



## **CASEY BASS COAST HPV SERIES**

### **HPV AND PUSHCART RULES BOOKLET**

**15<sup>th</sup> WONTHAGGI**

**HUMAN POWERED GRAND PRIX**

**MARCH 23 - 25, 2012**

**WONTHAGGI, VICTORIA**

**CASEY CARDINIA EVENTS**

**ROUND 1 FEBRUARY 25, 2012**

**ROUND 3 MAY 12, 2012**



## AIMS

The **2012 WONTHAGGI Human Powered Grand Prix** is an exciting program designed to provide opportunities for students, teachers, parents and local industry to work together to design and construct a human powered vehicle.

The program aims to encourage participants to examine and use the latest technology while considering its impact on the environment and the way people live locally and globally. It requires a team effort and an across-the-curriculum approach.

**There have been substantial changes to content of this document for 2012.  
Read the booklet fully and check you vehicle's compliance.**

### **THE 2012 WONTHAGGI HUMAN POWERED GRAND PRIX**

- actively involves young people in finding solutions for a world they will inherit
- provides an excellent technology studies project for primary and post-primary students
- is a great opportunity for schools and communities to work and learn together
- provides an opportunity for women and girls to participate in what has traditionally been a male area of curriculum
- will be a fun program with real world challenges
- offers students opportunities to explore and address vehicle design, driving skills and vehicle and passenger safety issues.

## THE WONTHAGGI EVENT

Participants in **The 2012 WONTHAGGI Human Powered Grand Prix** will gather in Wonthaggi from **FRIDAY March 23<sup>rd</sup> to SUNDAY March 25<sup>th</sup>** to celebrate their achievements. Activities will include judging of developmental work, displays and endurance trials on a 1.4km street circuit.

## THE CATEGORIES

**The 2012 WONTHAGGI Human Powered Grand Prix** has ten separate categories designed to cater for different levels of technology application and understanding. Category 9 has been included to cater for community groups and students from more than one school and Category 10 caters for more mature participants.

- Pushcarts
  1. Primary Y3-4
  2. Primary Y5-6
  3. Junior Secondary Y7-8

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- Human Powered Vehicles
  4. Junior Secondary Y5-7
  5. Middle Secondary Y8-10
  6. Senior Secondary Y11-12
  7. Open Secondary Y7-12
  8. Open Girls Y7-12
  9. Community
  10. Veterans

## **CLASSES**

- **Students from Year 5 to 7**
  - **Students from Year 8 to 10**
  - **Students from Year 11 and 12**
  - **Open entries for any group of same school students.**
  - **All girls from Year 7 to 12**
  - **Teams of enthusiasts**
  - **Mature age teams**
- Junior**
  - Middle**
  - Senior**
  - Open**
  - Open Girls**
  - Community**
  - Veterans**

## **TEAMS**

- Junior teams will contest a 16 hour trial with teams of up to 12 riders with a minimum of 4 girls. Students may come from a cluster of Primary and Secondary schools.
- All secondary entries are to be team entries and must consist of current students from the same school.
- Teams in the 24-hour Trial will consist of a minimum of six and a maximum of eight riders. At least half the members of the Middle and Senior class entries must be female. Community teams are free with respect to age and gender. Veterans teams consist of riders with an average age of 35 years or more.
- All team members must be familiar with the operation of their vehicle entry and must participate in the 24-hour Trial at Wonthaggi.

**In the spirit of learning and  
having fun**

# PUSHCARTS VEHICLE SPECIFICATIONS

Designing and developing a pushcart can be an enjoyable and productive way of introducing primary students to technology, science and environmental education. The machine, powered solely by students, is based on the old fashioned billycart.

## 1. REQUIREMENTS

- Teams of eight students will, with assistance if required, design and build a pushcart according to the specifications which follow.
- Each team of eight must include at least four girls.
- The team may obtain the assistance of other students, parents, friends, local tradespeople, community groups etc. in the development of the vehicle. **However, adults are not permitted to assist when the team is presenting to the scrutineers, nor may they “pace” the team during the track events. Teams who are assisted by adults in the delivery of presentations or on the track will be penalised.**

## 2. DESIGN REQUIREMENTS

### 2.1 General

- The basic design is a billycart with three or four wheels, a roll/push bar and front steering. ( The roll bar may be the push bar or they may be separate)
- Any construction material may be used, provided that the safety requirements are met. No car or motorcycle parts are to be used with the exception of seat belts, which are a safety item.
- Every component of the cart in its dismantled state **must be able to fit under an imaginary bar 100 mm high**. The cart can be as high or elaborate as desired providing it can be disassembled to meet this requirement.
- The front of the push cart must have adequate foam or padded protection to prevent injury should the cart collide with another cart, or the feet and legs of another cart’s pusher.

### 2.2 Brakes

- A brake must operate on at least one rear wheel. The brake control or pedal must have a definite “off” position, controlled by the rider.
- Moving bolts on the front axle pivot and brake parts must have lock nuts or washers, or be so designed that they don’t work loose during the Trial.

### 2.3 Wheels

- Wheels, including tyres, may not exceed 255mm / 10 inches in diameter.
- Front wheels must not contact the cart on full steering lock, causing front wheels to lock.

### 2.4 Safety

- Protruding bolts and fasteners must be cut off and jagged edges filed smooth. **This requirement will be strictly observed at scrutineering.**
- Drivers must be restrained so they cannot fall out of the cart. A proper car seat belt with buckle must be fitted and used by the driver when in the cart. The belt must be wide enough so as not to cause injury **and it must fasten with a buckle. Velcro fastening is not acceptable.**
- The roll bar must provide protection at least 100mm above the head of the tallest driver. It can serve as a push bar or the push bar can be of a separate construction.
- Each member of the team must wear knee and elbow pads, an ASA approved bicycle helmet and protective gloves.

## 2.5 Stability

- If a rear step is installed to enable the pusher to scoot the vehicle, the cart must be stable while the heaviest pusher is standing on the step and the lightest driver is sitting in the cart.

## 2.6 Vehicle Identification

- Each vehicle will require three white identification panels measuring 100 mm x 100 mm for displaying the team's number. These panels must be fitted to each side and the front of the cart. They must be pliable and not constitute a danger to pusher or driver. Numbers will be supplied on registration.
- A 'Tested' sticker will be supplied after the scrutineering 'all clear' has been obtained. This is to be displayed above or below the number at the front of the cart. Provision must be made for this in the front identification panel.
- Provision may need to be made for the display of sponsor panels.

## 3. ASSEMBLY COMPONENT, DESIGN & CONSTRUCTION

Each pushcart will be presented to the judges in a dismantled state. The team will re-assemble the cart without any help from adults. In the unlikely event of a team taking more than 30 minutes to assemble the cart, the attempt will be abandoned for assessment purposes.

