

# NEW ENERGY NEW GENERATION 2024

RIDEABLE SOLAR CAR CLASS

TECHNICAL  
REGULATION



## Document Control

Release version 1.1 issued 26 Jun 2024

p.14 3.1 d) The track width must be at least 50% of width (for both front and rear), measured between the midpoints where the tyres touch the ground.

Release version 1.0 issued 26 Jan 2024

For the latest information, please refer to ([engineering.vtc.edu.hk](http://engineering.vtc.edu.hk))

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## 1. General

### 1.1 Event Organizer

	Background
a)	The regulation, lessons notes, and other material for New Energy New Generation 2024 events can be downloaded from the Event page, under the link Tomorrow's Engineers/ Exploring Engineering/IVE Engineering website. They comprise of 2 main parts including the New Energy New Generation 2024 events Official Rules, and the on-track and off-track awards.
b)	Each team must read and understand the New Energy New Generation 2024 events Official Rules.
c)	To highlight rule changes and aid the understanding of frequently misunderstood rules, <b>Yellow highlighted parts</b> indicate a change, or addition to the previous version of Official Rules.
d)	<p>In this document functions and roles are defined as follows:</p> <p>Event Organizer – IVE Engineering that organizes the New Energy New Generation 2024 event.</p> <p>Educational Institutions – eligible for New Energy New Generation participation are Institution and secondary schools preparing students for vocational training certificates, professional certificates, or upon completion of the 6-year secondary education for the Hong Kong Diploma of Secondary Education Examination (HKDSE).</p> <p>Team – a group of secondary school students and teacher(s) with a team name and one vehicle accepted for entry to the New Energy New Generation 2024 event.</p> <p>Participant – a member of a Team.</p> <p>Team manager – a Participant is a staff member of the Educational Institution that has been appointed on the event registration document as contact point for his/her Team for the Event Organizer, who bears overall responsibility for the Team, including the supervision of Team members, Duty of Care for the Team members, and be responsible for their behavior and compliance with the rules.</p> <p>Team leader – a student member of the Team currently enrolled and be responsible for team coordination.</p> <p>Race Director – a person appointed by the Event Organizer, who is responsible for managing and sanctioning all on-track activities.</p> <p>Technical Director – a person appointed by the Event Organizer, who is responsible for managing and ensuring the technical standards of the event.</p> <p>Track Marshal – persons appointed by the Race Director to act on his/her behalf, to maintain off-track safety and ensure compliance with the safety rules of the competition.</p>

e)	Any decision by the Event Organizer is final.
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#### 1.2 Acceptance

a)	Applications to enter the competition must be made via the registration online form under the link Tomorrow's Engineers/ Exploring Engineering/IVE Engineering website.
b)	By the fact of their entry, Participants accept all provisions of the Official Rules and agree to abide by all decisions made by the Organizers. The Event Organizer reserves the right to add, and/or modify the rules. In such an event, the Teams will be notified. The Event Organizer are solely empowered to pronounce in cases not provided for in the rules.
c)	The Event Organizer reserve the right to modify, postpone or cancel the competition for any reason including for reasons of force majeure due to, including but not limited to, adverse or extreme weather conditions, the occurrence of a natural disaster, acts of terrorism or safety concerns. No claims for compensation will be accepted.

#### 1.3 Entries

a)	New Energy New Generation 2024 is an academic educational programme.
b)	All Teams wishing to enter must be affiliated with Educational Institutions.
c)	Each Participant must be associated with one Team only.
d)	For each entry, Team Manager, and Driver must be designated.
e)	All information will be addressed to Team manager. For the purposes of the project, he/she will be responsible for the Team, and speak on behalf of the Team.
f)	Both the Driver and the Reserve Driver must be at least 16 years old. The Driver and Reserve Driver can be staff members and/or students at the Educational Institute.

#### 1.4 Track Access Conditions

a)	During both the practice runs and the competition, all solar cars must comply with the technical and safety rules of the event. Whenever the solar car enters the track, the solar car body must be in place, follow the instructions from Race Director and bear all the racing numbers, and IVE Engineering logo required by the Rules.
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#### 1.5 Identification

a)	IVE Engineering logo and racing numbers will be provided by the Event Organizer. They must be fixed to the vehicle body such that they can be clearly read during the event.
b)	All vehicles are subject to the Organisers' approval concerning these provisions.

