

2016 SPECIFICATIONS

PUSHCARTS

RACV

ENERGY 
BREAKTHROUGH

17-20 NOVEMBER 2016 | MARYBOROUGH, VICTORIA

POWERED BY IMAGINATION

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

A PARTNERSHIP BETWEEN



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Innovations in Technology

Proudly supported by Central Highlands Water.



1. Spirit of Competition

The theme of Innovations in Technology is "Working With Water".

This includes learning about water, where it comes from; its wise use and conservation; its power; learning about the technology of design and construction and of course, the environment in which we live.

All Craft and Models are to be designed and constructed by the students in the year of the event.

2. Team Composition

Innovations in Technology teams must have a minimum of four and six participants, at least half of whom must be female.

3. Challenge 1: Crafty Design

Primary & Secondary Students

3.1 The Challenge

The challenge for Crafty Design is to **create a craft that resembles some of the Macro invertebrates** that live in and around the water. Macro means that we can see it with our eyes. Invertebrates are small animals and are a collective term used for all animals without a backbone which include spiders, crustaceans, worms, insects and molluscs.

There will be a special prize for those who demonstrate they have met the objective.

One of the Macro invertebrates we at 'Water watch' are intrigued with is the Mayflies; the mayfly nymphs can be identified by their three tails. They are found throughout Australia inhabiting streams, rivers, wetlands and pools, under bark, logs and rocks. The Mayfly nymphs all graze on algae or plants or consume detritus.

Secondary students are encouraged to create other ways for craft to travel, e.g. craft must still have contact with water, but could travel under water.

3.2 Materials and Specifications

- Using construction materials such as TEKO, LASY and LEGO in conjunction with scrap or recycled material, create a stable craft (in keeping with the above theme) which will run under its own power, along a channel of 9.4 metres x 81.5 cm, carrying a full soft drink can. Please note that the water depth of the channel is approximately 12 cm.
- Craft must complete one full length of the channel.
- The craft must be able to maintain a direction within a lane, towards a designated target area on the end and must complete the course within a set time of three minutes.
- Craft dimensions: length and width to be under 81.5 cm.
- The fuel source must be an alternative to fossil fuel. No dry cell batteries or capacitors permitted.
- To encourage greater innovation in design, students may no longer use compressed air as a means of propulsion.



3.3 Judging Criteria:

- All information relating to assessment of **Crafty Design** is to be presented on a **poster** approximately 65cm wide x 85cm high (thick cardboard backing is recommended).
- Each team will be allocated 20 minutes in which to **present and discuss** their entry with the judges.

Judging will include assessments in the following areas and should be included on the poster:

- **Safety** - including energy source; the load (soft drink can); moving parts are shielded.
- **Innovative Construction** - materials used; design originality; community involvement. Use of recycled material (teams should look to improving craft each year and modify). Recycling does not mean use of exactly the same model - recycling of materials is encouraged, NOT the recycling of crafts!
- [As indicated in 2015, models used in previous years will not be acceptable.](#)
- **Planning and Testing** - includes challenges and problems encountered during planning/construction; modifications.
- **Presentation** – use of diagrams, photos colour; originality; evidence of teamwork; involvement of school, community and/or industry.
- **Cross Curricular Aspects** – demonstration that project has been incorporated into subject areas at school.
- **Model/Craft** - Potential, Appearance and Sustainability – use of originality and imagination; artistic form; sustainability of model working; student input; ability to identify how the model could be improved, given time and appropriate materials.

3.4 Performance Test and Time Trial:

- All entries are required to demonstrate their crafty design/water catchment model in operation, and complete a Performance Test.
- During the performance test, the craft/model will be judged on how it shows advancement in technology along with its reliability, sustainability and efficiency.
- Higher marks will be awarded for completion of task in a given time without any assistance from the team.
- The performance test will involve a time trial for Crafty Design entries – this takes place at the water tanks at 2.00 pm.



Central Highlands Water is committed to environmental education.

They are proud sponsors of the Innovations in Technology category of the RACV Energy Breakthrough and are looking forward to helping provide hands-on learning opportunities for participants again this year.

Central Highlands Water has developed a unique Environmental Education Centre, which has been recognised nationally as a finalist in the prestigious Banksia Environmental Awards and the Victorian Landcare Awards.

There's also a host of resources and excursions available for schools on the Central Highlands Water website: <http://www.chw.net.au>

For more Information please contact:

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4. Challenge 2: Junkyard Challenge

4.1 The Challenge

PRIMARY Grades 4, 5 & 6: Better Bridges

Do you have creative problem solvers and budding engineers?

The Junkyard Challenge involves teams of 4 who will be provided with a range of materials and required to create a structure that will span 1.5 metres. This creation will be required to support a 4 litre container of water by the end of a three hour time limit.

This is a class for Primary students only.

4.2 Equipment provided

The types of materials available will be a mystery to the teams, but they are likely to include recycled items – some useful, some not! It will be up to the team to decide which materials they would like to use and how they will build their structure.

EACH team will receive this BASIC PACK consisting of:

- | | |
|--|---|
| <ul style="list-style-type: none">• Design pack: Paper & pencils.• Retractable tape measure.• Fine nib texta. | Connectors <ul style="list-style-type: none">• 2 rolls of gaffer tape.• 3 rolls of sticky tape.• Roll of thin tie wire.• 2 packets of zip ties.• Bag of Rubber bands• Ball of string. |
| Tools: <ul style="list-style-type: none">• Scissors.• Pliers.• hacksaw (2 blades)• Retractable Stanley knife.• Safety Glasses (2 per team).• Cutting board (NOT TO BE USED IN STRUCTURE) | Materials: <ul style="list-style-type: none">• 2 bike tubes.• 6 pieces of tubing (2 thin, 4 thick).• 4-6 pieces pine.
(less than 50cm long).• 2 large boxes of thick cardboard. |

Junkyard Materials:

Materials will be available on the day to assist your construction! (That's the mystery)

- There will be a work station where several adults will supervise the children using the drills, spare Stanley blades also available.
- Students should be assessed at school as being proficient in the use of tools /safety when using tools (e.g. using a power drill & cutting away from the body).

