

School ..... Team Name .....

Power

\_\_\_\_ Watts

Scrutineered by	Date	Passed

## Design Guidelines / WOF

### THREE+ WHEELED VEHICLES (Evolocity 2021)

A significant component of the design and construction of each machine must be done by the team. No commercially available machines will be permitted. All vehicles will be scrutineered and compete at the scrutineer's discretion. All technical queries should be posted in 'General Discussion' on <http://evolocityschools.freeforums.net/> and wait for 'Admin' to answer.

All Standard Class (350W) vehicles must use the standard bike motor, gearbox & batteries (or the brushless motors) supplied by EVolocity

All other vehicles will be entered in the Open Class if power  $\leq 1kW$

#### Chassis and general construction:

- (P) (F) 1.1 Chassis is robust with suitable materials and joining techniques.
- (P) (F) 1.2 Safety critical components, especially steering, should have appropriate failure reducing fastening techniques such as lock nuts (with minimum of one thread protruding), castellated nuts or similar.
- (P) (F) 1.3 A mechanism to prevent feet escaping/ protect the lower body such as a solid bulkhead forward and beneath the drivers feet.
- (P) (F) 1.4 Provide surfaces for mounting a race number (approx. 200mm x 150mm ea.) and sponsor decals to be seen clearly **at all times** from front and side.

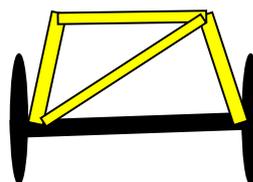
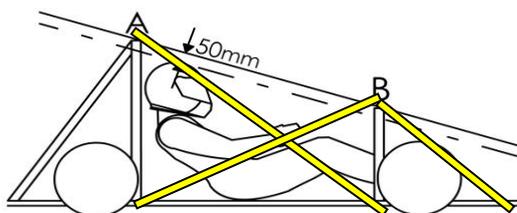
#### Centre of Gravity:

- (P) (F) 2.1 Vehicles should demonstrate sufficient stability. Stability is affected by Centre of Gravity, wheel track, wheel base, steering & other design aspects. If scrutineers deem a vehicle unstable they may ask for a demonstration of ride stability and it may be restricted from competing in events at the discretion of the scrutineers.

- See tips below.

#### Safety Cell

- (P) (F) 3.1 Develop a **safety cell** in such a way as to provide effective protection for the driver that will withstand reasonable impact forces from **all directions**. These diagrams show **examples** of where directional forces have been considered.



Lateral triangulation

**Assessment** - Helmet of driver must be at least 50mm below the line A-B as shown  
 - Adequate fixing  
 - Driver must be securely contained within safety cell

#### Drive train:

- (P) (F) 4.1 The drive train must be adequately guarded to ensure no person can come into contact with it at any time. This should prevent fingers, hair & clothing becoming trapped by the driver or anyone working on the vehicle.

#### Tyres and steering:

- (P) (F) 5.1 Tyres not excessively worn (no canvas showing)
- (P) (F) 5.2 Steering systems must be safe for the task, and have minimal play in joints.

#### Braking:

- (P) (F) 6.1 The vehicle must have an effective braking system that will prevent it from being pushed from a standstill with the brakes applied.
- (P) (F) 6.2 The brakes must be operable without compromising vehicle control and must be able to stop the vehicle within its lane & 14m from the end of the Drag Race.

#### Comments:

**Driver and seating:**

- P F 7.1 The vehicle will have a seat/ body support firmly fixed to the chassis and the driver will remain in contact whilst racing. (*refer to safety cell assessment*)
- P F 7.2 There should be some form of head restraint behind the driver's helmet.
- P F 7.3 Rider to wear zipped cotton overalls, FULL FACE helmet, sturdy shoes or boots, and leather gloves. Visors or glasses are recommended. There is to be no bare skin exposed. Long hair is to be tied up.

**Electrics and batteries:**

- P F 8.1 Batteries must be adequately secured to the chassis, separated from the driver in a way that will prevent any person or object from being able to damage, or be damaged by them. Batteries must have adequate ventilation if required.
- P F 8.2 Use an appropriate circuit breaker or fuse in the circuit from the power supply, rated for the current draw of the system and the size of the power wiring.
- P F 8.3 System must have an accessible & labelled 'Kill Switch' to isolate the battery from the circuit. A sticker to mark the location will be provided.
- P F 8.4 The motor controller must be adequate for the task and mounted safely.
- P F 8.5 Vehicles competing in the **Standard Class** are required to use the EVelocity batteries, motor and gearbox (**without modification**).
- P F 8.6 Vehicles competing in the **Open Class** can use any motor and gearbox. Batteries must not exceed **48V**. A thermal overload switch appropriate to the chosen battery size will have to be provided to ensure the power output is kept under 1kW.  
Overload sizes:           0 to 24V is a 100A overload,  
                                      25V to 36V is a 50A overload,  
                                      37V to 48V is a 40A overload).

**All Open Class vehicles must have a thermal overload connected before Race Day**

- P F 8.7 All components that require it must have adequate heat dissipation.
- P F 8.8 The throttle must reliably return to zero when it is released.
- P F 8.9 Wires and terminals on the vehicle must be neatly run, secured and unable to chafe, be protected from moving parts, and be rated correctly.
- P F 8.10 A wiring harness will be supplied (on request) to plug the energy monitor into for the Economy Run. **It must be correctly fitted before Race Day as shown below:**

**Other:**

- P F 9.1 All wheel bearings smooth and free running
- P F 9.2 All cockpit edges and sharp edges/protrusions in the cockpit must be padded/protected and potentially dangerous open tubes to be plugged.
- P F 9.3 Scrutineers will take into account any other aspects of the vehicle that could affect safety of occupant or people nearby and reserve the right to restrict the vehicle's entry. Queries of regulations should be directed to the online forum.

**Health & Safety:** Evelocity will supply an event plan. **RAMS documents** are the responsibility of the school team(s).

**Build Tips when designing your vehicle:**

- ◇ Discuss any doubts about your design with the Chief Scrutineer **before** you start building.
- ◇ Think about how you will store and transport the vehicle. Larger vehicles will be potentially more difficult to manage.
- ◇ Keep the Centre of Gravity low to improve stability. Eg. keep the driver as low as possible with respect to the chassis. One way of achieving this is to make the seat height below wheel hub centres. Batteries typically have high mass, so keep them as low as possible also.

**OPEN CLASS:** If teams build a vehicle using a **non-standard motor, battery voltage above 24V or make other modifications** they may at the scrutineer's discretion, compete in the Open Class events. Some restrictions may apply if safety is not assured.