#### 1.6 Compliance

a)	Only vehicles that comply with the rules can participate. No vehicle will be allowed on the track for practice or competition until the Organisers have approved it. The decisions of the Organisers are final in all matters concerning the compliance of vehicle design and construction with the Official Rules.
b)	The Organisers reserve the right to rescind vehicle approval upon further or more detailed evaluation. The Organisers must be notified of any modifications to the vehicle after inspection. Non-compliance with this rule may lead to vehicle disqualification.
c)	Vehicles complying with all safety rules but not all technical rules will not be allowed to compete. However, they may be allowed on the track for practice or demonstration at the discretion of the Technical Director.

#### 1.7 Protests and Disputes

a)	The Team Manager is the only person authorized to lodge protests. Protests must be brought to the attention of the Technical Director via the results desk. Protests must be lodged within the following times: a) Vehicles: before track closure on the current day. b) Team and Driver behavior: within 30 minutes following the end of the attempt. c) Results: within 1 hour after the result of an attempt has been posted.
b)	In the event of any disputes, all decisions made by the Race Director are binding and final.

#### 1.8 Penalties

a)	Non-compliance with the driving rules or safety rules will result in the penalties as described. Notwithstanding this, the Organisers reserve the right to make decisions on a case-by-case basis depending on the severity of the breach.
b)	The Organisers may exclude, disqualify or penalise any Participant who has cheated, gained an unfair advantage due to any breach of the Official Rules, hindrance of other Participants, departure from the normal course, or any act or omission capable of misrepresenting performance, especially regarding energy consumption or method of propulsion.
c)	During the competition, the Driver or Team Manager must report to the Organisers any movement made or attempted by means other than the vehicle's own propulsion system. In such an event, the attempt in question will be invalid. If this type of incident is not reported, all the Team's attempts will be invalidated.
d)	The following general penalties apply: 1st infraction: Formal warning. 2nd infraction: Best overall attempt invalidated at the end of the competition. 3rd infraction: Immediate Team disqualification.

## 2. Safety

### 2.1 Safety rules

a)	<p>As with any motorsport activity there should be an understanding that certain inherent risks will be present.</p> <p>Recognising and controlling these risks is vital for the well-being of people and local surroundings.</p> <p>Safety both on and off track is an essential consideration for the Organisers.</p> <p>These Rules are to protect all individuals and surrounding areas.</p> <p>Any activity deemed by the Organisers unsafe or outside of the spirit of the event will be met with appropriate action.</p>
b)	<p>Compliance with safe driving rules, as well as any instructions given by Track Marshals or the Organisers is mandatory for everyone. All Participants must comply with the safety measures and must notify Organisers about any anomalies or incidents. In case of dangerous conditions, leave the area immediately.</p>
c)	<p>The Race Director is responsible for and has the final authority in determining the safe conditions for track operations regarding weather.</p>
d)	<p>Non-compliance with any of these Rules, on track or off track, may lead to disqualification from the competition at the sole and absolute discretion of the Organisers.</p>

### 2.2 Driving Knowledge and Test

a)	<p>Only the registered Driver and the Reserve Driver will be authorized to drive the vehicle.</p>
b)	<p>Drivers may be questioned about their knowledge of the driving rules during the inspection. The Organisers reserve the right to deny track access to Drivers with insufficient knowledge of the Rules.</p>
c)	<p>Driving on-track: Drivers must use smooth, safe driving techniques for example thinking ahead, avoiding sudden directional changes, and being fully aware of vehicles around them.</p>

d)	Drivers without driving license, must have a minimum of 10 hours of driving experience with their vehicle, proved by licensed driver.
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### 2.3 Driving under the Influence of Alcohol

a)	Driving under the influence of alcohol is forbidden. This applies to all Drivers, and Reserve Drivers. The Event Organizer reserves the right to conduct the alcohol testing with the Drivers if any concerns. Team will be disqualified if Drivers are found under influence of Alcohol substances.
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### 2.4 Briefing

a)	For the Final, there will be a briefing session provided for all the Team manager and registered driver and reserved driver. Attendance of the briefing session is compulsory. If the Team Manager and the registered driver and reserved driver not present, his/her Team's vehicle will not be authorized on track for the Final.
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### 2.5 Access to the Track

a)	Vehicles must pass a safety inspection prior to accessing the track for practice runs. A safety sticker will be clearly affixed once the vehicle has passed the inspection.
b)	For practice runs on both the test track and the competition track, only vehicles with a safety sticker will be allowed on the track.
c)	Only vehicles with safety and technical inspection stickers will be allowed to compete the race.
d)	The Organisers will allow the opportunity for Team Managers and Drivers to survey the track before any vehicles are allowed on the track.
e)	At no time on the racetrack are drivers allowed to push their vehicle or have it pushed, including to start the run or to cross the finish line.
f)	It is forbidden to drive against the race direction.
g)	The use of hand-held communications is forbidden in the vehicle. However, the use of a "hands-free" communication kit is allowed if both hands of the driver remain on the steering system.

