

2019 SCHOOL'S HANDBOOK
PART B: PUSHCARTS

ENERGY BREAKTHROUGH

20-24 NOVEMBER 2019 | MARYBOROUGH, VICTORIA

POWERED BY IMAGINATION

THE PREMIER SCIENCE, TECHNOLOGY, ENGINEERING AND MATHS, ACTIVE LEARNING PROGRAM



A PARTNERSHIP BETWEEN



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PUSHCARTS

1. OVERVIEW



Ages: Open to Primary students.

Class: A1, A2

Quota: 80

Challenge: To demonstrate their knowledge and understanding of their pushcart by assembling it in front of a panel of judges and completing a formal presentation.

The carts are then pushed energetically through an obstacle course, sprint and circuit events at Maryborough in November.

1.2 Classes

[The classification for schools entering the A1 and A2 classes will include the TOTAL school enrolment, not the Primary component of a school. This classification will be made by the organisers using information published on each school's website and the MySchools website.](#)

CLASS	YEAR LEVEL	TEAM SIZE	GENDER REQUIREMENTS	SCHOOL SIZE
A	Years 1 - 6	Min 4 - Max 10	At least 50% female.	N/a
A1	Years 1 - 6	Min 6 - Max 10	At least 50% female.	Schools with an enrolment of 200 or less
A2	Years 1 - 6	Min 6 - Max 10	At least 50% female.	Schools with an enrolment of more than 200.

1.3 Team Composition

- All entries are to be team entries and must consist of current school students.
- All team members must be familiar with the operation of their vehicle, innovation or pushcart and must participate equally in the assessments at the event in Maryborough.
- Team members do not have to all come from the same school. They could be part of a scout, church, or other community group, however they must all be current school

students and be covered by the group’s insurance. [Where non-school teams have riders from other schools participating in Energy Breakthrough, they must have written approval from the Principal of the school.](#)

- Teams in the Pushcart category will consist of:
 - a minimum of eight (8) and a maximum of ten (10) participants,
 - of whom at least half must be female.
 - All team members must participate in the Design and Construction and Display and Presentation elements of the event.
 - Each team member must participate in at least two of the three track components: sprint, endurance and obstacle.
 - The team may obtain the assistance of other students, parents, friends, local trade’s people, community groups, etc, in the development of the pushcart. However, adults and other students are not permitted to assist the team when competing.

2. ASSESSMENT

2.1 Overview

The Energy Breakthrough is unique in that all teams must compete across three areas of assessment: Design and Construction, Display and Presentation and Trials.

All sections must be attempted and points are awarded in the following sections:

SECTION	PUSHCARTS
Design & Construction and Scrutineering	30
Display and Presentation	30
Trial elements:	
Endurance trial	15
Time Trial	15
Obstacle	10
Total	100

It is the responsibility of each team to ensure they complete all sections. The schedules for each of these sections are outlined in this Handbook and further details are provided in an Information Kit distributed in November.

2.2 Scrutineering

Immediately following their Design and Construction assessment, all teams must present their pushcart, all team members and safety equipment to judges for scrutineering.

All pushcarts must be scrutineered to ensure the vehicles are safe and meet all the design specifications outlined in the relevant section of this Handbook. These checks ensure that the vehicle is safe for the occupant, other teams and spectators.

Where entries do not comply with specifications, or are considered unsafe, scrutineers will provide assistance and/or direction with work required in order to comply.

A ‘Tested’ sticker will be allocated to teams after successful completion of scrutineering. Teams will not be permitted to participate without a sticker. This is to be displayed above or below the number at the front of the pushcart.

Officials and / or Scrutineers can refuse permission to enter the track for any safety reason.

Pushcarts may also be inspected at random during the trials for operation of safety items or when the vehicle is involved in a track incident.

2.3 Design and Construction



2.3.1 Purpose

The purpose of Design and Construction is to assess the team's knowledge and understanding of the pushcart and its design and construction.

The Design and Construction assessment requires each team (without support crew) to rebuild their dismantled pushcart within 30 minutes.

Teams will also be required to:

- discuss and explain design and construction processes, and
- show all rider safety equipment, including each person's gloves, helmets and glasses.

2.3.2 Criteria

This event also enables the judges to assess teamwork, practical skills and understanding as well as the design features of the pushcart.

Throughout this assessment, judges will be looking for:

- competence at assembly,
- innovation in design,
- construction of pushcart,
- overall team approach,
- use of recycled materials,
- technology skills, and
- involvement of other people in design.

In the unlikely event of a team taking more than 30 minutes to assemble the pushcart, the attempt will be abandoned for assessment purposes.