During Term 4 we shall provide a Safety Licence for students to complete so that teachers/ mentors are confident all team members are capable with tools – drill & blades.

4.3 Process:

- The teams will start with a 10 minute discussion time and then have 1 hour and 50 minutes to build their structure. Then teams will check their structure against the criteria. A total of 2 hours maximum time.
- Each team may bring a mentor with them to help during the discussion phase **to assist** in the sharing of ideas, supervise students, **but not to participate in the construction of the structure.**

- The Mentors could be a parent/teacher. If the team is unable to organise a mentor, please let the Planning Committee know prior to the event.
- Students may Barter & Swap what is in their BASIC PACKS during the time.

4.4 Finished Product:

- The structure **MUST** be able to support a 4 litre bottle of water (4kgs).
- Presentations will be made immediately after the test period is completed.

4.5 Judging Criteria:

A judging rubric will be emailed to participating schools in Term 4.

“The Best Bridge Trophy”

- Judges will be looking for the structure that resolves the task, effectively and elegantly. Fitness for purpose and aesthetically pleasing, will win the day.

Special Award – “Working under Pressure”

- For the team that has demonstrated throughout the entire project – consistently sharing ideas & tasks and therefore working together to solve issues as they arise. Your machine may not work the best, but you could be the best working team.

4.6 Useful Links:

Websites which will encourage the students’ exploration of the broad range of bridge structures from around the world, plus information links that can be useful are:

<http://www.civil.iitm.ac.in/node/473>

<http://www.youtube.com/watch?v=a2jEq4XP0IM>

<http://www.gravitykills.net/PhysicsOlympics/Bridge.htm>

<http://www.youtube.com/watch?v=baiPAPsWKOg&feature=related>

<http://science.howstuffworks.com/engineering/civil/bridge.htm>



5. Junkyard Challenge – Secondary - Years 7 – 10: Mindful Machines

5.1 The Challenge

Teams of secondary students will be provided with a range of materials and be required to create a structure, device, or machine that will move 4 litres of water across a 1.5 metre gap. The major restriction is that your project can have only one significant base point or footing (think crane).

5.2 Materials Provided

The types of materials available will be a mystery to the teams, but they are likely to include recycled items – some useful, some not! It will be up to the team to decide which materials they would like to use and how they will build their structure.

**Mystery... Intrigue... Planning... Negotiating... Challenge...
Competition... Innovation...**

What more could you want?

EACH team will receive this BASIC PACK consisting of:

- Design pack: Paper & pencils.
- Retractable tape measure.
- Fine nib texta.

Tools:

- Scissors.
- Pliers.
- Pruning saw
- Hacksaw (2 blades)
- Retractable Stanley knife.
- Safety Glasses (2 per team).
- Shifting spanner.
- Cutting board.

(NOT TO BE USED IN STRUCTURE)

Connectors:

- 2 rolls of gaffer tape.
- 3 rolls of sticky tape.
- Roll of thin tie wire.
- 2 packets of zip ties.
- Bag of Rubber bands.
- Ball of string.
- Bag of long bolts, nuts & washers – about 10 of each.
- Bag of nails 4” to 6” in length.

Materials:

- 2 bike tubes.
- 6 pieces of tubing (2 thin, 4 thick).
- 4-6 pieces pine. (less than 50cm long).
- 2 large boxes of thick cardboard.
- 1 wooden pallet base

Junkyard Materials:

Materials will be available on the day to assist your construction! (*That's the mystery*)

- There will be a work station where several adults will supervise the students using the drills - spare Stanley blades also available.
- All team members will have their tools and equipment licences signed off by their supervising teacher /mentor prior to the event.
- All team members **MUST** display professional occupational Health and Safety practices at all times – or risk being excluded from the event.(Safety glasses are a **MUST** when drilling).

5.3 Process:

- The teams will start with a 10 minute discussion time and then have 1 hour and 50 minutes to build their structure. Then teams will check their structure against the criteria. A total of 2 hours maximum time.
- Each team may bring a mentor with them to help during the discussion phase **to assist** in the sharing of ideas, supervise students, **but not to participate in the construction of the structure.**
- The Mentors could be a parent/teacher. If the team is unable to organise a mentor, please let the Planning Committee know prior to the event.
- Students may Barter & Swap what is in their BASIC PACKS during the time.

5.4 Finished Product:

- The finished structure **MUST** be able to move 4 litres of water (4kgs) across a 1.5 metre gap.
- Presentations will be made immediately after the test period is completed.

5.5 Judging Criteria:

A judging rubric will be emailed to participating schools in Term 4.

“The Magnificent Machine Trophy”

- Judges will be looking for the structure that resolves the task, effectively and elegantly. Fitness for purpose and aesthetically pleasing, will win the day.

Special Award: “The Practice under pressure Trophy”

- Awarded to the team that displays outstanding shared-teamwork and coolness under pressure throughout the event. Your machine may not work the best, but you could be the best working team.

As this challenge requires students to respond in diverse and interesting ways, it is suggested that participants utilise the internet to gain insights and options as to how they might respond to the task, in the lead up to the event. Information is power.