

HOLD YOUR WATER!

Introduction

Student teams design and build a device to safely drop a cup of water, retaining as much water in the cup as possible. Students learn that engineers solve problems under constraints.

Grades

Middle and high school

Materials

Per team: One 3 fl. oz. (88mL) cup, manila folder, paper for sketches, 4 sheets of paper, 1 roll tape for sealing parcels, 4 paper clips, 2 pipe cleaners, 2 medium rubber bands, 1 trash bag twist tie, 4 flexible straws, 15 mini plastic straws/stirrers, 1 6-foot length of string, trash bag. Water Towels Ladder Masking tape Water proof covering for floor Food coloring Score sheet (if you run a contest) Syringe measuring device

Design & Construction

Teams work only with materials provided and are allowed to sketch their designs. Determine the time allowed for engineering and construction before the teams begin.

Parts of the device or the entire device can be below or above the cup. The cup must be part of the device and hold 0.68 fl oz. (20 mL) of water during the drop. The device, including the cup, can be no longer than 2 feet from top to bottom. Only water is to be used in the cup.

The cup can be modified but must hold 20 mL of water or the team will be disqualified.

Set-Up

Testing: One student team member is the "Holder" who holds the device until the drop, while the "Tester" - who must be an adult - is stationed on the ladder.

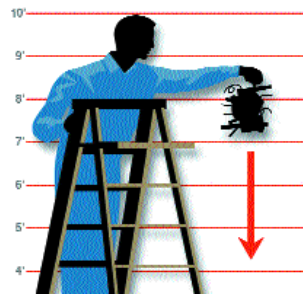


Use appropriate ladder safety at all times. Before setting up the drop, the Holder takes the device to the "Water Judge." The Water Judge fills the cup with 20mL of water. (Adding food coloring makes spilled water easier to see.) The judge leaves the device on the table for the Holder to pick up.

The Tester releases the device from between the set heights of 7 and 9 feet (2.13m and 2.74m). Mark the set height on the ladder with masking tape.

No part of the device can be below 7 feet or above 9 feet before release (i.e. 2 feet (0.61 m) available for the device). A designated judge will okay the height before the Tester can release the device.

With one hand on the ladder, the Tester must drop - not toss, lower or push - the device. No part of the device can connect to any freestanding objects such as the ladder or the Tester after release.



After the device lands, the tester takes the device to the "Water Judge" who checks and records the amount of water left in the cup, using the syringe-like device. The judge will round up to the closest mL. Dry the target after each drop.

Each team has only one attempt at releasing the device.



This activity provided by Fluor Corporation. Each year for National Engineers Week Fluor offices compete in friendly contests. This activity is adapted from these events. More ideas for extensions, scoring and making this a competition are provided at www.eweek.org.