**The Design & Construction** segment enables the judges to assess teamwork, practical skills and understanding as well as the design features of the vehicle. In this segment, they will be looking for:

- competence at assembly
- innovation in steering and braking
- pushcart presentation
- use of recycled materials
- acknowledgement of sponsors
- involvement in the wider class or school community in designing and constructing the vehicle
- ability to rebuild the pushcart from the dismantled state within 30 minutes

When the judges have assessed the team during the Design & Construction segment, final scrutineering will be carried out (testing of brakes) and, if all is well, the team may proceed to participate in the Trial segment.

Pushcarts may be permitted to compete in the obstacle course, sprint or endurance relay events without a "TESTED" sticker displayed on the vehicle at the organisers discretion.

## 4. ASSESSMENT

**Design and Construction** .....40 points

The points allocated for each team in the obstacle, sprint and endurance races shall be calculated by dividing your teams time by the fastest teams time and multiplying by the number of points allocated for the section.

Eg. For sprint races .....  $\frac{\text{Your teams time}}{\text{Fastest teams time}} \times 20 \text{ points} = \text{your points scored.}$

**Obstacle Course** .....20 points  
**Sprint** ..... 20 points  
**Endurance Relay** .....20 points

## 5. THE TRIALS

An obstacle course, sprint relay and an endurance relay will test all aspects of vehicle design, construction and reliability as well as student fitness and teamwork.

- The Design & Construction elements and safety requirements must be satisfied before a team can participate in the trials.
- Power for the vehicle must come solely from the single team member who is pushing the cart.
- The pusher may ride on the back of the cart while scooting it along.
- Adequate time will be provided before the trial events start for rectifying any minor problems that might become evident during the Scrutineering and Design & Construction segments.
- Ultimate success on the track will depend as much upon fitness and teamwork as on the design of the cart.
- Poor teamwork, particularly at changeover points in track events, could lead to loss of valuable time.
- Undesirable track behaviour (e.g. arguing at changeover, “pacing” by adults) may be penalised by the marshals.
- All the relay events involve "out and back" trials and are timed over the whole team's efforts **including changeovers and stops.**
- The obstacle race requires rider/pusher changeovers at each end of the figure 8 and the Sprint race at each end of the course. The Endurance relays involve rider/pusher changeover only at one end.
- Teams will be required to participate in all events. Points will be allocated on the basis of elapsed time in each of the obstacle, sprint and endurance events.
- All relays require each member of the team to ride and push in turn, in pairs.

**The Obstacle Relay** trial shall be over a figure 8 shaped course with a start and 2 garages at one end and a Rider/Pusher change over box at the other.

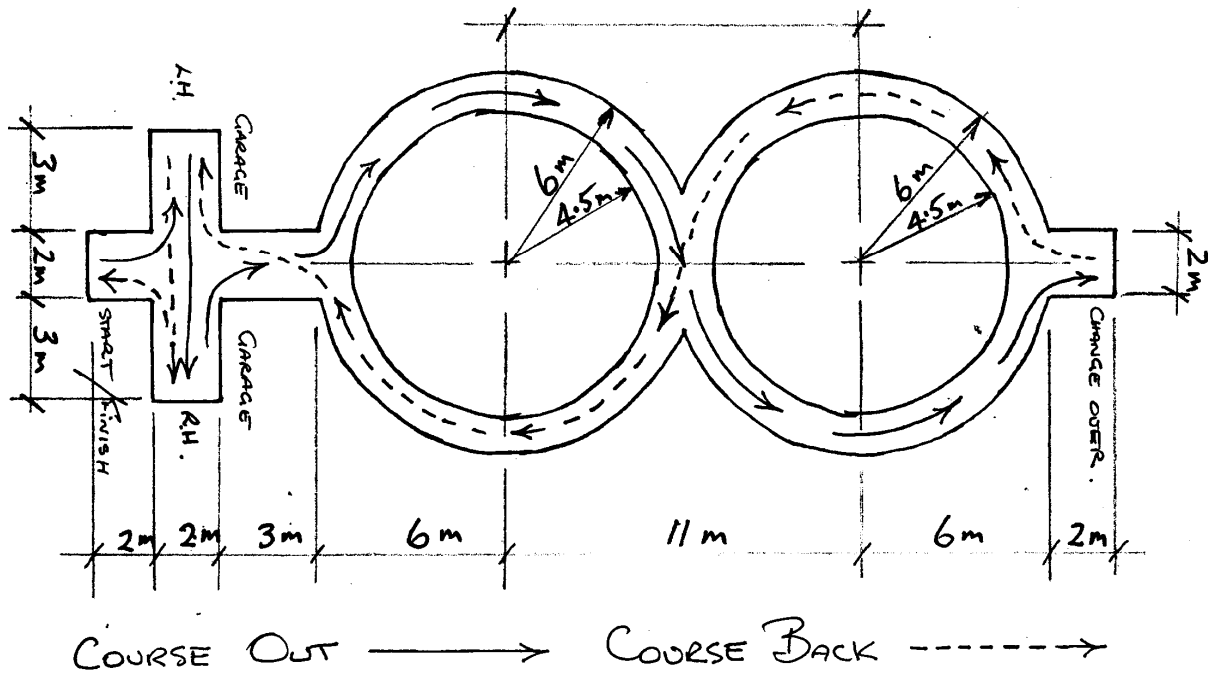
- All rider changes are to be carried out in the marked change box and seat belts are to remain fastened until the cart has entered the change box.
- Any method of turning the vehicle may be employed as long as the two participants do not leave the change box. Seat belts must be fastened before the cart can leave the change box. Penalties apply to riders/pushers who step outside the box or course marking.
- Directions of travel and change over points are as per the diagram and instructions.
- The team's time shall be taken from the start of the first rider/pusher combination, until the last combination completes the course.
- Penalties apply for hitting any marker on the course or errors of passage of the course.
- Each penalty point shall add 5 seconds to the overall elapsed time score.

**The Sprint Relay** component will be conducted over a 50 metre straight track. The team's time shall be taken from the start of the first rider/pusher combination until the last combination completes the course.

**The Endurance Relay** component will be conducted over an approximately 150m long grass track. The teams time shall be taken from the start of the first rider/pusher combination until the last combination completes the course.

# 6. PUSH CART OBSTACLE TRACK

PUSH CART TRACK & COURSE.



# **HUMAN POWERED VEHICLE SPECIFICATIONS**

Entrants will design, build and compete in an endurance event, using a vehicle powered solely by human effort. Design requirements include a maximum length of 2.7 metres, single seat and minimum of three wheels. The rules are similar to those for the RACV ENERGY BREAKTHROUGH, the MAROONDAH GRAND PRIX, the CASEY CARDINIA CYCLING FESTIVAL, the CASEY-BASS COAST HPV SERIES and the AUSTRALIAN INTERNATIONAL PEDAL PRIX vehicles, to allow vehicles from other events to enter without major structural changes.