Following the Design and Construction assessment, all pushcarts will be scrutineered to assess safety and compliance with the design specifications.

2.5 Display and Presentation



2.5.1 Purpose

The purpose of the Display and Presentation is for team members to demonstrate their knowledge and understanding of their entry.

Judges consider the different approaches taken in the presentations, such as some students reading from notes versus student presentations with limited reference to prepared notes. Schools are encouraged to be innovative in their presentations. However, care needs to be taken to ensure that ‘distractions’ do not overtake the real purpose, that is, *‘students demonstrating their understandings’*.

2.5.2 Format

Each team will be required to present for a maximum of 20 minutes to a panel of judges. This will be followed by up to 10 minutes of questions from the judges.

This oral report will relate to the development of the team entry, including ideas that did not work and why.

The judging panel consists of three members: a community representative, a young person with an interest in education and/ or technology and an education/teacher representative. Judges will ask questions of team members following their presentation.

All registered team members are required to participate equally in the presentation. Teams may choose to include up to two (2) additional students (i.e. support crew) to join their registered team members in their presentations. However, the presentation roles must still be shared equally by all participating team members.

The display may include photos, videos, models, prototypes etc to explain the involvement of students, school, community and/or industry in the program and the development of their entry. To reduce interference from nearby panels, no public address or small music (CD) systems will be allowed without prior approval of the Display & Presentation Coordinator.

The presentation should be designed in a way that ensures information is well presented by students and enables the students to demonstrate their knowledge, understanding and involvement in all aspects of the entry.

2.5.3 Schedule

A specific time for each team to complete their Display & Presentation will be included in the Information Kit sent to schools in November. Each team is allocated time to set up their display prior to their time.

Event schedules will require teams to have arrived and be available from 12 noon on the day of the assessment. Late arrivals will be accepted only by negotiation.

2.5.4 Criteria

The team will be required to present their record, visually and orally, showing:

- The various aspects of the project, including sketches, mock ups.
- How the pushcart was developed, what problems arose and how they were overcome.
- How other students and other people were involved.
- How studies were integrated in the development of the pushcart.
- How the team prepared for the Breakthrough.

It is understood that the levels of student involvement in the technical and practical activities related to the design and building of an entry will vary with age.

The oral presentation will be assessed according to:

Presentation Style:

The introduction and outline of the presentation; awareness of the audience; style of presentation (reading from notes or reciting); clarity of language; use of materials, diagrams and models covered.

Team Work:

The effectiveness of leader's role; sharing of knowledge and responsibility in the team; acknowledgment of individual team members' role; team attitude and enthusiasm and the extent to which the presentation reflects the students' own work.

Knowledge and Understanding:

Knowledge of the aims and values of the Energy Breakthrough; highlights of the school and community participation; team planning; preparation and training and technical aspects of the development of the vehicle.

Development of a Story:

About the entry, including the challenges; the preparations; the school and community's involvement and the students' achievements.

The visual display will be judged according to:

Layout and Organisation:

The range of visual media and written text depicting vehicle development; the arrangement of items; the variety of information presented and the acknowledgment of sponsorship/financial support received.

Quality of Display:

The effective use of diagrams, models, photos, text, drawings, etc. to convey message.

2.6 The Trials

In this section, the operation of each entry will be tested. **Pushcarts** teams tackle a Sprint Relay, Obstacle course & an Endurance Relay. All teams must participate in all three elements.

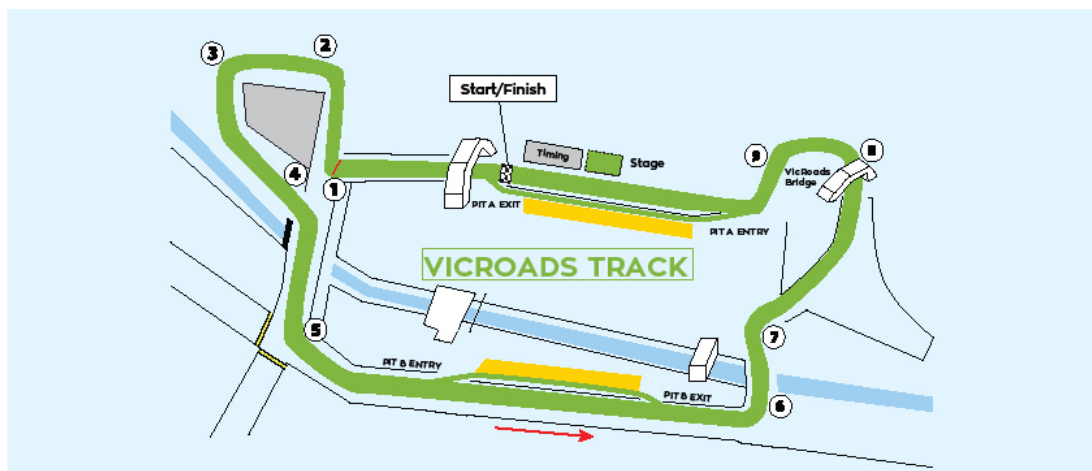
- Points will be allocated on the basis of time for all events.
- Power for the vehicle must come solely from the single team member who is pushing the pushcart.
- The pusher may ride on the back of the cart while scooting along.
- Ultimate success on the track will depend as much upon fitness and teamwork as on the design of the vehicle.

