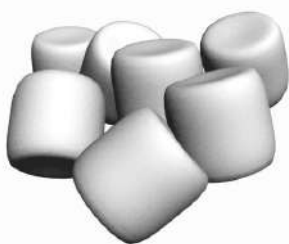


NAME: _____ DATE: _____ PERIOD: _____ PG # _____
MY JOB: _____



EARTHQUAKE STEM LAB -
You will design a structure to
withstand the force of an earthquake.



I Introduction: Major earthquakes in the United States have damaged or destroyed numerous buildings, bridges, and other structures. By monitoring how structures respond to earthquakes and applying the knowledge gained, scientists and engineers are improving the ability of structures to survive major earthquakes. Many lives and millions of dollars have already been saved by this ongoing research.

II Your Job: You and your group will design and construct the frame of a large building to be built in a congested urban setting in an earthquake prone area. You are challenged to research, design, and construct an earthquake-resistant building. Each group's building must be at least 30cm tall and its base must fit within the assigned plastic container. You may only use toothpicks and miniature marshmallows. At the end of the lab, each design will be tested through an earthquake simulation. The design that withstands the earthquake the longest without breaking or collapsing will win the competition.

III BUILDING CRITERIA:

Your building must be at least 30 cm tall.

Your building may only be constructed of toothpicks and miniature marshmallows.

You may place only three purchase orders for building materials.

IV COST CRITERIA:

You may not spend more than \$1050.

SUPPLIES	PRICE
1 Toothpick	\$5.00
1 Marshmallow	\$10.00
Rental Of I-pad For Research	\$5.00
Rental Of Ruler	\$5.00

V Considerations:

- 1) You will purchase the materials from the teacher using your team's purchase orders.
- 2) You will be given only 3 purchase orders to use. Keep track of your company's finances. WRITE IT DOWN.
- 3) Your total budget for all materials is \$1050.00. You may not exceed your budget.
- 4) The materials you will be using are delicate and can be easily damaged during construction.
- 5) You may not return any unused materials.
- 6) Be careful not to waste or unnecessarily damage your materials.
- 7) You may test and redesign your structure as many times as needed up until the time limit.

VI Rules and guidelines for use of materials:

- 1) Marshmallows must remain intact. Do not tear or break into smaller pieces.
- 2) Do not eat any of your materials.
- 3) You must use only the materials your team purchases in class. You may not bring in your own materials or use the materials from another team.

VII Procedures:

- 1) Pick a name for your team.
- 2) Discuss with your team ideas for your earthquake proof structure. Consider shape and design. You may choose to rent an i-pad for internet research during this step.
- 3) Make your first sketch of your building design. Use the attached sheet.
- 4) Based on your sketch, determine the materials needed. Complete the purchase order.
- 5) Show your teacher the sketch and purchase order to obtain the materials.
- 6) Build the structure.
- 7) TEST the structure by simulating an earthquake. Were there any problems?
- 8) REVISE the design. Fix any problems your building may have had by REVISING your design. If additional materials are needed, you may submit a second purchase order.
- 9) TEST your structure again. Were there still problems, if so...
- 10) REVISE the design. Fix any problems your building may have had by REVISING your design. If additional materials are needed, you may submit a second purchase order.
- 11) Your team and structure are ready for TEST DAY!

VIII. TEST DAY / CONCLUSION

1) How tall is your building? _____centimeters

2) How much did your group spend? Did you stay within the budget? \$ _____

3) How well did your structure perform? How long could it withstand the most violent shaking?

4) Describe what happened to your building while it was going through the “earthquake.”

5) What shapes did you use in your design that provided strength to your tower?

6) How did your group’s design compare to other designs in the class?

7) What structural shapes seem to survive quakes best? Why do you think this particular type of design worked the best?

8) Think back and describe in your own words the steps of the engineering design process that you went through.

TEAM NAME: _____ Period: _____

TEAM MEMBERS: _____

PURCHASE ORDER # 1

TEAM: _____ **PERIOD:** _____

BUDGET = _____
I-pad rental..... = _____
ruler rental..... = _____
of toothpicks _____ **x** _____ = _____
of marshmallows _____ **x** _____ = _____
TOTAL COST = _____

**REMAINING
BUDGET:**

\$ _____



PURCHASE ORDER # 2

TEAM: _____ **PERIOD:** _____

BUDGET = _____
I-pad rental..... = _____
ruler rental..... = _____
of toothpicks _____ **x** _____ = _____
of marshmallows _____ **x** _____ = _____
TOTAL COST = _____

**REMAINING
BUDGET:**

\$ _____



PURCHASE ORDER # 3

TEAM: _____ **PERIOD:** _____

BUDGET = _____
I-pad rental..... = _____
ruler rental..... = _____
of toothpicks _____ **x** _____ = _____
of marshmallows _____ **x** _____ = _____
TOTAL COST = _____

**REMAINING
BUDGET:**

\$ _____

SKETCH OF BUILDING

[illegible]

[illegible]

Title	Role
Team Leader	Oversee all projects and delegates authority to group. Maintains focus of group and keeps team “on-task”
Team Accountant	Oversee and maintain a record of ALL costs incurred by group AND statistical information about the structure (i.e. height of structure, etc.)
Building Consultant	Manage the development and construction of “office building”
Independent Financial Researcher	Review and ensure financial and statistical data of OPPOSING group

50 marshmallows

100 toothpicks