Entrants may:

- Design and build a vehicle “from a clean sheet”.
- Develop or adapt a vehicle from an existing design.
- Liaise with local industry or community groups to design and build a machine.
- Commercially designed vehicles are acceptable, however the spirit of the event encourages school based design and construction.

For school entries the school Principal must sign a declaration indicating the level of involvement in the design and construction by the students.

The entrant must maintain the vehicle in compliance with these regulations and event supplementary regulations throughout the entire event.

Vehicles that don't comply fully with these specifications, can be accepted at the Organizing Committee/Scrutineers discretion, except where the breach is in regards to safety.

**No vehicle will be allowed to start in the event until it has passed scrutineering.**

The organizing committee and or scrutineers reserve the right to stop and inspect any vehicle during the race and assess its compliance to the race regulations. Vehicles that are deemed not complying to the event regulations due to an accident or parts removal and/or replacement, cannot return to the track until repaired and inspected by a race scrutineer.

All entrants in the Wonthaggi Human Powered Grand Prix will be required to participate in a 24-hour endurance trial event (junior 16 hour) on the Wonthaggi Grand Prix circuit through the Wonthaggi Recreational Reserve (including the lights-on period). Entrants in Casey Cardinia events shall compete as per those specific regulations.

**Where it is envisaged that vehicles will be entered in a range of event venues, entrants are advised to check the relevant specifications when designing their vehicles.**

## **1. SCOPE & CONFIGURATION**

### **1.1 INTENT**

The human powered vehicle category is intended as an experiment in personal mobility; the objective is to build an efficient and stable machine powered entirely by human effort.

### **1.2 SEATING CAPACITY, WHEELS**

The vehicle shall carry a rider alone, and shall have three or more load bearing wheels arranged in a stable configuration. All wheels on the vehicle must be load bearing when stationary.

### **1.3 RIDING POSITION**

Riding position shall not compromise machine controllability or safety, nor shall the riding position place the rider in a potentially hazardous position in the event of a collision. For these reasons a prone riding position or extreme recumbent position is not allowed.

Note: Any design that places the rider in other than a conventional reclined seating position shall be submitted, prior to the event, to the organisers to gauge compliance with this clause and its intent.

## 1.4 POWER SOURCE

Motive power shall be entirely supplied by the rider; however innovative systems such as regenerative braking are encouraged. Where regenerative systems are used, adequate shielding and guarding of the energy storage and drive systems shall be used to protect the rider, pit crew and officials from potential hazards.

## 2. DESIGN AND MATERIALS

### 2.1 INHERENT SAFETY

- The design shall provide protection for the rider in the event of a collision or rollover.
- The design shall be free of protrusions or other features capable of causing interference or injury to riders, fellow competitors or spectators.
- Where composite materials are used, constructors must ensure Safe Work requirements are met in regard to unbound fibres and sharp protrusions that may endanger riders or pit crew.
- Vehicle control and stability shall not be jeopardised by inappropriate design and construction methods. For example; tilt steered vehicles requiring rider lean have proven unstable in past events. Compliance with this clause may need to be demonstrated.

### 2.2 CONSTRUCTION

Choice of design and construction materials is free, except that:

- Mounting methods used for composite material or metal safety bars that are demountable from the vehicle frame shall be by means of bolts, anchor plates, slip joints or other rigid methods. Each mount end of the bar shall be affixed to the main chassis or to substantial brackets. For composite material bars, anchor plates must sandwich, and be glued to, the bar structure or be cast into the structure as part of the composite.
- Where part of the protection system joins onto a composite material chassis or a composite protection system mounts to tubular framework, a 7cm<sup>2</sup> (min) anti “Tear Out “plate (e.g. 30mm diameter washer) shall be used on both sides of any composite material joint, to spread the loads over the materials surface. A crush resistance system must be inside of any composite sections, where bolt forces are applied across the section.
- Construction methods shall produce a sound, race-worthy vehicle that presents no dangers to rider, other competitors or pit crew.
- The use of Go-kart, motorcycle or bicycle frames is not permitted, but bicycle centre brackets, head stems, forks and wheel dropouts etc are allowed.

### 2.3 BODYWORK

Full or partially enclosed bodywork is encouraged.

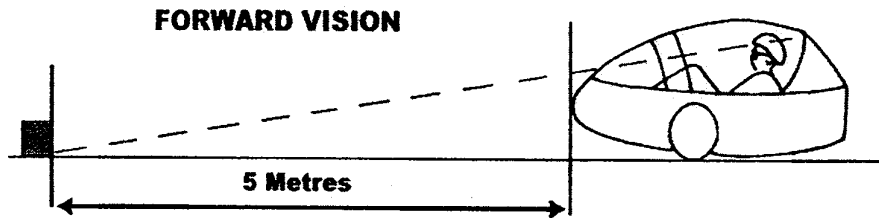
Where full bodywork is fitted:

- There must be a forward distance of at least 300mm between the rider’s face and any bodywork or screen. Open cockpit and screen edges must be taped or have rolled edges to prevent cuts.
- The rider shall be able to open and/or remove bodywork and exit the vehicle without external assistance in a reasonable time span. (*An assistant may be used during testing*).
- Bodywork shall be capable of being opened and/or removed from outside the vehicle, independent of the rider, in an emergency.
- Rider and vehicle safety shall not be impaired by restricted ventilation or visibility.
- The positioning of operating devices for the opening of body sections must be marked on the outside with a white triangle having 50mm sides and a 10mm black border making their location obvious to anyone not familiar with the vehicle.

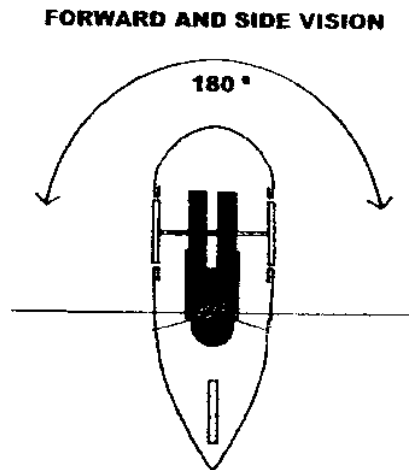
## 2.4 RIDER VISION

Riders seated in the normal riding position must be able to meet the following vision requirements.

- Sight an object on the road at a distance of 5 metres in front of the vehicle.



- Sight 180 degrees ahead of the rider and any other vehicles behind the rider on each side by turning their head. Constructors must avoid excessive width of the front protection bar, where it will restrict the rider's view of the track.



- Provision should be provided to reduce the effects of rain and fogging. Where a windscreen is removed from a fully enclosed vehicle for any reason, or has been modified by the addition of holes, the rider must wear effective eye protection (glasses or goggles).

## 3. DIMENSIONS

The vehicle shall comply with the following major dimensional requirements.

