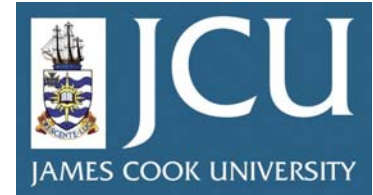




Engineers Australia
(Townsville Local Group)
& the JCU
School of Engineering



Spaghetti Bridge Design and Build

2007 COMPETITION RULES

1. PRELIMINARY

Engineers are called upon to design structures to meet a wide variety of criteria. In this case, a design is called for which is structurally sound but encourages the minimal use of an inexpensive material (spaghetti).

2. AIM

To design and construct the most efficient bridge for a specified span and type of loading. The estimation of efficiency will be based on a formula relating load carrying capacity and mass of materials used.

3. TEST RIG

The test rig has a gap of 170 mm between the supports.
The load will be applied at mid-span at the top using a hanging container filled with ball bearings. The container is hung using two rods 70 mm apart. If the bridge tilts to one side and 'leans' on these rods, the bridge will be deemed to have failed at that load.

4. BRIDGE DESIGN SPECIFICATIONS

The bridge **MUST** be constructed using San Remo brand spaghetti (**standard**) – not thick or thin. Only fast drying cement is to be used to join the pieces of spaghetti together.

The bridge must;

1. Be a minimum of 190 mm long. This length consists of 170 mm for the test rig gap and at least 10 mm on either end to ensure the bridge can span the gap,
2. Not have an overall length greater than 200 mm,
3. Not be higher than 150 mm above the test rig supports at any point,
4. Not protrude below the level of the test rig supports,
5. Not be wider than 55 mm at any point,
6. Not have a total mass in exceeding 60g.

5. DESIGN AND CONSTRUCTION OF MODEL BRIDGES

The bridge may take any form with any number of members. It should be designed using the principles of physics, statics and dynamics with which the group is familiar. An appropriate design process should be used to evolve the final form of the bridge.

Teams are encouraged to undertake tests on trial designs.

6. CALCULATION OF EFFICIENCY

Efficiency will be calculated on the basis of load capacity against bridge mass. The method shown below will be used.

$$\text{Efficiency} = \frac{P}{M}$$

where P = Failure Load in grams
M = Bridge Mass in grams

7. PRIZE CATEGORIES

A perpetual trophy (that will be retained by the winning school for the year) will record 1st team place and prizes will be presented in the following categories:

Part A

Maximum Efficiency

1st Prize \$200.00

2nd Prize \$100

1. All entries will be inspected for correctness of materials and dimensions.
2. All entries will be weighed.
3. The bridge will be placed in the loading frame and slowly loaded at its mid-span until failure occurs.
4. Whilst the judges will endeavour to smoothly load the bridge, it may be necessary to unload the bridge and reload it with heavier weights. Any stress this introduces on the bridge will not be taken into account.
5. The judges shall determine when failure has occurred.
6. Each entry will have its efficiency calculated and recorded.
7. The winner shall be the entry with the highest efficiency.
8. The judges decision on any matter is final.

Part B

Most Original Entry

Prize \$50.00

The judges shall consider originality and aesthetics in awarding this prize.

Prizes will be paid in cash to a representative of the winning team's school.

The intent of the prize is as a reward to the students for the effort of not only competing, but in producing winning designs. Accordingly, the prize money is to be appropriately distributed by the school to the members of the winning team and at the discretion of the school, a portion may be retained by the school to cover costs.

8. ENTRY

Several teams from each secondary school may enter by submitting

Entry Form 1 by Monday 20th August, to:

**SPAGHETTI BRIDGE COMPETITION
C\ Regional Coordinator, ENGINEERS AUSTRALIA
School of Engineering
James Cook University
Townsville 4811**

Entry Form 2 is to be brought to the competition with the bridges. Bridges will not be accepted into the competition unless accompanied by the completed entry form.

Bridges are to be delivered to the judges a **minimum of 15 minutes prior** to the start of the competition. The judges will then scrutinise and weigh them before judging commences.

9. TEAMS

Team size is limited to a maximum of 6 students per team.

10. COMPETITION VENUE

**James Cook University Open Day
School of Engineering
Sunday 2nd September
Start time 1.00pm**

11. ENQUIRIES

All enquiries are to be directed to:

Bronwyn Wood, Regional Coordinator, Engineers Australia

Ph: 4781 6327 E-mail: bwood@engineersaustralia.org.au

12. CONCLUSION

Building Spaghetti Bridges is just one of the many activities promoted by Engineers Australia and the JCU School of Engineering.

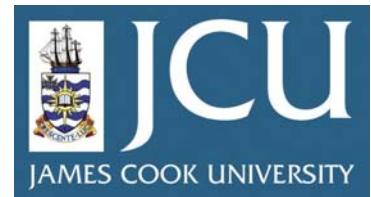
It is hoped that the Spaghetti Bridge Competition and other activities will fuel your interest in Engineering and other Technical Careers. It is important to build up engineering skills in Australia to ensure economic growth and continued prosperity.

HINTS ON DESIGNING AND BUILDING SPAGHETTI BRIDGES

1. There are many Engineers in the Townsville area.
(They will not design your entry!)
2. In this competition, the strongest structure will not necessarily be the winner.
3. Big structures are usually heavier than small ones.
4. Simple structures are easy to build.
5. Simple structures are quick to build.
6. Short compression members are stronger than long ones of the same cross-section.
7. Don't be afraid to make your own tests on trial designs.
Spaghetti has been chosen as a material to keep costs low.
8. To construct a truss make a full size template on graph paper, cover it with cellophane (clear plastic) and then assemble and glue the truss members on top of the template. The clear plastic will prevent the glue from sticking to the template.
9. **HAVE FUN!**



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Spaghetti Bridge Design and Build Competition 2007
Sunday 2nd September, 2007

ENTRY FORM 1
Intention to Compete - Secondary Schools

PLEASE PRINT

SCHOOL NAME & ADDRESS:

..... Postcode:

TEAM NAMES (Maximum of two teams per school with up to six students per team)

1 2

ADDITIONAL TEAMS

Do you wish to enter additional teams if they can be accommodated? YES/NO

Number of extra teams that your school would like to nominate.

CONTACT REPRESENTATIVE:

Name:

Phone Numbers:(B/H).....(A/H).....FAX

Email address if available.....

Signature: Date:

1. This form is to be submitted by Monday 20th August to

SPAGHETTI BRIDGE COMPETITION
 Regional Coordinator, Engineers Australia, School of Engineering,
 James Cook University, Townsville, 4811

2. There is no entry fee.



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Spaghetti Bridge Design and Build Competition 2007
ENTRY FORM 2

Entry Form 2 is to be brought to the competition with the bridges. Bridges will not be accepted into the competition unless accompanied by the completed entry form.

PLEASE PRINT

TEAM NAME:

TEAM MEMBERS' NAMES (maximum of six):

- | | |
|---------|---------|
| 1. | 4 |
| 2. | 5 |
| 3. | 6 |

SCHOOL NAME

SCHOOL ADDRESS.....

CONTACT REPRESENTATIVE:

Name:

Phone Numbers:(B/H).....(A/H).....**FAX**

Email address if available.....

STATEMENT (To be signed by a supervising parent/teacher)

I hereby certify that the entry submitted by this team was **built** entirely by the team members and that the materials used were in accordance with the 2007 competition rules.

Signed:

Date:

Name (please print):

Position:.....