2.6.1 The Circuits

There are two tracks in Princes Park, Maryborough surrounding the beautiful Lake Victoria. On both tracks there are some unlit sections at night, and the sealed surfaces are not “billiard table smooth”.



The **Track 1**, shown above, is a challenging street circuit that reflects real-world conditions. This track will be used for the Secondary HPVs and Energy Efficient Vehicle teams and the Pushcart sprints.



The **VicRoads Track**, shown above, is located between the Maryborough Caravan Park and the Princes Park oval. It is approximately 1.1 km long and includes a number of challenging left and right hand bends.

This track will be used by the HPV A (Primary) teams, the Try-athlon Endurance teams and the Pushcart Endurance event.

2.6.2 Time Trial (Sprint relay):

The sprint relay will be conducted over a 50 metre straight track with eight team members having a turn of pushing and driving.

POINTS ALLOCATION FOR THE SPRINT RELAY

- Points will be allocated on the total team time recorded. That is: 15 points to the team recording the fastest time.

$$\text{Time Trial Score} = 15 - \left[\left(\frac{X - Y}{Y} \right) \times 15 \right]$$

- Where Y = fastest team time recorded & X = team's own time

2.6.3 Obstacle :

Four pairs of team members will be required negotiate an Obstacle Course on both sealed and grassed surfaces. Each pair will comprise a driver and a pusher. Each pair will do one lap of the Obstacle Course. Therefore four team members will each PUSH one lap only and four team members will each drive for one lap only.

POINTS ALLOCATION FOR OBSTACLE COURSE

$$\text{Obstacle Course Score} = 10 - \left[\left(\frac{X - Y}{Y} \right) \times 10 \right] - \text{Penalty}$$

- Where Y = fastest team time recorded (in seconds) & X = teams own time (in seconds).

Obstacle - Penalties & Infringements:

INFRINGEMENT	PENALTY POINTS
Contact with hay bale or barrier, loose seat belt and/or helmet,	0.2
Careless driving, contact with other vehicle, no seat belt, no helmet, incorrect pit change over	0.5
Very dangerous driving	1

2.6.4 Endurance Relay:

- This relay will be conducted on the VicRoads track with eight team members each having a turn of pushing and driving.
- Each person will be required to push for approximately 200 metres, then drive for approximately 200 metres before change-over.
- The endurance will be run in a *time trial format*, that is, each team starting with a 20-30 second gap.

POINTS ALLOCATION - ENDURANCE

- Points will be allocated on time taken to complete the trial by the team. That is, 15 points to the team recording the fastest time.
- Other finishers: (X/Y) multiplied by 15 = points
- Where Y = highest number of laps recorded & X = team's number of laps.

PUSHCARTS

WEDNESDAY 20 NOVEMBER

1.00 pm – 5.00pm **Registration open**
Location: Administration Centre

THURSDAY 21 NOVEMBER

All Day: Teams arrive and set up camp

9.00 am **Registration opens**
Location: Administration Centre

1.00 pm – 6.00 pm **Design and Construction & Scrutineering**
Location: Presentation Marquees

FRIDAY 22 NOVEMBER

7.30 am **Compulsory Meeting of Team Manager and Captain**
Location: VicRoads Stage, VicRoads Track

8.30 am – 10.30 am **Endurance Event**
Location: VicRoads Track

12.30 pm – 6.00 pm **Display and Presentation**
Location: Presentation Marquees

12.30 pm – 6.00 pm **Obstacle Course**
Location: Near Pushcart Marquees

SATURDAY 23 NOVEMBER

9.00 am **Obstacle Course (continued)**
Location: Near Pushcart Marquees

10.30 am – 12noon **Sprint Event**
Location: Track 1

3.30 pm **Presentation Ceremony (Primary)**
Location: Stage in Energy Expo area

SUNDAY 24 NOVEMBER

No activities

*** PLEASE NOTE THAT THIS TIMETABLE IS SUBJECT TO AMENDMENTS.**

PUSHCART SPECIFICATIONS

Version 2018.01

1. SPIRIT OF COMPETITION

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.