- 3.1 Length 2700 mm maximum
- 3.2 Width 1100 mm maximum
- 3.3 Height 1200 mm maximum
- 3.4 Wheelbase 1000 mm minimum between the most forward and most rearward axles
- 3.5 Track 600mm minimum lateral distance between the centre point of the outermost wheels measured at ground level
- 3.6 Turning circle Be able to turn in a circle of 10 metre diameter maximum, between kerbs, in either direction

## 4. OCCUPANT PROTECTION

Each vehicle shall be fitted with a safety cockpit area that will protect the rider in the case of a rollover or impact accident. Although reference in these rules shall be made to “Bars” any structure or material that performs the same function and meets similar strength and rigidity requirements shall be allowed. All exposed corners of protection bars shall have a radius of no less than 50mm.

### 4.1 ROLL OVER PROTECTION

Roll over protection for the cockpit area shall consist of three principal parts. They shall be (a) Head Protection Bar, (b) Cockpit Side Intrusion Assembly and (c) Leg Protection Structure.

Cockpit overhead intrusion devices are recommended and may become mandatory in future years.

#### 4.1.1 Head Protection Bar

A structure that encloses (outlines) the complete silhouette of the rider when seated in the vehicle and viewed from the rear. The head protection bar shall be within 150mm of the rider’s helmet measured forward or rearward.

For this section vehicles shall be classed as -

**a. Open vehicles.**

Where the cockpit area is open to the elements or a flexible material is used to cover the overhead area, the minimum size of the head protection bar shall be at least 500mm wide at the height of the rider’s shoulders, with the edges of the bar rising around the riders head till they join. On a horizontal line drawn 150mm vertically down from the bars highest point, their distance apart shall be a minimum of 400mm between the outer edges. All exposed corners shall be a minimum 50mm radius.

With the tallest rider seated in the vehicle in the normal riding position, the minimum clearance between the top of the rider’s helmet and the bottom of the head bar shall be 150mm vertical distance

**b. Enclosed hard shell canopies.**

Where the cockpit area is closed off from the main airflow, using a rigid material (Coreflute or better) to cover the overhead area, the minimum size of the head protection bar shall be 500mm wide at the height of the riders shoulders, with the edges of the bar rising around the riders head till they join. On a horizontal line drawn 150mm vertically down from the bars highest point, their distance apart shall be a minimum of 300mm wide between the outer edges. With the tallest rider seated in the vehicle in the normal riding position, the minimum clearance between the top of the rider’s helmet and the bottom of the head bar shall be 100mm vertical distance

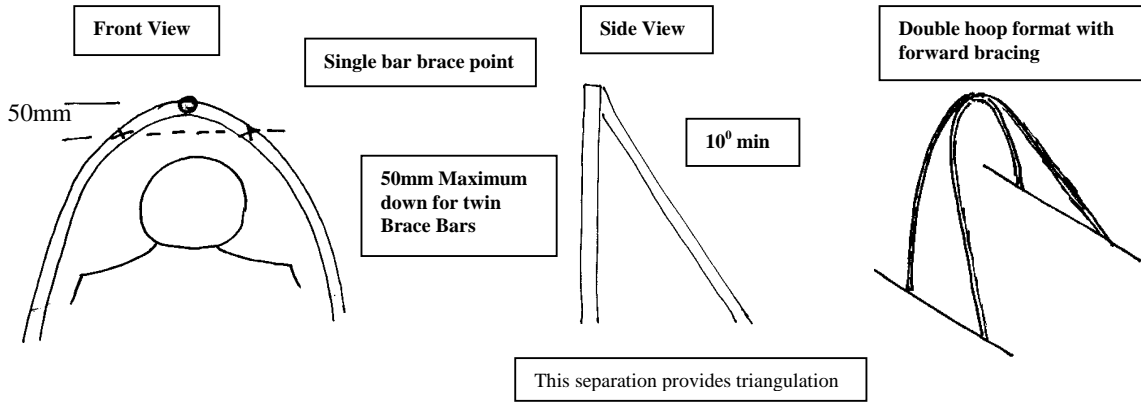
Where the “Hard Shell” or part thereof, is a removable section for rider access during the race, the rider protection system must remain fastened as part of the chassis / frame / body assembly. A robust and reliable locking system must secure the hard shell section closed at all times the vehicle is on track.

If the enclosing hard shell or a lid or window within 400mm forward distance of the head protection bar, is removed during a race, due to accident or for ventilation/vision reasons, then the vehicle shall be deemed to be have been changed to an open top vehicle and must meet those specifications, or shall not proceed.

##### 4.1.1.1 Head Protection Bar bracing

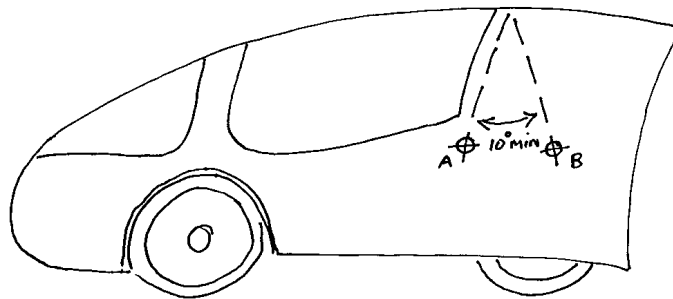
Bracing of the head protection structure shall be to the highest point where a single brace is used or, to within 50mm vertical height of the highest point where two braces are used. The minimum included angle for a brace to a protection bar shall be 10°. Where the brace material has a bend in its line, the angle shall

be taken from a straight line between its mount points. However the bend angle of a brace bar shall not exceed  $30^{\circ}$  unless a gusset is used across the bend.



The Cockpit Overhead Intrusion Device shall not be deemed as part of this bracing.

Where the Head Protection Bar is part of a body assembly, the bracing may be part of that bodies panelling or part of the bars structure, providing that an angle of not less than  $10^{\circ}$  can be shown by projecting lines between the head bar and the bodies mounting points.



Where this configuration is used the composite shell must be mounted with two bolts (eg. points A & B) each side of the vehicle, adjacent to the main head protection bar or at the head bar and another substantial mounting point where direct support for the body work and head bar is provided.

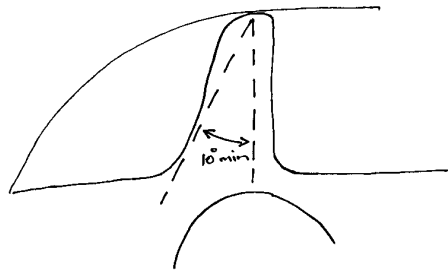
#### 4.1.2 Cockpit Side Intrusion assembly

A rigid Cockpit Side Intrusion assembly shall be provided on each side of the vehicle, rigidly mounted to the main protection bar so that it protects the rider's arms, shoulders and hips from any impact with track side obstacles or a "T bone" collision by another vehicle.

#### 4.1.3 Leg Protection Structure

A Leg Protection Structure shall be provided that traverses the vehicle's centre line, across the knee area, to protect the knees and feet when the vehicle is inverted. The leg protection structure must be supported by a brace to its highest point to prevent the bar folding over in the event of a roll over or collision.

