



# National 100m Solar Car rules for NSW competition

Australian-International Model Solar Car Challenge

## 2024 Regulations

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These rules are a lift from the National rules and adapted for NSW State competition.

## 1. Introduction

### 1.1. Overview

The Model Solar Car Challenge aims to deliver a first-hand educational experience to students in the areas of Science, Technology, Engineering and Mathematics (STEM), with an emphasis on design, engineering and renewable energy.

The event has been designed to expand student learning and provide a practical experience in designing and building a functioning solar powered vehicle, to gain an understanding of the engineering processes involved and recognise the importance of renewable energy for a sustainable future. It also focuses on getting students to work together as a team and demonstrate, apply and effectively communicate their learnings.

Learning outcomes of the Challenge are to be focused on the students. Teacher, mentor and parent guidance is strongly encouraged but it's important that students complete all work themselves and are exposed to the full process of taking an idea from a simple sketch to a well-defined engineering masterpiece.

### 1.2. Competitors

The competition is open to entries from schools, other organisations and private entries in Australia. Competitors must be students currently studying up to and including secondary level Year 12.

### 1.3. Contact and Correspondence

All correspondence should be sent directly to [michael.richards@unsw.edu.au](mailto:michael.richards@unsw.edu.au)

## 2. Interpretation of Regulations

These regulations have been designed by the AIMSC Committee to operate in good faith. The nature of the event is to promote learning and encourage thinking outside the box, so everything is open for interpretation, but please check with the Committee if uncertain whether an interpretation may give an unfair advantage and be ruled against later on.

## 3. Entries

### 3.1. Registration.

As outlined in 1.2 above all students wishing to enter just need to register their team on the website [www.sunsprint.com.au](http://www.sunsprint.com.au)

### 3.2. Original Work

Each team must design and build an original model solar vehicle, and not simply re enter a car from a previous year's event. While some components may be reused, the chassis and body of the car must be original and be the work of the students alone. Where a car may be similar to a previous design, the team must demonstrate some fundamental difference that sets their entry apart from the previous year. Teams must ensure that their answers presented in the knowledge test are in their own words, and that the Video Presentation is of their own creation.

## 4. Competition Elements

### 4.1. Track Type and Racing Format

Racing will take place across two days on a specially constructed track. This will be either a 2-lane figure 8, with a low bridge at the crossover point, or a single lane flat oval. Both types will feature curves with an approximate 5m radius.

A start gate is located on the downhill slope of the figure 8 track and racing typically held over a single lap of approximately 100m in length. Racing on the oval track will take place as a pursuit where cars start on opposite sides and travel in the same direction. Pursuit races may be started on the flat or a short removable downhill ramp.

The racing format will be decided by the Committee and communicated to teams prior to the event. Round robin rounds are typically held on Day 1 and cars then ranked on their performance for the final knockout competition on Day 2. Figure 8 races may be extended from a single lap to two laps in finals.

### 4.2. Winning Vehicle

On a two lane track the winner shall be determined as the first to cross the finish line. In the case of a pursuit race, the winner shall be the first car to catch the opponent and make contact, or to complete a set number of laps. All this must be achieved without interfering with the opposing car or any official equipment.

If a car comes off the track at any point during a race then the opposing car shall be deemed the winner. If both cars fail to finish then the one that has travelled farthest will be awarded the win.

If a team believes they have been mistreated, or lost due to an unfair incident or advantage for the opposing team, then they must report this to the AIMSC Committee immediately after their race. The AIMSC Committee will work together to resolve the issue and return their decision promptly. That decision will be final.

## 5. Scrutineering

Upon arriving at the event each team must pass through Scrutineering with their vehicle. Cars will not be allowed on the track until they've been checked for compliance and fitted with a race number.

Each car will be judged according to these rules. Where a car does not meet these rules, the team will be allowed to make the necessary modifications until it complies. A car may not be allowed to race if this isn't possible.

