

The Big Boom Project

Planet Holloway Physics

Objective: Design and build a crane boom to hold 0.2 kg, up to a maximum of 2 kg (4.4 lbs) using only 100 popsicle sticks ($4\frac{1}{2} \times \frac{3}{8}$) and glue. The more mass the crane holds and the further from the edge of the table, the better your score can be. (*Do not use* tongue depressors, which are double width, or coffee stir sticks or balsa wood. Also, no string or cable of any kind).

Requirements: The boom is to hang out over the edge of the table, but may be clamped to the table with a C clamp on the bottom 1" of the crane. An S hook will be attached to the end of your beam that hangs off the table in order to attach the testing weights (you may supply your own S hook or use one of mine). All measurements will be made to where the S hook is located, not the overall length of the beam.

The crane is a fixed crane and does not need to move, nor does it require a cable and pulley system. We are only designing the beam portion of the crane for this project. The minimum requirements are that an S hook must be at least 2" x 3" from the edge of the table. That can be 2" vertically and 3" horizontally or vice versa. The mass, attached via the S hook, must not touch the crane while hanging other than the hook of the mass attaching to the S hook which will hang on your crane boom. The crane must hold 0.2 kg to qualify for a C (we will use the scoring rubric below).

There is no limit to the amount of glue you may use, but the glue should only be inside the joints. No glue should be visible on the outside of the sticks. If you keep a damp cloth nearby while assembling, the excess glue wipes off easily while wet. A penalty will be incurred for excess glue, ranging from 5 to 50 points depending on severity. Design is very important, so research, plan and test before building your final beams. Also, no part of the beam may break during testing.

Names:
Per.

Print out this page and attach it to the top of your research project

Research: Included in this project is engineering research on topics related to cranes, booms and beams.

- Write an engineering report explaining your design and the decisions you made in your choice of structure. Include pictures or illustrations. (3 page max)

Grading: There are two grades for this project, one for the engineering/research and one for the crane. The research is worth 50 points and the crane is worth 200.

Scoring for beam –

Fail	Crane fails to support itself when clamped to table
D	Meets requirements, but cannot 0.2 kg
A-C	See scoring rubric below

If your crane can hold at least 0.2 kg, then you qualify for the scoring rubric below. Carefully measure and record dimensions of the crane to the “S” hook from the edge of the table, then add weights to see maximum hold strength. Note: you may add counterweights to the crane, but they do not count toward weight held. Only weights added to the “S” hook will count toward weight held.

Category	Scoring formula	Max points	Team score
Weight held	Mass (kg) x 50 =	100	
Vertical height	Inches from table top x 5 =	50	
Horizontal span	Inches from table edge x 5 =	50	
Diagonal distance	Inches from table edge to S hook x 5 =	75	
Subtotal			
Penalties	Glue, number of sticks, etc.		
Total			

Research paper	Self score (50 pts possible)	
Grand Total	250 points possible	

Good luck, have fun and no glue on Mom’s kitchen table!