Where the leg protection structure is part of a body assembly, the bracing may be part of that bodies panelling or part of the bars structure, providing that an angle of not less than  $10^{\circ}$  can be shown by projecting lines between the leg bar and body mounting.

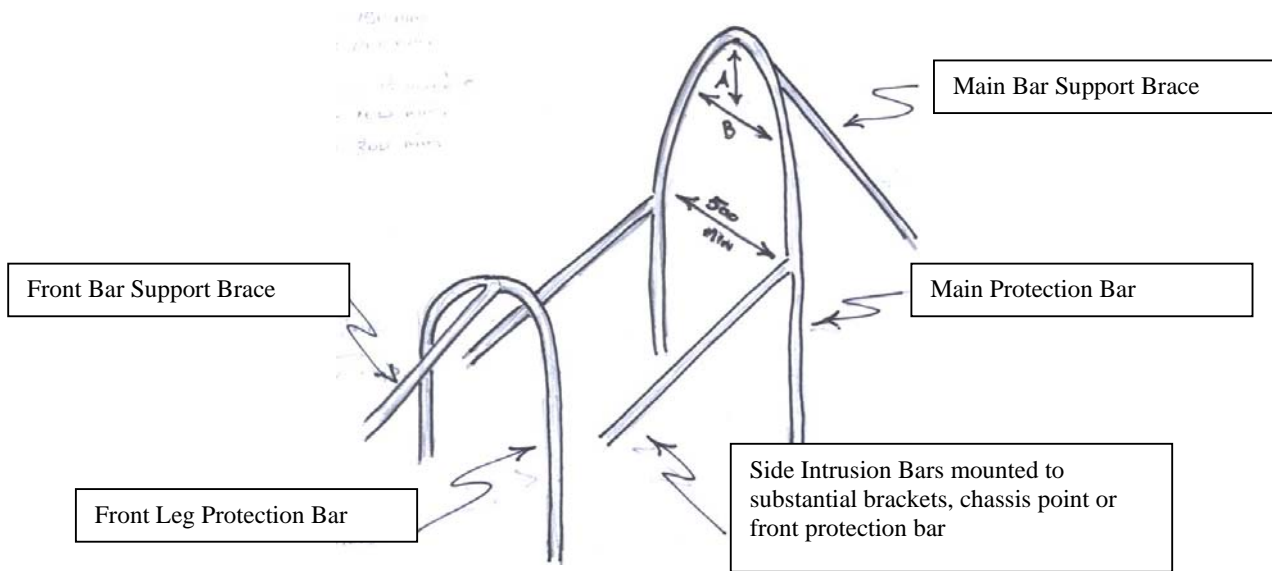


It is recommended that a **Cockpit Overhead Intrusion Device** is provided that protects the rider from impact or intrusion, if the vehicle is hit by or hits another vehicle or track side obstacle, while on its side. The minimum requirement shall be two bars, (Aluminium, Steel or Composite) evenly spaced about the centre line of the vehicle and connecting the main head protection bar and the leg protection bar. These bars must be a minimum of 200mm apart and a maximum of 300mm apart at their mid point. Closer spacing is allowed when more than two bars are used but the minimum overall width is 200mm. There is no maximum width for more than two bars but they should be evenly spaced.

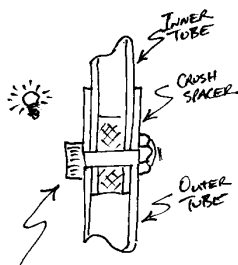
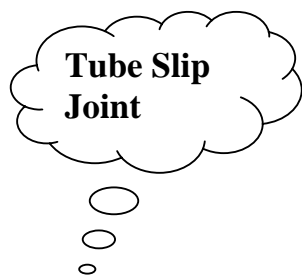
## 4.2 CONSTRUCTION

### 4.2.1 Rider Cockpit Protection Assembly

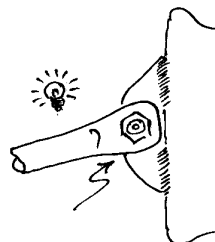
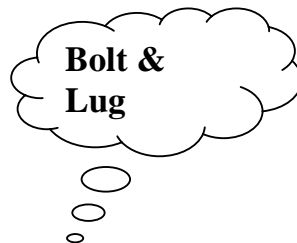
Dimensions for	Open Vehicles	Enclosed Vehicles
A	150mm	150mm
B	400mm	300mm



These sections shall be assembled to form a solid structure in conjunction with the body, frame or chassis. They will be mounted and braced to solid frame or chassis areas to resist bending in all directions from impacts that are foreseeable during a race incident.



Minimum bolt size M6  
x Gr5 + Nyloc nut



Minimum bolt size M6  
x Gr5 + Nyloc nut

Any parts of the structure may be joined using bolts and welded tabs, Slip joints with through bolts (a crush spacer must be used in the inner tube), welding or a similar high strength composite material design or appropriate combination. No joint shall have the potential to slip along the section/bar/tube etc to which it abuts. Eg. No ring clamps etc.

#### 4.2.2 Materials For Rider Protection Structures

The minimum size tubes or material used in a safety structure or its braces shall be as below. Other shapes and sections of materials may be used but shall be the minimum sizes given across in their smallest direction

1. Steel - 12.5 mm minimum outside diameter for round tube.
2. Aluminium - 16 mm minimum outside diameter for round tube.
3. Composite materials that have a comparable or greater strength to the aluminium or steel sizes stated, and formed in such a way as to create a rigid structure, comparable to a tube assembly, may be used.

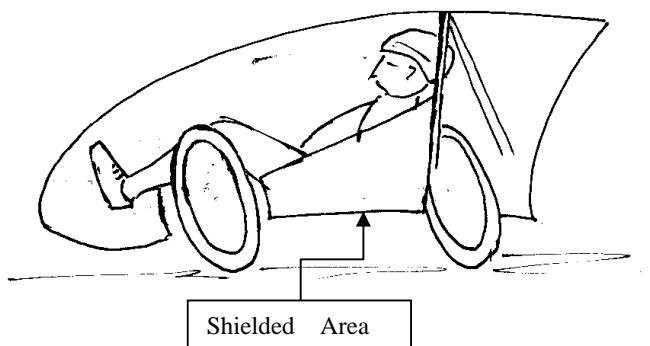
N.B. A safety structure, constructed of any material, should not deform from its shape to any appreciable degree, when solidly pushed by hand **in any direction**.

The minimum bolt size used in the mounting or joining of rider protection tubes or materials shall be M6 x Gr 5 strength, fitted with Nyloc nuts or similar. At least 3 threads should show through the nut.

Where part of the protection system joins onto a composite material chassis or a composite protection system mounts to a tubular frame, a 7cm<sup>2</sup> (min) anti "Tear Out" plate (e.g. 30mm diameter washer) shall be used each side of the composite material join, to spread the loads over the materials surface. A crush resistance system must be inside of any composite sections, where bolt forces are applied across the materials section.