## 2.6 Overtaking

a)	Drivers are required to give clear passage for other vehicles wishing to overtake.
b)	The Driver of the overtaking vehicle is responsible for the safety of the manoeuvre.
c)	Drivers of the vehicles being overtaken must use their mirrors and must not change course suddenly.
d)	On the track, overtaking is authorised on both the right and the left, provided the above-mentioned safety rules are followed.







## 2.7 Breakdowns and Other Incidents

a)	Intentional stopping on the track is forbidden unless it is required by the competition.
b)	The Driver is allowed 30 seconds to attempt to re-start the vehicle from within its driving position.
c)	If a vehicle breaks down or is involved in a minor disabling accident on the track, the Driver must immediately make every attempt to drive the vehicle to the side of the track and wait in the vehicle for the Track Marshals to arrive.
d)	In an emergency, the Driver must get out of the car and wait in a safe place off the track for the Track Marshals to arrive and recover him/her and the vehicle.
e)	It is forbidden to carry out repairs on the track. In the event of a flat tyre, even when near the starting line, a new start will not be granted for the attempt in question.

## 2.8 Off-track Vehicle Movements

a)	All vehicles must be parked inside the designated area or directly in front of it. When off the track, vehicles must be moved without the use of the motor. They must be pushed or pulled by an accompanying Team Member wearing gloves.
b)	Any breaches and any unsafe or unfair behaviour brought to the attention of the Organisers could result in a penalty.

## 2.9 Helmets

a)	<p>Helmet certification labels must be clearly readable. Helmets worn by all Drivers will be subject to inspection. Helmets should not have any indentations or cracks and should be in proper working condition as intended by the helmet manufacturer.</p>
b)	<p>All helmets must be affixed with a face shield (or visor). The face shield (or visor) must cover from the top of the face down to below the driver’s nose. The helmets must correctly fit the Driver and be secured by a chin strap. Visors should be free from major scratches and have clear visibility.</p>
<p>Only approved protective helmets are allowed for use, with the standard fulfilled, which is listed in regulation of Hong Kong legislation “Schedule 1 Approved Protective Helmets of Cap374F Road Traffic (Safety Equipment) Regulations”. Standards can be referred to the Transport Department website: <a href="http://www.td.gov.hk/filemanager/en/content_174/belt_and_helmets-e.pdf">http://www.td.gov.hk/filemanager/en/content_174/belt_and_helmets-e.pdf</a>. The approved type of protective helmets should bear marking signifying compliance with the approved standards. According to the above website, some marking samples are attached for reference:</p> <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 10px;">  <p>ECE Regulation No. 22 standard.</p> </div> <div style="margin-bottom: 10px;">  <p>Snell standard M2000.</p> </div> <div style="margin-bottom: 10px;">  <p>Federal Motor Vehicle Safety Standard (USA) No. 218 for motorcycle helmet.</p> </div> <div style="margin-bottom: 10px;">  <p>Japanese Industrial standard JIS T8133</p> </div> <div style="margin-bottom: 10px;">  <p>British standard BS 6658</p> </div> <div>  <p>Australian Standard</p> </div> </div>	

	(Reference from: <a href="http://www.td.gov.hk/filemanager/en/content_174/belt_and_helmets-e.pdf">http://www.td.gov.hk/filemanager/en/content_174/belt_and_helmets-e.pdf</a> )
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### 2.10 Equipment and Materials

a)	<p>Teams are recommended to use at the event:</p> <ul style="list-style-type: none"> <li>a) Safety gloves for general work, including movement of vehicle</li> <li>c) Safety glasses for all Participants</li> <li>g) Tools and materials</li> <li>h) Effective equipment suitable to mitigate and/or control Lithium-based battery fires must be used during battery charging. The equipment must prevent or contain the spread of fire or battery event during charging. Equipment that may be used includes a fireproof blanket that can be placed over AND under the lithium battery being charged. The blanket must be big enough to fully cover and contain any potential battery fire.</li> <li>i) Local transportation</li> <li>j) Electrical safety <ul style="list-style-type: none"> <li>i. All electrical equipment used must be properly fused</li> <li>ii. Electrical cables must be in good condition and appropriate for the equipment</li> <li>iii. Teams are only allowed to use a single multi-plug strip with internal overcurrent protection</li> </ul> </li> <li>k) Gas safety</li> </ul> <p>Safety glasses shall be worn when working on your vehicle with hydrogen gas.</p>
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### 2.11 Vehicle Design

a)	During vehicle design, construction and competition planning, participating Teams must pay attention to all aspects of safety.
b)	Vehicles must have three or four running wheels, which under normal running conditions must be all in continuous contact with the road
c)	All vehicles must have a minimum crumple zone of 100 mm between the front of the vehicle body and the driver's feet.
e)	Vehicle bodies must not include any external appendages that might be dangerous to participants; this includes pointed parts of the vehicle body.
f)	Vehicle body panels and windows must be rigid and may not change shape due to wind.
g)	The vehicle interior must not contain any objects that might injure the Driver in the event of a collision.
h)	Windows must not shatter into sharp shards.