## 6. Servicing

To allow students space to work on their cars, designated areas will be set up to allow for modifications and repairs. This will be a restricted area for team members only. Teachers, parents and mentors will not be permitted in these areas but allocated a nearby space from which they can supervise their students for safety. Team members will not be allowed to consult with Teachers. Parents or mentors during the event.

Modifications are allowed during the event but must always comply with these regulations in full. Cars may be checked and re scrutineered at any time to ensure ongoing compliance.

Hazardous substances are strictly prohibited due to Health and Safety Regulations. Any substance classed as hazardous (solvents, liquefied gases, etc.) must be approved by the AIMSC Committee before being used during the competition, and the team must provide the relevant MSDS.

## 7. Car Specifications

### 7.1. Size Limit

The car must fit in a box, 500mm long, 150mm high and 320mm wide with the solar panel fitted in place. It must also stay within 190mm of the centre of the guide rail at all times to ensure there's no interference with the car beside it or any timing equipment when racing.

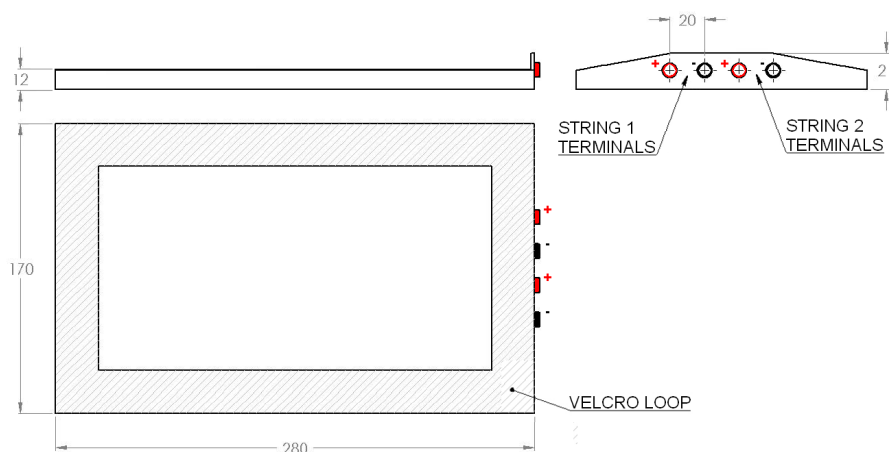
### 7.2. Source of Power

Cars must race with a solar array provided by the AIMSC and can only operate on the energy provided by this array during the course of a race. The array will be provided to teams immediately before each race and collected immediately after. Car design must allow for easy installation and removal in less than 1 minute. Any practice must be conducted with a solar array provided by the team.

### 7.3. Solar Array Specifications

Competition arrays consist of a Scorpio Technology Number 26 solar panel mounted on an aluminium backing for protection. These have been standardised to weigh  $240g \pm 15g$  and produce  $5.5 \pm 0.1$  Watts of power at standard test conditions ( $1000 \text{ W/m}^2$  irradiance, 1.5 air mass,  $25^\circ\text{C}$ ).

Arrays are approximately 276-280mm in length and 165-170mm in width. The height of the terminal end will be no more than 21mm and all other sides a maximum of 12mm. 25mm wide Velcro loop tape is available around the outer edge on the underside of the panel as a possible method of attachment to the car.



Arrays consist of two identical solar cell strings, each wired to a positive red (Jaycar PS-0406) and negative black (Jaycar PS-0408) 4mm banana socket terminal, and teams are free to connect these in either series or parallel as desired. A typical electrical output of the two strings configured in series is given below:

Volts open circuit	8.64V
Volts at maximum power	6.88V
Current at maximum power	0.808A
Current short circuit	0.9A
Maximum power watts	5.56W

#### 7.4. Use of Electronic Devices

Electronics of any kind are allowed however any energy storage devices such as capacitors must be fully discharged before the start of each race.