#### 4.2.3 Floor and Side Protection Panels

All vehicles shall be fitted with a floor pan. It must be of sufficient size and construction as to prevent the rider's feet, legs or hands from contacting the road surface when seated. The rider's body, along each side, shall be protected by rigid material panels (Coreflute Plastic or better) that restricts the rider from accidental contact with the road surface or another vehicle in a rollover, T bone or side slide situation.

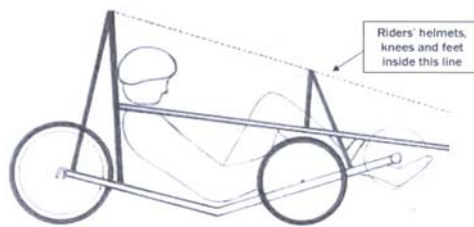


This area shall cover from shoulder to hip and down to the floor line under the rider and be rigidly retained in place with the floor pan.

In Delta design vehicles, the side panel shields must extend forward past the riders knee area.

#### 4.2.4 Rider to Road Clearances While Inverted

A projected line across the height of both main and leg protection bars shall provide a minimum clearance of 50mm between the rider's knee and toes in their highest position and this line. The line drawn between the head and knee protection bars is carried forward for the foot clearance.



### 4.3 SEAT

#### 4.3.1 Position

Seat design shall not compromise machine controllability or safety, nor shall the seat place the rider in a potentially hazardous position in the event of a collision. For these reasons a prone riding position or extreme recumbent position is not allowed.

#### 4.3.2 Locking

The seat must be positively fixed into the riding position. Adjustable seats must lock securely into position for each rider and must not be able to be moved while the rider is seated. A retaining system must hold the seat in position when the vehicle is inverted.

#### 4.3.3 Extra padding

Any temporary or removable seat padding used by the riders must be fixed into place using a positive attachment to a fixed part of the vehicle or seat frame. Straps, Ties, Cord loops, Velcro, Clips etc meet this requirement

### 4.4 SEAT BELT

#### 4.4.1 Type

The vehicle shall be fitted with an adult four point automotive static seat belt.

Automotive full harness types are acceptable.

The seat belt will include a standard automotive buckle and be free of visible damage.

Seat belts are to be at least 48mm wide and adequately attached to the frame by the standard terminal plates of a commercially made seat belt.

#### Recommended suppliers

**HEMCO INDUSTRIES Vic.**

**Phone (03) 5334 1213**

**Fax (03) 5334 1011**

**KLIPPAN SAFETY PRODUCTS**

**Phone 1800 804 588**

#### 4.4.2 Mounting

The seat belt shall be mounted to a major structural member of the vehicle **in such a way that the belt is positioned to satisfy ADR 4/01.**

Upper belts may be mounted to suitably braced points on the roll bar **but must not pull excessively downwards on the rider's shoulders while restraining the rider.**

#### 4.4.3 Positioning

The positioning of buckles and belts on the rider's body shall conform strictly to the belt wearing requirements of Australian Design Rules (ADR's) for motor vehicles.

The relevant section of the ADR 4/01 is reproduced below.

**“Seat belts are designed to bear upon the bony structure of the body, and should be worn across the chest, shoulders and low across the front of the pelvis; wearing the lap section of the belt across the abdominal area must be avoided.**

**Seat belts should be adjusted as firmly as possible, consistent with comfort, to provide the protection for which they have been designed. A slack belt will greatly reduce the protection afforded to the wearer.”**

Riders may be directed to the pits during the race to have their seat belts readjusted.

### 4.5 SHIELDING

#### 4.5.1 Rider Protection

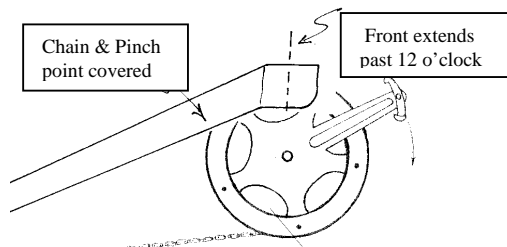
Wheel spokes shall be shielded **on both sides** with rigid material to prevent injury resulting from accidental contact with rider's limbs or fingers. **This applies to both external and enclosed wheels** where fingers can reach through wheel cut outs, steering handlebar and parts clearance holes.

Exposed axle ends further than 300mm from the centre line of the vehicle shall be:

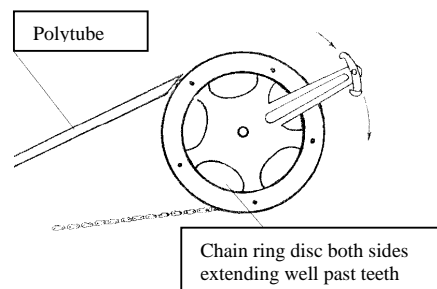
- In a recess or be flush with the hub.
- Covered by body work or by bar work.
- Dome nuts or hub caps.
- Shielded by an annulus capping.
- A nyloc nut with no thread showing.

Other moving components (chains, sprockets, gear wheels and controls) shall be guarded to prevent accidental hazardous contact with rider or clothing and have “pinch points” shielded.

#### Rigid Chain Guard



#### Chain Tube and Sprocket Rings



#### **4.5.2 Protection of other Vehicles**

All vehicles must incorporate substantial forward protection for the rider's feet, to cope with a frontal collision, and must be designed so as not to cause penetration damage to another vehicle in a collision. Chains, gear wheels and sprockets shall be suitably shielded to prevent their contact with other vehicles.

#### **4.5.3 Shielding from Road Surface**

Vehicles must be fitted with an under-tray or floor panel which prevents the riders feet, legs or hands from contacting the road surface when seated in the riding position. It is encouraged that the tray/floor be part of a body shell but, as a minimum, must be securely affixed to the side protection panels.

### **4.6 SAFETY EQUIPMENT**

#### **4.6.1 Helmets**

Riders shall wear a properly fitted and adjusted approved bicycle helmet **complying with ASA 2063** or the appropriate European Standard, at all times when riding the vehicle.

#### **4.6.2. Gloves**

To protect the riders from gravel rash or friction burns riding gloves shall be worn at all times when riding the vehicle.

#### **4.6.3 Glasses**

In open top vehicles riders shall, at all times, wear glasses that adequately protect their eyes from foreign matter. Where the front screen is wholly or partially removed from an enclosed body, or has been modified by the addition of holes, the rider shall wear eye protection.

#### **4.6.4 Clothing**

Clothing should be firmly fitting and, preferably, cover the rider from elbows to knees. Singlets and tank tops are not permitted.

## **5. STEERING**

### **5.1 TYPE**

The type of steering mechanism is free, provided the driver is afforded continuous positive control without the need for regular adjustment. Simple rope systems are not permitted.

