.

Formula 24+ Sporting Regulations:

S1.1. Amended in line with new battery specification previously notified.

S1.5. New regulation to provide a fairer scoring system.

The Corporate Challenge Sporting Regulations:

S1.1. Amended in line with the new battery specification previously notified.

S2.3. Reduction of allowed driving time from 120 to 90 minutes for driver fatigue/safety reasons.

Long Term Regulation Development Plan 2013

Greenpower aims to keep regulations as stable as possible year to year to prevent teams having to build new cars annually with the resultant financial and time implications. Fundamental changes to regulations that require significant work or new vehicles to be built are kept to a minimum. However, it has become apparent that longer term development is required in key areas.

To give teams as much notice as possible of impending major changes, Greenpower can announce that the following regulations will be introduced for the 2013 season in all categories. Whilst the 2011 and 2012 regulations will not include these changes, any team building a new car should endeavour to design and build with these changes in mind.

The major changes for 2013 will focus on two main areas:

Vehicle Stability:

- The minimum ground clearance will remain at 30mm, with a maximum ground clearance of 70mm introduced. The base of the driver's seat and batteries will be no greater than 100mm from ground level.

Driver Safety:

- Drivers in low reclined seating positions with a raking angle of less than 45degrees if the seat has a flat base, or 30 degrees with a front angle of 15 degrees will be required to wear 5 or 6 point safety harnesses.
- It is desirable to construct a "structural cage" around the driver's position. External bodywork either side of the driver's torso shall be of rigid material such as aluminium, plastics, carbon fibre, grp or other composites of at least 1.5mm thickness. Plywood needs to be a minimum of 3mm thick. Corroflute type material is not advised for this area. This shall be lined internally with foam as per 2011 regulations.