i)	The energy compartment (motor/transmission/battery, etc.) should be easy to access for a quick inspection.
j)	All parts of the drive train must be within the confines of the body cover.
k)	All objects in the vehicle must be securely mounted. Bungee cords or other elastic materials are not permitted for securing heavy objects.
l)	All vehicles must have a solid floor and frame that prevent any part of the driver's body from contacting the ground.

#### 2.12 Chassis

a)	Teams must ensure that the vehicle chassis will safely protect the driver's body, including the event of a front, side, or rollover collision.
b)	The vehicle chassis must be equipped with an effective roll bar that has a minimum 50 mm around the driver's helmet when seated in normal driving position with the safety belts fastened.
c)	If this position impairs the driver visibility it will be deemed that the roll bar is not adequate. The driver must not be in such position that he or she must raise their head or torso above the roll bar to pass the visibility test.

#### 2.13 Roll Bar

a)	<p>The roll bar must extend in width beyond the driver's shoulders when seated in normal driving position with the safety belts fastened.</p> <p>Teams may use a tubular or panel roll bar. If a tubular roll bar is used, it must be metal. A panel roll bar is the rigid partition separating the cockpit from the energy compartment, and it must be integrated into the vehicle chassis or monocoque.</p>
b)	The roll bar must be able to withstand a static load of 700 N applied in a vertical, horizontal, and/or perpendicular direction, without deforming in any direction.

#### 2.14 Propulsion and Energy Storage System Isolation

a)	A rigid Bulkhead must safely isolate and seal the vehicle's propulsion and energy storage systems from the driver's compartment.
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	<p>A bulkhead is an upright partition separating the driver's compartment from the energy compartment. This means fuel cells, batteries (propulsion or accessory), etc. must be placed outside the driver's compartment behind the bulkhead. The purpose of this bulkhead is that in the event of a fuel leak, fire or battery release incident, it prevents liquids and/or flames from reaching the driver. Avoid having any gaps or holes between the body and the bulkhead. It is recommended to seal gaps with materials such as metal/aluminium sheeting or aluminium tape.</p>
b)	The bulkhead must be able to protect the driver from an open flame in the energy compartment.
c)	The bulkhead must prevent manual access to the energy compartment by the Driver.
d)	If holes are made in the bulkhead to pass through wires or cables it is essential that the wires and cables are protected by a grommet or similar protective material to prevent chafing or damage. All gaps and holes must be filled.

### 2.15 Visibility

a)	<p>The Driver must have access to a direct arc of visibility ahead and to 90° on each side of the longitudinal axis of the vehicle. The Driver's field of vision must be achieved without aid of any optical or electronic devices. Movement of the Driver's head within the confines of the vehicle body to achieve a complete arc of vision is allowed, but the driver's helmet must always be 50 mm below the roll bar. The side windows tinting must be light enough to allow the driver to be seen from outside the vehicle.</p>
b)	<p>The vehicle must be equipped with a rear-view mirror on each side of the vehicle, each with a minimum surface area of 2500 mm<sup>2</sup> (e.g. 50 mm x 50 mm). An electronic device may not replace a rear-view mirror.</p>

### 2.16 Safety Belts

a)	<p>The Driver's seat must be fitted with an effective safety harness with at least five mounting points to maintain the Driver securely in his/her seat. The five independent belts must be firmly attached to the vehicle's main structure and be fitted into a single buckle, specifically designed for this purpose.</p>
b)	<p>The safety harness must prevent any upward or forward motion of the Driver's torso. The adjustor must be located as close as possible to the connection point. The crotch</p>

	strap mounting point must be underneath the body, and the topmost straps should be mounted 0° to 10° below the top of the Driver's shoulder.
c)	The safety harness must always be worn tight and fastened to prevent the Driver from having free movement when the vehicle is in motion.
d)	Each safety harness mounting point must be able to withstand a 200 N force in any direction.
e)	Vehicle safety harness must be specifically manufactured for motorsport use (e.g. certified or compliant with FIA standards).