#### 7.5. ON/OFF switch

Each car must be fitted with a commercially available ON/OFF switch.

#### 7.6. Motors

Cars may use any type of motor/s but specifications of the make and model must be made available to the AIMSC.

#### 7.7. Wheels

Wheels must be at least 2mm wide and have a radius of at least 1mm on the running surface. No knife-edge wheels.

#### 7.8. Cargo Area

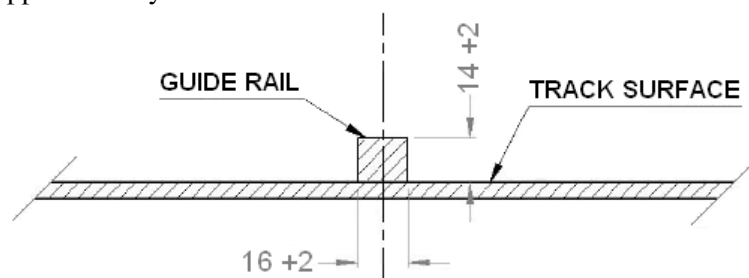
Cars must at all times when racing be capable of carrying a 6-pack of undeformed, commercially-available, 200ml juice boxes. This 6-pack may be left intact or the individual juice boxes separated and placed in any orientation with the straws removed. Racing will be conducted with either 2x full juice boxes whenever an electronics device is used or 1x full juice box if no such device is present. Teams must supply their own full juice box/es on race day but are permitted to run without the remaining empty cartons provided the space designed to normally house them is fully enclosed.

#### 7.9. Side Panels

Cars must have two rigid side panel areas of at least 100mm long and 50mm high, one on each side, for attaching number stickers that can be easily seen by spectators when racing. The curvature over this area can be no more than 20mm horizontally and 10mm vertically.

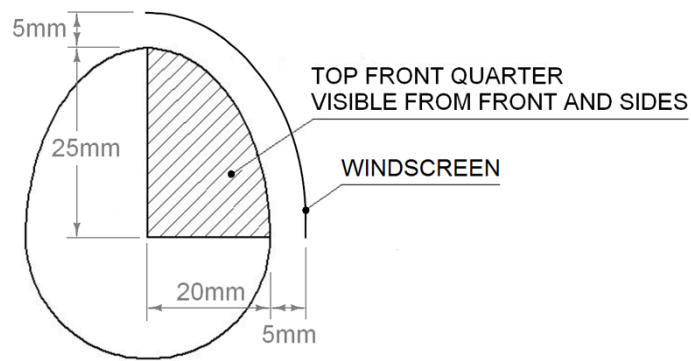
#### 7.10. Steering

Cars must incorporate a means of steering around the track using the rectangular guide rail at the centre of each lane. This rail will be 16-18mm wide and 14-16mm high. It's advised that designs have an adjustable guide system to suit different tracks and overcome minor lane misalignments. Track curves will be approximately 5m in radius.



#### 7.11. Driver Compartment

Each car must have space for a driver to navigate the track. The occupant will be a regular ~50g egg provided by the AIMSC. The compartment must be sealed to prevent a broken egg from spilling on the track and the top half of the egg have a transparent windscreen with 180° vision in the horizontal plane. A clearance of at least a 5mm is required between the egg and windscreen.



### 7.12. Stopping Block

Cars will need to be capable of withstanding a collision with a weighted styrene foam stopping block. The blocks, one for each car, will be placed on the track after the finish line and be approximately 400mm long, 250mm wide, 100mm high, and ballasted to weigh 500 +/-10 grams. Blocks will have a groove of approximately 25 mm wide, and of similar depth, cut into the bottom to clear the guide rail and be free to slide along the track after impact. Cars may be subject to a number of such collisions during the course of an event, as designated on race day by the AIMSC. Egg/Driver may be checked for damage after each race and the win awarded to the other car if the faster car's driver suffers an injury (cracked or broken egg).