

EPAM's Protect Coastal Communities from Storm Surge Waves Challenge

EPAM, a strong supporter of STEM education, offers this fun engineering mini challenge for students everywhere. Climate change is contributing to higher ocean levels and more coastal flooding from storm surge around the globe. With limited materials, students can model storm surge and compete locally to build barrier walls to protect paper houses on a "beach" from being flooded by waves. Which team's walls will protect the houses the best?

Summary

Group size: 2 students

Minimum time: 60 minutes

Key concepts: climate change, flooding, storm surge, engineering design, seawalls

Challenge Materials

Each group will need:

- 9"x13"x2" (approx. 23x33x5 cm) aluminum baking pan
- 1 lb (450 g) non-hardening modeling clay
- 20 toothpicks
- Scissors
- Construction paper
- Clear tape
- Water
- Empty 16-oz (0.5 L) plastic bottle



Preparation

For each group:

- Construct a "beach" on one end of the pan using modeling clay. The beach should be sloped such that it is approximately 4" (10 cm) long and 1" (2.5 cm) high at the back edge.
- Construct twelve paper "houses" with construction paper and clear tape. The houses should be cube-shaped with 0.75" (2 cm) sides. For the competition, the houses will be evenly spaced four at a time along the back edge of the pan. Making extra houses in advance will save time later.
- Fill the pan with water to a depth of 0.5" (1.25 cm), so the water goes halfway up the beach.
- Place a plastic water bottle width-wise at the opposite end of the pan.
- Practice making waves by either bobbing the water bottle up and down or pushing it back and forth. Calibrate how hard you push such that the waves just reach the top of the beach, but do not slosh over the edges of the pan.

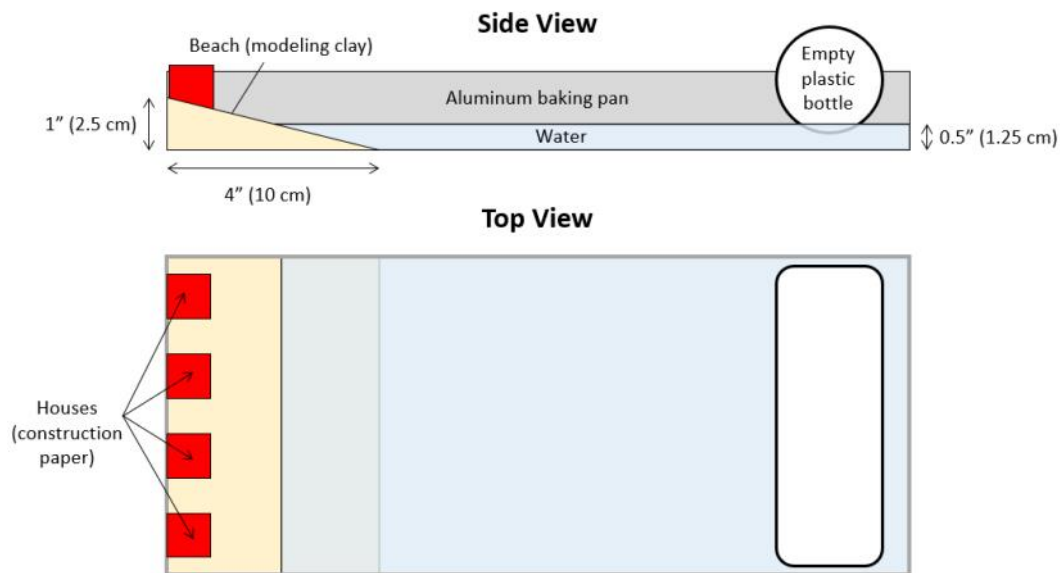
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Wall Requirements

- The wall must be made from no more than 20 toothpicks. Students are allowed to cut the toothpicks.
- Students can use *small* amounts of modeling clay to hold toothpicks together if needed. They cannot build entire sections of the wall out of modeling clay, or completely cover a toothpick wall with modeling clay.
- The wall must allow residents access to the beach; it cannot be a continuous, unbroken wall across the entire pan.
- When tested, the wall must keep all four houses dry.

Testing Procedure

1. Place four houses, evenly spaced, along the back edge of the beach.
2. Use the water bottle to make **five** waves, the same height you made them in the Preparation section.
3. Record how many of the houses have visible "water damage."
4. Remove the four houses, make sure the beach is dry, and repeat the test two more times.
5. The team with the lowest total number of wet houses across all three trials wins. If a tiebreaker is needed, perform more trials until one team wins, or appoint a neutral person to start making bigger waves.



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