### 2.17 Vehicle Access

a)	It is imperative for Drivers, fully harnessed, to be able to vacate their vehicles at any time without assistance in less than 10 seconds.
b)	The driver compartment must have a single opening mechanism per door, which must be easily and intuitively operable from both inside and outside the vehicle. The method of opening from the outside must be clearly marked by a red arrow and must not require any tools.
c)	It is forbidden to use adhesive tape to close the Driver's opening from the outside.

### 2.18 Horn

a)	Each vehicle must be equipped with an electrically powered horn typically used in current automobiles. Bike or cycling horns are no longer permitted.
b)	The horn must be mounted at the front of the vehicle without obstruction
c)	The horn must emit sound greater than 85 dB(A) when measured 4 meters in front of the operating vehicle. The horn must produce a continuous single tone sound when activated -- chirping or siren-like tones are not permitted.
d)	The horn must be powered by the vehicle battery. However, the power consumed by the horn does not need to be measured by the Joulemeter.

### 2.19 Driver Position

a)	For safety reasons, the head-first driving position is prohibited.
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## 2.20 Emergency Shut-down

a)	The purpose of the emergency shutdown system is to disable the propulsion system of the vehicle. Different types of propulsion systems require different measures to accomplish this.
b)	For Battery Electric vehicles the emergency shutdown mechanism must provide a physical isolation of the propulsion battery from the vehicle electrical system. The use of a power controller or other logic systems to drive an isolation device is not permitted. If relays are used, the relays must be a normally open contact type. Care should be taken to ensure that the relay coil power is also removed when the relay coil is open. This may be achieved by using a latching circuit.
c)	There must be both an internal and an external emergency shutdown mechanism.
d)	The internal emergency shutdown mechanism is for driver operation and may be designed in any effective way.
e)	The external emergency shutdown mechanism must be at the rear of the vehicle and permanently installed on a non-detachable part of the bodywork.
f)	A standard sticker (Blue triangle with red electrical arc) provided by the Organisers must be positioned on the vehicle body to indicate clearly the exterior position of the emergency shutdown actuator.
g)	The external emergency shutdown mechanism must be achieved by means of a latching red push button, which can only be re-activated by rotating it. Push/pull levers are not accepted.
h)	In addition to the above devices, all vehicles must be equipped with a “dead man’s safety device” or sometimes referred to as “operator presence control.” The purpose for this device is to ensure that in case the driver becomes incapacitated the vehicle’s propulsion power is automatically disengaged (returns to an idle condition). This device may consist of a spring-loaded hand operated accelerator or foot pedal lever. An electric dead man switch is permissible if the switch is located on the steering wheel. If an electric dead-man switch is used the driver must directly (for example by thumb or index finger) engage the switch continuously while driving.
i)	This device is a separate switch from the required “emergency shutdown” mechanisms identified unless the function of the device is identical to the internal emergency shutdown mechanism in which the dead man switch and the internal emergency shutdown can be combined into one switch.

### 2.21 Additional Inspections

a)	After passing technical inspection, any alternation must be re-approved by the Organisers.
b)	After any significant incident to the vehicle, it must be re-inspected.
c)	At any time, the Organisers may perform unannounced inspections on the vehicles.

### 2.22 Fire Extinguisher

a)	Each vehicle must be fitted with a 1kg fire extinguisher within the cockpit and be accessible to the Driver. These should be securely mounted to prevent movement while driving / braking. All Drivers must be trained in the use of said fire extinguisher.
b)	The extinguisher must be pressurised to 8 bar minimum and 13.5 bar maximum. The following information must be visible on each extinguisher: capacity, type of fire extinguisher, weight or volume of the fire extinguisher and date the extinguisher must be checked, which must be no more than two years after either the date of filling or the date of the last check.
c)	The extinguishers must be easily accessible for the driver.

### 3. Car design

#### 3.1 Dimensions

a)	The total vehicle height must be between 1000 mm and 1300 mm.
b)	The total vehicle width, excluding rear view mirrors, must be between 1200 mm and 1300 mm.
c)	The total vehicle length must be between 2200 mm and 3500 mm.
d)	The track width must be at least 50% of width (for both front and rear), measured between the midpoints where the tyres touch the ground.
e)	The wheelbase must be at least 1200 mm.
f)	The Driver's compartment must have a minimum height of 880 mm and a minimum width of 700 mm at the Driver's shoulders.
g)	The vehicle body and chassis ground clearance must be at least 100 mm with the driver (and necessary ballast) in the vehicle.
h)	The maximum vehicle weight (excluding the Driver) is 225 kg.
i)	All vehicle dimensions must not be achieved by body extensions such as 'stuck-on' appendages or cut-outs.

#### 3.2 Vehicle Body

a)	Teams must submit technical drawings, photographs or animations of their entire vehicle design to the Organisers for approval at their earliest opportunity.
b)	The vehicle body must cover all mechanical parts when viewed from all sides. The wheels and suspension must be fully covered by the body when seen from above, and the wheels must be covered up to the axle centre line when seen from front or rear. The covering for the wheels and suspension must be a rigid, integral part of the vehicle body.
c)	Driver access must be easy and practical, as found in common passenger cars. All Urban Concept vehicles must have two doors, one in each side of the driver compartment. Each door opening must have a minimum dimension of 500 x 800 mm. This will be verified with a rectangular template of 500 x 800 mm with 50 mm radius corners vertical or horizontal.

d)	Any access opening mechanisms must be firmly attached to the vehicle body by means of hinges or sliding rails. Adhesive tape, Velcro, or similar materials are not permitted for this purpose.
e)	The vehicle must have a fixed roof covering the Driver's compartment.
f)	A windscreen with effective wiper(s) is mandatory.
g)	Vehicle bodies must not include any external appendages that might be dangerous to other Team members; e.g. sharp points must have a radius of 50 mm or greater, alternatively they should be made of foam or similar deformable material.
h)	A towing hook or ring is mandatory at the front of the vehicle. It can be rigid or flexible (cable or strap). If it is rigid, it must be placed fully under the body for safety reasons. Alternatively, it may be retractable or removable as in a regular car but should be easily accessible. It must be used to tow the vehicle in case of breakdown on the track. It must have a traction resistance equivalent to the weight of the vehicle and have an opening width of at least 30 mm.

### 3.3 Turning Radius and Steering

a)	Vehicle steering must be achieved by one system operated with both hands using a turning motion. It must be precise, with no play or delay. Steering must be operated predominately through the front wheels.
b)	Steering must be achieved using a steering wheel or sections of a wheel with a minimum diameter of 250 mm.
c)	Steering bars, tillers, joysticks, indirect or electric systems are not permitted.
d)	The turning radius must be 6 m or less. The turning radius is the distance between the centre of the circle and the external wheel of the vehicle. The external wheel of the vehicle must be able to follow a 90° arc of 6 m radius in both directions. The steering system must be designed to prevent any contact between tyre and body or chassis.

### 3.4 Wheels and tyres

a)	a) The rims must be between 15 to 26 inches in diameter.
b)	The wheels located inside the vehicle body must be made inaccessible to the Driver by a bulkhead and must not come in contact with the chassis or body. Any handling or manipulation of the wheels is forbidden from the moment the vehicle arrives at the starting line until it crosses the finish line.
c)	For the tyres, It is recommended to use flat or round or triangular profile tyres designed for small passenger cars or mopeds or motorbikes are permitted. Both tyres of an axle must be the same. Tyres must fit the rims recommended by the

	manufacturer and with minimum tread of 1.6mm in the tyre surface in contact with the ground . The width is measured with the tyre fitted on its rim at its rated pressure.
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### 3.5 Lighting

a)	The vehicle must have a functional external lighting system, including: <ul style="list-style-type: none"> <li>a) Two front headlights</li> <li>b) Two front turn indicators</li> <li>c) Two rear turn indicators</li> <li>d) Two red brake lights in the rear</li> <li>e) Two red rear running lights</li> <li>f) The centre of each headlight unit must be located at an equal distance and at least 300 mm from the centre-line of the vehicle.</li> <li>g) The mandatory red indicator light for the self-starter operation must be separate from any of the above.</li> <li>h) A Hazard light function must be included in the vehicle system.</li> </ul>
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### 3.6 Braking

a)	The vehicle must be equipped with a four-disc wiring/ hydraulic brake system, with a single brake pedal, which has a minimum surface area of 2500 mm <sup>2</sup> . The brake pedal must operate the master cylinders either directly or through a rigid mechanical link. Wires/cables are not allowed. Manufacturer's documentation is required to demonstrate authenticity.
b)	The brakes must operate independently on the front and rear axles or in an X pattern (i.e. right front wheel with left rear wheel and left front wheel with right rear wheel).
c)	A single master cylinder may be used provided it has a dual circuit. A maximum of two master cylinders is allowed.
d)	The effectiveness of the brake system will be tested during vehicle inspection. The vehicle must remain immobile with the Driver inside when it is placed on a 20 percent incline with the main brake in place. Moreover, a dynamic inspection may be performed on the vehicle-handling course.
e)	A parking brake function is required to keep the car stationary during technical inspections and fuel measurements. It must provide a brake force of at least 50 N.
f)	Wet weather capability is mandatory.

g)	The vehicle's brake effectiveness may be re-inspected before and/or after any run.
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#### 4. Electrical system