**Steering columns that project towards the rider's face must not be closer than 300mm from the rider's face.**

### **5.2 FREEDOM FROM BINDING AND FOULING**

Steering linkages shall operate freely from full left to full right lock without binding or fouling.

### **5.3 LOCK STOPS**

Positive stops shall be provided to limit the steering linkage movement at maximum lock to prevent damage, over centre travel, or tyre/wheel contact against occupants or frame components.

Stop bolts, plates, chains or cables are acceptable for this requirement.

## **6. BRAKES**

All wheels in contact with the road must have a braking capability.

Brake systems must not apply friction contact to the tyres.

### **6.1 INDEPENDENT SYSTEMS**

All vehicles shall be fitted with a minimum of two separate and effective braking systems.

A separate brake lever must be used for each system.

Brake controls must be away from any moving parts and or the road surface, to avoid injury to the rider or compromising the braking systems operation on the vehicle.

## **6.2 ADJUSTMENT**

Allowance must be made for brake wear, as brakes must continue to work effectively for the duration of the event.

## **6.3 SIMULTANEOUS OPERATION AND DIRECTIONAL STABILITY**

A minimum of any two braking systems shall be operable by the rider simultaneously.

Independent operation of any braking system shall not have the potential to affect directional stability of the vehicle. That is, the braking power of each and every braking system shall be symmetrical about the vehicles longitudinal centre line.

## **6.4 STEERING CONTROL**

Full steering control shall be maintained while any two braking systems are being operated.

# **7. ANCILLARY DEVICES**

## **7.1 LIGHTING**

The track will be lit with normal street lighting supplemented, where possible, with some additional lighting. Therefore the vehicles front lighting shall meet the requirements of **rule 7.1** and the events supplementary requirements as stated in **Appendix 1**:

### **7.1.1 Headlight**

Each vehicle shall have a minimum of one white headlight forward of the riders feet at the front of the vehicle. Flashing headlight settings are not to be used in any circumstances.

The headlight must be of sufficient size and light intensity to effectively illuminate the track and be fitted at least 250mm and not more than 600mm above road level.

Note. Clear covering panels over all light types, especially covers at acute angles to the light, severely reduce the lights illumination of the road and may cause non compliance to this rule.

### **7.1.2 Tail Light**

Each vehicle shall have a minimum of one red tail light with a total lens area of at least 7cm<sup>2</sup>.

Red flashing LED-type bicycle tail lights are acceptable when set to the “3 LEDs” flashing at one time.

The tail light shall be positioned symmetrically about the vertical axis of the vehicle and within 150mm of the rear of the vehicle, set at least 350mm and not more than 600mm above the road surface.

### **7.1.3 Outline Lighting**

The use of reflective material or strip lighting to indicate machine width and height (especially from the rear) is encouraged. However, any lighting/outline marking system that may be mistaken by a rider as a Red tail light or White head light shall not be used. Teams may use subsidiary lights of colours other than red or white, anywhere on their vehicle.

### **7.1.4 Mounting and Aiming**

All lights shall be securely mounted to maintain correct aim.

### **7.1.5 Batteries**

All batteries used in the vehicle shall be suitably restrained with the method dependent on size and weight of the battery. Lighting or other power source batteries shall not be able to fall out of their restraint if the vehicle is inverted. Wet batteries (liquid lead/acid) shall not be used.

### **7.1.6 Operation**

Both head and tail lights must be securely mounted and continuously operational during the designated “lights on” period. This will approximate to the streets lights being lit. Teams will be advised when lights must be turned on and when they may be turned off.

## **7.2 MIRRORS**

### **7.2.1 Number and Type**

The Vehicle shall be fitted with two flat plain or mildly convex mirrors, one on either side of the rider. The two mirror lenses shall have similar curvature (i.e. same image size).

### **7.2.2 Positioning**

Each mirror shall be positioned no lower than rider chest height and such that:

- the rider is afforded a clear view to the rear in each mirror.
- the rider can reach each mirror from the normal riding position.

### **7.2.3. Size**

Reflecting surface area of each mirror shall be 20cm<sup>2</sup> minimum. Automotive spot mirrors (2”) meet this requirement.

### **7.2.4 Mounting**

Mirrors shall be securely mounted and be free from vibration.

## **7.3 WARNING DEVICE**

An audible electrical warning device shall be fitted and be operable from the normal riding position, and shall not impair rider control in its mounting or use. The warning device shall be mounted forward of the front axle and the mouth of the device must be licked by the external air stream.

The rider may be required to demonstrate the operation of the horn at pit exit.

The operation of the horn must be solely by the use of a momentary switch.

The horn must emit sound in excess of **85** dbA measured directly in front of the vehicle at a distance of 1 metre from the front of the vehicle. This will be checked at scrutineering.

## **7.4 OTHER DEVICES**

Other equipment e.g. drink bottle, GPS, communication radio etc shall be securely mounted, and shall not impair rider control in their mounting or use.

## **7.5 SPEEDOMETER**

It is compulsory that the vehicle be equipped with a simple electronic speedometer (eg cateye) to monitor speed whilst in the pit areas (speed limit of 15kph).

## **8. MARKINGS**

### **8.1 NUMBER AND COLOUR**

Each vehicle shall have three identification panels, so that the vehicle number is clearly visible from the front and either side. The front number must be on a body panel that is at an angle of not more than 45° to the vertical. On vehicles where it is not practical to have the front number on the longitudinal centre line of the vehicle the number panel shall be affixed to the RHS of the vehicle forward of the front axle.

Identification panels shall be either a rectangle 250 x 300mm or a circle 280mm diameter.

Panels shall be coloured according to the class entered and surrounded by a black border 18mm wide (insulation tape).

The colour of the number panel for each class shall be as follows;

Junior	Orange
Middle	<b>Pale Green</b>
Senior	Yellow
Open	White
Open Girls	White
Community	<b>Pale Blue</b>
Veteran	<b>Pale Blue</b>

No marking or design is permitted within 50mm of the panel, or within 50mm of the border. Official numbers will be supplied by the organisers at the time of registration and must be properly affixed to the vehicle prior to scrutineering.

## **8.2 EVENT SPONSORSHIP**

Vehicles shall have provision for placement of event sponsorship stickers that must be clearly visible at all times throughout the event.

Each vehicle shall have one space on each side of the vehicle measuring 600mm by 300mm for this purpose.

## **8.3 TEAM SPONSORSHIP**

Teams are invited to display on their vehicles and uniforms, any signs/logos that promote healthy school/institution, industry and community links.

Signs/logos, stickers, vehicle name etc. representing drug, alcohol, illegal substances or practices are forbidden.

The event organisers, in the public's interest, reserve the right to request removal of any offensive signage or refuse participation in the event by a team member, team or vehicle.

## **9 TIMING**

The organisers utilise an automatic timing system that requires all vehicles to be fitted with a timing transponder. Fully charged transponders will be available from the organizers at registration and must be securely mounted in the vehicles at all times during practice and racing.

Mounting instructions, if required, will be supplied with any further regulations.