An integral part of the building of this Pushcart involves students thinking creatively and innovatively in the design, development and construction of such a vehicle to ensure that it performs efficiently and effectively across all areas of the event.

2. SCRUTINEERING

Immediately following their Design and Construction assessment, all teams must present their pushcart, all team members and safety equipment to judges for scrutineering.

All pushcarts must be scrutineered to ensure the vehicles are safe and meet all the design specifications outlined in the relevant section of this Handbook. These checks ensure that the vehicle is safe for the occupant, other teams and spectators.

Where entries do not comply with specifications, or are considered unsafe, scrutineers will provide assistance and/or direction with work required in order to comply.

A 'Tested' sticker will be allocated to teams after successful completion of scrutineering. Teams will not be permitted to participate without a sticker. This is to be displayed above or below the number at the front of the pushcart.

Officials and / or Scrutineers can refuse permission to enter the track for any safety reason.

Pushcarts may also be inspected at random during the trials for operation of safety items or when the vehicle is involved in a track incident.

3. DESIGN REQUIREMENTS

3.1 General:

- The basic design is a billycart with four wheels, a roll-push bar, a brake and front steering. (Roll bar can be the push bar or they can be separate.)
- Any construction material may be used, provided that the safety requirements are met. No car or motorbike parts may be used except seat belts, which are a safety item.

- Every component of the cart in its dismantled state must fit into an imaginary box 10 cm deep. The cart can be as high or as elaborate as desired, providing it can be disassembled to meet this requirement.
- The front of the pushcart must have foam protection (minimum of 4 cm thickness of foam) to prevent injury should the cart collide with another, or the feet or legs of another pusher.
- Moving bolts on the pushcart must have lock nuts or double nuts **or be designed** so that they don't work loose during the trial.

3.2 Brakes:

- A brake must operate on at least one rear wheel.
- The brake control or pedal must be controlled by the rider and have a definite 'off' position.
- The brake is to be operated by the driver
- Hand operated brakes must have fixed steering, no rope

3.3 Wheels and Steering:

- Wheels, including tyres, must not exceed 250 mm in diameter.
- Front wheels must not contact the cart on full steering lock causing front wheels to lock.
- The steering is to be operated by the **driver, that is, not the pusher.**
- Where rope steering is used the rope must have at least 300mm of plastic tube or other reinforcing material on both sides closest to the connected point of wheels.

3.4 Safety:

- Protruding bolts must be cut off and jagged edges filed smooth.
- The design shall be free of protrusions or other features capable of causing interference or injury to fellow competitors or spectators.
- The roll bar must provide protection to the driver. It must be at least 100 mm above the head of the tallest team member while sitting in the pushcart. It can also serve as a push bar.
- Each member of the team must wear knee and elbow pads, an approved bicycle helmet and protective gloves.

3.5 Seat Belts

TYPE:

- The vehicle shall be fitted with an approved (Australian Design Rules) adult three point (minimum) automotive static or inertia reel seat belt.
- Automotive full harness types are acceptable.
- The seat belt will be completely standard, including buckle, stitching and mounting plates.
- Second-hand belts free of visible damage are acceptable.
- Seat belts must be adjustable to fit all individual team members.

MOUNTING:

- The seat belt should be mounted to a major structural, non-moving member of the cart.
- Upper belts should be mounted behind the rider's shoulders, to suitably braced points on the roll bar.

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 pushcart.
- Pushcarts must demonstrate stability to compete in all events of the Breakthrough.

3.6 Vehicle Identification:

- At registration, each pushcart will be provided with three adhesive identification panels (300mm x 300mm) with their competition number on it.
- One of these identification sticker must be attached to a 300mm x 300mm panel on the front of the pushcart, whilst the other stickers must be attached to a 300mm x 300mm panel on the left and right hand side of the pushcart.
- Number panels must not constitute a danger to pusher or driver.
- Provision may need to be made for the display of sponsor panels.



CIRCUIT LENGTHS
 TRACK 1 - 1.58 km
 VICROADS - 1.11 km

KEY

- Toilets
- Showers
- Camping Area
- First Aid
- Food & Refreshments
- Assembly Point
- Marshall Point & Number
- Track Direction
- Start/Finish
- Pushcart Changeover Point
- Wrist Banding Station
- Repair Station
- Recharge Station
- Parking Area
- On-site Supermarket
- Hospitality Marquee
- Stage #1
- VicRoads Stage
- Road Closure

Map not to scale