##### 4.1 Vehicle Electrical Systems

a)	Speed limit is set as 30km/hr.
b)	<p>Vehicles may only use one of two energy categories listed below. As determined by the Organisers based on current location circumstances not all energy types will be available; Teams will be communicated to which energy types or fuels will be available per event location.</p> <p>a) Battery-Electric  <i>b) Hydrogen Fuel Cell (This type is a trial-run, and teams who are interested can contact the event organizer for additional specifications and details.)</i></p>
c)	For safety reasons, the maximum voltage on board of any vehicle at any point must not exceed 48 Volts nominal or 60 Volts max.
d)	<p>For all energy types, only one vehicle battery is allowed.</p> <p>Battery definition: A 'battery' is defined as a source of electrical energy, which has exactly two connectors and can be described as a unit. This unit may contain more than one sub- unit. If more than one sub-units are used they should be packaged together in a single physical package. The package may be made of any material provided it contains the entire battery.</p>
c)	The battery must be fixed outside of the Driver's compartment behind the bulkhead. Batteries mounted directly under the driver's seat are not allowed.
d)	<p>The team must fulfill the requirement for BMS and battery pack:</p> <ul style="list-style-type: none"> <li>-Battery Management Systems (BMS) must be able to control and protect the battery against risk of fire.</li> <li>-The BMS must provide cell balancing and overvoltage protection during off-track charging.</li> <li>-It is necessary to include the following additional specifications of BMS: cell level over-discharge, cell level overcurrent, and battery over-temperature protection. BMS must automatically disconnect the battery, without requiring any action from the operator, when any of the aforementioned parameters exceed their limits or go out of range.</li> <li>-The BMS must be in the physical battery pack and be powered directly by the battery.</li> </ul>

e)	<p>For batteries, the following applies:</p> <ul style="list-style-type: none"> <li>-If there are one or more cells or modules, the overcurrent protection value for cells in parallel must be selected such that under normal operating or expected failure conditions, no single cell will be exposed to current beyond its rating.</li> <li>-All cells must be identical in configuration. A battery constructed from cells of different capacities is not allowed.</li> <li>-Charging of batteries must be done with the battery charger purchased together with the battery or a purpose-built charger specifically suited to the given battery chemistry.</li> <li>- For batteries not rated in Wh, the Wh rating is calculated by multiplying the amp-hour rating of the battery by its nominal voltage.</li> <li>-Protection for battery charging, whether in or out of the vehicle must be provided.</li> <li>-Any battery pack not in use must be enclosed in a battery charging bag. The bag must be securely mounted and suitable to prevent the battery, in the event of a battery fire, from burning through the battery mounting or the vehicle body and dropping to the ground.</li> <li>-Printed manufacturer’s documentation for batteries and the BMS must be available for review during technical inspection.</li> </ul>
f)	<p>All batteries must be short circuit protected. Protection may be in the form of a fuse, fusible link, or a circuit breaker. Short circuit protection devices must be located on the positive conductor and as close as possible, or a maximum 300 mm from the positive terminal of the battery. The rating of the short circuit protection device must enable the battery to always supply enough short circuit current to open the device.</p>
g)	<p>For safety reasons, both the positive and negative circuits of the propulsion battery must be electrically isolated from the vehicle body, frame, and metal components.</p>
h)	<p>The accessory battery provides all allowed safety devices (windscreen wipers, lights).</p>
j)	<p>All electrical/electronic enclosures purchased or built by the Teams must be made of transparent material or at least have a transparent cover to allow the technical inspectors to view the contents.</p>
k)	<p>Electrical wiring must be in good condition, neat, secured and not close to moving parts. All wiring connections and terminations must be visible and easily accessible. Splices are not allowed.</p>

#### 4.2 Solar panel

a)	<p>Maximum allowed solar cell surface area is the active cell area.</p>
b)	<p>Maximum allowable solar collector with Silicon solar cells is <math>1.0 m^2</math>. If the solar collector is made up of GaAs solar cells, the maximum solar collector array will be reduced to 50 per cent of the maximum solar collector area specified for Silicon solar cells.</p>

c)	For safety reasons, the maximum voltage on board of any vehicle at any point must not exceed 48 Volts nominal or 60 Volts max.
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#### 4.3 Battery Electric Vehicles

a)	The drive train in the Battery Electric category is restricted to a maximum of one electric storage device, and up to two electric motors, with associated control units.
b)	Only Lithium-based batteries are permitted as electric storage devices.
c)	The vehicle must be equipped with an onboard Battery Management System (BMS) to control and protect the battery against risk of fire. Any BMS for propulsion batteries must provide an isolation of this battery in the event of any measured parameters getting out of their designed range.
d)	The Lithium-based battery and any accessory circuits are subject to the maximum voltage.
e)	Participants are required to present a printed copy of their electrical schematics at Technical Inspection.
f)	The vehicle battery must be placed outside the Driver's compartment behind the bulkhead and securely mounted. Bungee cords or other elastic materials are not permitted for securing the battery.
g)	All electrical circuits must be protected.

