

## **Hydraulics (45 Minutes - Coach Scheduled Event)**

**Description:** Each team will build a device that will use a hydraulic system to accomplish a task. This event has a written test.



**Participants per Team:** 2

### **Spirit of the competition:**

- It is a rules violation if coaches, parents, mentors, or spectators enter the competition area or communicate with the team members at any time during the competition. Violation of this rule will place the team below all other teams.

### **Safety Requirements:**

#### **Safety glasses labeled ANSI Z87.1+ (impact rated)**

- Glasses must be worn during all practice and test runs.
- If a team does not have the required eye protection, they will be given the opportunity to obtain it, time allowing, but will not receive extra time.
- If a team is unable to obtain eye protection, the team will not compete and will receive a no-show score.

Indirect Vent Goggles



ANSI Z87.1-2015 certified and meets CE EN166 & D3 Splash/Droplet standards.  
Eyeglasses and Safety Glasses are not safety rated for this event!

### **Team members must bring:**

- Pencils and scissors
- Optionally the team may bring a straight edge measuring device

### **Materials Provided:**

- 1 meter of masking tape
- 2 brass brads
- 2-12 ml syringes
- 50 cm of PVC Tubing 1/8"ID X 1/4"OD Flexible Clear Vinyl Hose
- 20 Craft Ice Sticks with Holes
- Water

### **The Competition:**

**The estimated time to finish the written test is 15 minutes and 45 minutes for the entire event.**

**Part 1 – Written Test:** The team members will take a test on the principles of hydraulics.

#### **Part 2 – Building Phase:**

- Each team will have the same task to build a device that uses hydraulics to perform a task. Examples: a drawbridge, a door opener, a lifting device, etc.
- The nature of the device will not be advertised in advance of the competition.
- The teams do not have to use all of their materials but must use at a minimum both syringes.
- Only those materials provided may be used to build the device.
- If the device is tested using any separate item(s) (e.g., support a load, launch a projectile, or roll a ball) item(s) of the specified characteristics (dimensions, mass, shape) will be available for each team to use in constructing/testing their device. When finished building, students must remove the item from their device testing by the judges.

- The team will have a maximum of 30 minutes to construct the specified device.
- Unless specifically stated in the instructions, devices must be freestanding and may not be attached to a tabletop, floor, ceiling or other support.

### **Scoring:**

Teams will receive two weighted rankings. These rankings will be added to find the final placements. The team with the lowest sum will place first.

- 25% of team score: Teams receive a ranking based on their written test score.
- 75% of team score: Teams receive a ranking based on their tower. Teams with the highest tower and smallest area base will rank ahead of all others measured to the nearest millimeter and millimeter<sup>2</sup> (1mm) by the Event Supervisor or appointed judge.
- Specific scoring of the team build will be provided to the teams at the event. Teams will be given the scoring information, including how ties will be broken, before they begin building.
- The dimensions specified in the building instructions will be measured and recorded as accurately as possible by the Event Supervisor.
- Devices are required to accomplish a task (e.g., lift a load for so many seconds) and will be placed in tiers based on whether or not they accomplish the given task.
- Devices that accomplish the task will be ranked higher than all devices that do not.

### **Scoring Example:**

Equation: (written test ranking x 0.25) + (building ranking x 0.75) = final ranking

- Team A ranks 3rd on the written test. This scores 0.75 ranking points. The team also scores 5th on their hydraulics build. This scores 3.75 ranking points. The team's final ranking score is 4.5.
- Team B ranks 2nd on the written test. This scores 0.5 ranking points. The team also scores 7th on their hydraulics build. This scores 5.25 ranking points. The team's final ranking score is 5.75.
- Team A is placed first in the rankings.

### **Possible Resources:**

Division A will not release previous tests, or the exact resources used by the Event Supervisor or test writer for any events. The listed resources are meant as a starting point. It is up to the competitor to research further.

- [Young Engineers: Easy Hydraulic or Pneumatic Machine - Engineering Projects for Kids](#)
- [Modern Marvels: Hydraulic Force Transforms Society \(S11, E17\) | Full Episode | History](#)