The Timekeepers for the event shall be Multisport Australia

☎: + 61 2 97742148

☎: + 61 2 97741064

☎: + 61 411 029675

W : [www.multisportaustralia.com.au](http://www.multisportaustralia.com.au)

✉: [info@multisportaustralia.com.au](mailto:info@multisportaustralia.com.au)

✉: [cc\\_nsw@hotmail.com](mailto:cc_nsw@hotmail.com)

📍: PO Box 4228 , Lugarno, NSW, 2110, Australia

## Appendix 1 - Lighting and testing Methods

The head light fitted to Human Powered Vehicles for the Wonthaggi Human Powered Grand Prix, shall have an equivalent of 20 watts rated power, (preferably 25w) aimed to illuminate the roadway ahead.

- The headlight shall comprise a parabolic reflector and a light source, emitting a range of frequencies with an output in excess of 14500 lux. In the case of multiple headlights at least one light must have an output in excess of 9000 lux but may not be used in a system where only one light is selectable to a lower lux value than 14500 lux.
- The light must be capable of producing a visible light spot on the road surface. This spot must not exceed 40cm wide when measured 1 metre in front of the headlight.
- The output of the headlights will be tested using a standard Lux meter available from a secondary school science department with the sensor being placed at one end of a 100mm diameter, white (stormwater) PVC pipe, 600mm long and the light at the other end.
- Bicycle HID lights and 12v20w halogen down lights both meet this requirement.
- Most commercial LED type headlights currently do not comply with these requirements. If you intend to use high performance LED head lighting, “Check Carefully” the lux output before scrutineering,

The following is a list of commercially available lights that meet the requirements for the Wonthaggi Human Powered Grand Prix when mounted correctly without any form of transparent covering.

12V 20W 16° Downlight powered by a 12V 7Ah sealed Lead Acid batteries.

12V 20W 32° Downlight powered by a 12V 7Ah sealed Lead Acid batteries.

Cygolite Dual Cross Lithium ion

Cygolite Dual Cross 300 LED

Cygolite Trion 600 LED

Cygolite Dual Cross Pro

Ay Up Twin Cree X lamp

Lumicycle Halide 2009 Plus

Nite Rider Slick Rock 900

Jaycar Rechargeable 35W HID spotlight

LUXHID Maglevin HID 24W

Topeak Moonshine 3H with Lithium Ion battery

Topeak Moonshine Enduro HID

Most High Intensity Discharge (HID) models meet the basic requirements as listed above.

Exposure models Joystick (at the highest level), Diablo, Toro, MaxD and Six Pack

This list is not exhaustive and can be up dated at any time.

Competitors should be aware that many of the lamps listed above are expensive and it is the responsibility of the entrant to ensure that the headlights fitted to their vehicles comply with the current rules.



## ENTRY FORM

Tax Invoice

ABN 45 454 918 270

**March 23<sup>rd</sup>, 24<sup>th</sup>, 25<sup>th</sup>, 2012**

Category & Event	Team/Class		Cost
<p style="text-align: center;"><b>Pushcart</b> (Obstacle, Sprint, Endurance)</p> <p>(Indicate the class/age group in the appropriate box)</p>	<b>Middle Primary</b> Yr 3-4	<input type="checkbox"/>	<p><b>\$40</b></p> <p>(inc. GST)</p>
	<b>Senior Primary</b> Yr 5-6	<input type="checkbox"/>	
	<b>Junior Secondary</b> Yr 7-8	<input type="checkbox"/>	
<p style="text-align: center;"><b>Human Powered Vehicle</b></p> <p>(Scrutineering/24 hour Endurance)</p> <p>(Indicate the class/age group in the appropriate box)</p>	<b>Junior Secondary</b> Yr 5-7	<input type="checkbox"/>	<p><b>\$325</b></p> <p>(inc. \$20 Waste Disposal levy and GST)</p>
	<b>Middle Secondary</b> Yr 8-10	<input type="checkbox"/>	
	<b>Senior Secondary</b> Yr 11-12	<input type="checkbox"/>	
	<b>Open Secondary</b> Yr 7-12	<input type="checkbox"/>	
	<b>Open Girls</b> Yr 7-12	<input type="checkbox"/>	
	<b>Community</b>	<input type="checkbox"/>	
	<b>Veterans</b>	<input type="checkbox"/>	

School/Entrant: .....

Address: .....

.....Postcode .....

Phone: ..... Fax: .....

e-mail: .....

Team Name: .....

Enclosed is a cheque for \$ ..... Made payable to **Wonthaggi Energy Innovation Festival**

Contact Person .....Signature:.....

(please print)

Principal's Signature: .....

Indicate size of marquee if required. 3x3  6x3  6x6

Marquee prices; 3x3, \$190, 6x3, \$300 and 6x6, \$575. Marquee cancellation shall be no later than 3 weeks prior to the event or full payment will be required.

We intend to enter the Casey-Bass Coast HPV Series. Please circle YES/NO



## **Please don't forget to...**

Use a separate form for each team entry  
Forward entry forms and payment to:

**The Race Secretary  
2012 Wonthaggi Human Powered  
Grand Prix  
49 Kirrak Street  
North Wonthaggi 3995  
Victoria  
Phone (03) 5672 2570**

Web site: <http://www.wonthaggisc.vic.edu.au/hpv>

*Please indicate on the entry form if you wish to hire a marquee on a "walk in walk out" basis. Marquees are 3x3m or 3x6m in pit lane or 6x6m in the camping area.*

*Any information regarding special requirements such as large vehicles or space etc for catering or camping would be appreciated.*

*Teams wishing to be adjacent due to sharing of facilities should note that on their entry forms.*

Closing date for entries

**Friday 24<sup>th</sup> February 2012  
For Pushcarts and Human Powered Vehicles**

The first 80 entries in the HPV section will be accepted. Subsequent entries shall be placed on a waiting list in order of receipt of the entry.

All entries are accepted at the organiser's sole discretion.

For details of the Casey Cardinia events go to the cchpvcc website [www.cchpvcc.org.au](http://www.cchpvcc.org.au)

## Contact Numbers

### Race organisers

**Ewan Cole (Race Secretary)**

**Phone (03) 5672 2570**

**Mobile 0428 348 345**

**e-mail [ewancole@bigpond.com](mailto:ewancole@bigpond.com)**

**Allan Harris**

**Phone (03) 5671 3700/5672 0900**

**(03) 5678 7394 ah**

**Fax (03) 5672 1578**

**Website <http://www.wonthaggisc.vic.edu.au/hpv>**

### **Vehicle Specification**

Allan Harris

Work ☎ (03) 5671 3700

Home ☎ (03) 5678 7394

Fax (03) 5672 1578

### **EMERGENCY PHONE NUMBERS**

Police 5672 2761

Ambulance 000

Fire Brigade 000

Wonthaggi Medical Group 5672 1333

Wonthaggi Hospital 5671 3333