#### 4.4 Results Calculations

a)	All results showcased are considered tentative until they undergo verification and are officially disclosed by the Organizers following the conclusion of the event.
b)	All vehicles must be equipped with two joulemeters, one to measure the electric motor energy consumption, the other one the solar panel energy production. Stickers, "Solar Panel" and "Motor" must identify the two joulemeters.
c)	The joulemeters must be inaccessible to the Driver in his/her normal driving position.

#### 4.5 Joulemeters

a)	Joulemeters will be provided by the Organisers and must be installed on vehicles.
b)	The joulemeter(s) must be positioned so that the display or LEDs can be easily read and the joulemeters can be switched on and off from outside the vehicle without the removal of any vehicle body components.

c)	The location and placement of the joulemeter(s) will be verified during technical inspection.
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### 5. Technical Documents

a)	<p>Applicant teams will submit a series of documents to the Organiser at two stages of this Competition, including:</p> <p><b>Before Scrutineering</b> Teams must complete and submit the Technical Submission before the scrutineering. For those team cannot provide the Technical Submission, the team will not be allowed for participation in scrutineering and competition.</p> <p><b>During Final</b> Teams must have available for inspection with the vehicle, a printed copy of the latest version of the documents submitted above and additional supporting documentation.</p>
b)	An Electrical drawing (A4, 21 x 29.7 cm) of all the essential power circuits of the vehicle's electrical equipment are compulsory.
c)	The circuit drawing must contain batteries, fuses, circuit breakers, power switchers, solar panels, power trackers, capacitors, motor-controller or chopper, motor(s) and junction cables. All components in the circuit drawing must be labelled with their detailed electrical specifications.

### 6. Awards and Prizes

a)	On-track Awards		
	Type of Award	Description	Prize
	Energy Efficiency Award for Battery-Electric class	This award is presented to the top three teams that have made effort on utilization of the energy in the race. The energy grabbed from the solar or other source and the overall power consumption will be recorded before the start and at the finish line.	Winner, 2nd place and 3rd place
	Energy Efficiency Award for Hydrogen Fuel Cell class	This award is presented to the top three teams that have made effort on utilization of the energy in the race. The energy grabbed from the solar or other source and the overall power consumption will be recorded before the start and at the finish line.	Winner, 2nd place and 3rd place

	Best Time Record	This category recognizes the team which has made effort on the race strategy before and during the race. The team shall fully utilize the given time limit with a constant average and achieve the “Stop & Go” requirement.	Winner
b)	Off-Track Awards		
	Type of Award	Description	Prize
	Safety Award	This prize recognises the top three (3) teams having made the most extensive effort to comply with the safety rules set forth in the present document. The completed form must be submitted explaining how the team has integrated safety concerns into vehicle design and construction.	First prize Second prize and Third prize
	Innovation Award	This award is presented to the top team demonstrating outstanding initiative and technical ingenuity along with optimal use of new materials in the drive train, chassis, instrumentation and tires. The completed form explaining the innovation concept, the team’s approach, etc must be submitted with the entry form.	Winner
	Net zero Award	This category recognises innovative design research in terms of ergonomics, aesthetics, choice of materials and technical feasibility. The originality and overall coherence of the design are also taken into account. The term “design” includes: vehicle structure, driving position, etc. The completed entry form must contain the team’s design approach, the basis for their research and photos of the vehicle (front, rear and side views).	Winner

**7. Miscellaneous**

a)	For Personal Data, any personal information processed by the Organiser is for the purpose of facilitating your participation in and association with the Competition.
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b)	<p>For Photography and Videography Rights and Consent, during the competition, photographs and film will be made by, or on behalf of, the Organisers. Participants may be featured in these photographs and film. The usage and storage of these materials are governed by the terms set out in these Official Rules and in the Terms and Conditions for each competition component as signed by Participants.</p> <p>The Participant is aware that photo, audio and video recordings where they might be recognizable will be made (or be provided by Participants in their competition submissions) throughout the events (whether virtual or on-track), and that these recordings may be used commercially for advertising or promotional purposes. In submitted competition material, it is the Team Manager's responsibility to ensure that any pictured Participant has provided the appropriate consent.</p>
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We wish you a safe and pleasant event. The organisers reserve the right to add or amend the rules. Please check the [event website](#) for the latest updates and information.