

# Earthquake K'Nex Tower Challenge

Your corporation has been hired as the structural engineers in charge of designing a new 2-story art/music/dance studio in San Francisco . There are many building codes you must follow. Each floor of the building must support **at least** one weight. Also, the building will be located near the San Andreas fault; therefore your building must be able to withstand **both** small and large earthquakes. Since the building will be used for artistic arts classes, you may be as creative as you like with the shape and design of the building (it does not need to be box shaped).

## **Your building must meet the following requirements (CHECKLIST):**

- \_\_\_\_\_ A construction drawing with measurements and analysis must be submitted BEFORE purchasing your materials.
- \_\_\_\_\_ The building must fit on the base. The base minimum is 18 cm x 14.5 cm
- \_\_\_\_\_ Your building must be at least 27 cm tall.
- \_\_\_\_\_ Your building has 2 stories that are each at least 5 cm tall
- \_\_\_\_\_ Each story must support the weight of at least 1 weight without collapsing.
- \_\_\_\_\_ To survive an earthquake test, the building must not collapse until the shaking stops completely. The weights **must stay** on the building.
- \_\_\_\_\_ A full color LOGO/Name of Company must be attached to the tower

**You will be given a budget of \$50,000.** The costs will be posted on the projector.

**JOBS:** All 4 people in the group can build, but each person has a specific job:

**Architect/Company Logo Designer** - Design and draw the building on graph paper. Throughout the building process, you need to make sure that your building is being constructed according to your plans. Draw a full color LOGO of your team that will be taped to your tower.

**Name** \_\_\_\_\_

**Transportation Chief** - Deliver checks and pick up supplies. You are the only member of the group who is allowed to leave the construction site. You will also be in charge of keeping track of inventory and ordering whatever supplies are needed for the next day.

**Name** \_\_\_\_\_

**Accountant** - Keep track of company funds and record in the balance sheet each day. You must know exactly how much has been spent and how much is left over.

**Name** \_\_\_\_\_

**Head Builder** - Even though everyone can help build, you have a final say on how things must be built. You must work closely with the Architect to ensure the blueprint plans are being followed.

Names of all group members \_\_\_\_\_  
\_\_\_\_\_

### **TOWER CHALLENGE RUBRIC:**

#### **Group Grade:**

- \_\_20 points A clear, detailed COLORED construction sketch was completed with **length, width, height** and **costs**. All important design features and all critical measurements should be labeled on the sketch.
- \_\_20 points Building stands by itself, has a minimum base of 14.5 x 18 cm, is at least 27 cm tall, and has 2 stories that are each at least 5 cm tall and has a **full colored LOGO/Name of Company** taped to the structure.
- \_\_15 points Group members worked together, were respectful and stayed on task
- \_\_10 points Building supports 1 weight on the first story.
- \_\_10 points Building supports 1 weight on the second story.
- \_\_1 point Building remains standing with 1 weight on the second story after a mild earthquake.
- \_\_1 point Building remains standing with 1 weight on the second story after a major earthquake.
- \_\_1 point Building remains standing with 1 weight on the second story and 1 weight on the first story after a major earthquake.
- \_\_1 point Building remains standing with 2 weights on the top second and 1 weight on the first story after a major earthquake.
- \_\_1 point Building remains standing with 2 weights on the top second and 2 weights on the first story after a major earthquake.

\_\_\_\_ 80 points TOTAL

\_\_\_\_ **BONUS 10 points:** The building in EACH CLASS that is the **least expensive**, that can hold the most **weight/ remain standing after a major earthquake** will be awarded 10 bonus points.

**PROCESS QUESTIONS: (Answer in Complete Sentences)**

1. During construction, how did you test the strength and stability of your structure?
2. During construction, what strategies did you use to strengthen the weaker areas? Why?
3. What are the strongest parts of your building? Why?
4. What are the weakest parts of your building? Why?
5. If you had 5 more rods, where would you add them? Why?

## TOWER ARCHITECT BLUEPRINT REQUIREMENTS:

**You have to have your Blueprint drawing complete and approved before you buy any materials!**

1. Two Drawings - BIRD'S EYE VIEW and STREET VIEW

2. Full scale drawings - each square on your graph paper is \_\_\_\_\_ cm

Scale Factor: \_\_\_\_\_ cm = 1 cm actual on K'Nex pieces

3. Length, Width and Height measurements - all labeled in cm

4. Label and Color ALL materials used - Add up the TOTAL cost\$\$\$

EACH person in the group does a rough sketch below, Architect makes the final decision: