

BA Design for Industry: Year 1 Bridge building contest

J Errington MSc

The aim for our easter contest is to build the lightest bridge that will span a gap of 0.75m between two tables and take the weight of at least 1 brick. Marking will be by taking the maximum supported weight (x bricks) and dividing by the weight of the bridge to give a load carrying efficiency in %. This provides the mark you end up with for this part of the unit.

The bridge must rest freely on the end supports and no other supports e.g. from the floor are allowed. The bridge must provide a flat “roadway”.

BRICK INFORMATION: All information is an approximation

Weight: 1930g (4.25 lbs.); Length: 20.3cm (8 in.); Width: 9.1cm (3.5 in.); Height 5.7cm (2.25 in.)

Only organic construction materials are allowed (i.e. paper, card, wood, spaghetti, organic fibres e.g. wool, hemp, cotton thread etc.) No metal parts are allowed, not even nails staples or tacks. Glue is at the builders discretion, pva or similar is recommended, but obvious use of excess glue to reinforce structural members is not allowed.

No material longer than 400mm is to be used in the construction.

Materials such as thin ply, bendy board and mdf in sheets and strips are available from the workshop. You should fill in the approved form and bring it to me to be signed, along with a sketch of your proposed design showing where the requested materials will be used. All materials are on a first come first served basis.

There is no restriction on the type of bridge you can build, traditional arch, beam, truss, girder or suspension bridges are all models you might like to consider.

<http://www.garrettsbridges.com/trussdesign.html>

Points to remember:

If using wood examine the grain to choose suitable pieces. See

<http://www.garrettsbridges.com/popsiclesticktips.html> also

<http://www.garrettsbridges.com/tipscenter.html>

Consider and choose appropriate materials e.g. string is good in tension, but not effective in compression!

Stress is concentrated where sharp angles occur. Think about water flowing around your structural members, where would it flow fastest? Additional strengthening will be needed at these points – but not too much or you will have new stress concentrators!

<http://abcdpittsburgh.org/kids/kids.htm>

http://en.wikipedia.org/wiki/Suspension_bridge

<http://www.matsuo-bridge.co.jp/english/bridges/basics/suspension.shtm>

<http://www.brantacan.co.uk/>

Assessment

Assessment is based on the load efficiency of your bridge. However I will require a short report with photos etc. of your bridge as a record of the event. Here is an example

Full names of group members	Date and class/year etc
What sort of bridge:	Girder
Why:	Simple and easy to build
What materials:	6mm Mdf and 3mm ply
{ Sketch of design showing parts and materials }	
{ photo of bridge in place }	
{ photo(s) of bridge during testing }	
RESULTS:	
Weight of bridge:	1830g
Centre deflection unloaded	12mm
Centre deflection loaded with brick:	45mm
Maximum load supported:	1930g
Centre deflection at maximum load:	45mm
{ Graph of load vs deflection if enough points }	
{ photo of bridge after testing to failure }	
Reason(s) for failure	MDF broke at joint
Load efficiency:	Work it out!