

Triplicity

LEVEL:	Middle/Elementary School
DESIGN TYPE:	Prepared In Advance
DESIGN TEAM COMPOSITION:	2-4 students per design team

DESIGN CHALLENGE:

The focus of this competition is to create, build and test a three-part weight-bearing structure constructed from balsa wood, paper, and glue. The structure will be scored by comparing how much weight the structure supports to how much the structure weighs. The maximum weight the structure may “officially” support is limited to 300 pounds for all levels. This is a team contest so teams must consist of 4 co-ed members.

MATERIALS:

- 1/8” x 1/8” balsa wood strips
- Standard copy paper
- Glue

CHALLENGE RULES:

- The balsa wood strips may have a cross section no larger than 0.135” x 0.135” (0.343 cm x 0.343 cm).
- Paper is defined as either Newsprint (used for printing newspapers), or uncoated bond (Typical copier, typewriter or laser printer paper). The bond paper used will be white with an average thickness of .0037” (.095 mm). Newsprint paper will be uncoated with an average thickness between .0028” (.07 mm) and .0035” (.09 mm)
- Glue is defined as any commercially available adhesive material applied in a non-solid form capable of creating a permanent bond. Glue is to be used only as an adhesive in this challenge.
- Total weight of the structure may not exceed 100 grams.
- The combined total height of the three-part structure, when stacked (vertically one section on top of another), may not be less than 7 ¾ inches or more than 8 ¾ inches.
- Each section of three-part structure shall have minimum height of 2”, max. 4 ¾” and must be able to be separated for weigh in and evaluation to determine if in compliance with these specifications.
- Each section of three-part structure must hold a load (minimum 5lbs) at 2” minimum height. Structures that stack inside of each other will NOT be in compliance with these

specifications.

- The assembled three-part structure must fit entirely on the tester base, and may not touch any of the safety supports or 2” diameter safety pole
- The structure must be designed to support all weight stacked on the pressure board of the structures tester.

Weigh-In

- The judges will avoid touching the structure.
- The team will separate three-part structure into each structure component. Judges will examine each structure component separately to determine:
 - a. materials compliance
 - b. Minimum 2 inches, maximum 4 ¾” in height. Any structure designed with extensions that allow it to be minimum 2 inches, maximum 4 ¾” tall during weigh-in but shorter or taller during testing will not be considered in compliance with this specification.
- The judges will then ask the team to stack (vertically one section on top of another), the three structure components into a single structure and place the structure on the scale. Teams may not weigh the parts separately. Once the scale readings have stabilized, the judges will read the measured weight of the three-part structure aloud. Team members will validate that the judges read the scale correctly – and that the judges correctly record the “official Structure weight” on the Weigh-in form.
- The three-part structure will then be placed on a flat surface in the manner it will be tested to measure its height. A three-part structure designed with extensions that that allow it to be 7 ¾ inches or 8 ¾” tall during weigh-in but shorter or taller during testing will not be considered to be in compliance with these specifications.
- In order to validate the three-part structure can be legitimately tested; a representation of a Tester Base will be used. A team member must place the three-part structure on the Tester Base so the Safety Pole passes through the structure (without touching) and the Structure touches the base only.
- Each structure component or three-part structure assembly which is determined by Judge to NOT comply with these specifications will receive an “official score” of zero.
- Each team will have one opportunity with Judges to determine if their structure is in compliance with these specifications. If times permits (first come first serve basis), teams may modify structure to meet specifications and ask Judges re-examine and test, however, teams that have not been judged or tested have 1st priority.
- In the event of a disagreement, the opinion and decision of the judge is final.

Testing

- The team will assemble and place three-part structure in test apparatus.
- The pressure board must be placed so it is not touching the 2” diameter safety pipe.
- The structure may not be touched after the pressure board is in place.

- A weight must be supported by the 3-part structure for a minimum of 4 seconds to be included in the Official Weight Held total.
- The weights will be provided by the MESA Day coordinators and will be “Olympic” style metal plates with a 2-inch hole in the center.
- The team will determine which weights and place weights on the structure.

SCORING:

Awards will be given for 1st, 2nd and 3rd place design teams.

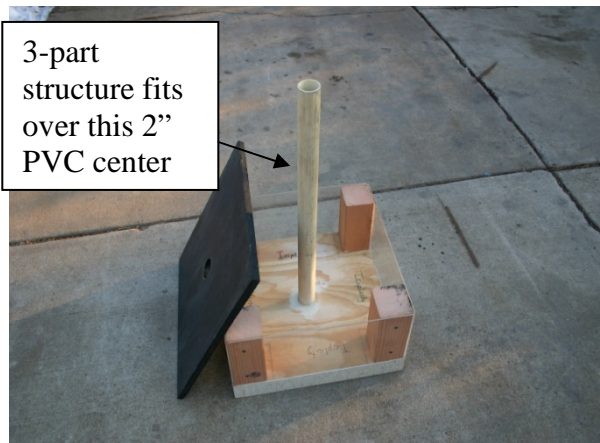


FIGURE 1.-Depicts Triplicate testing apparatus.

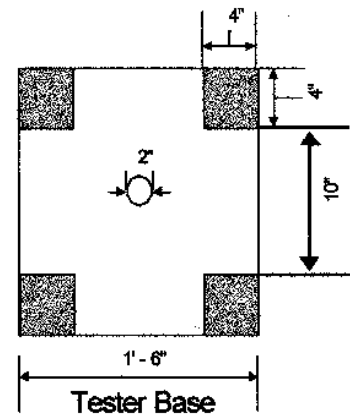


Figure B. - Tester Base

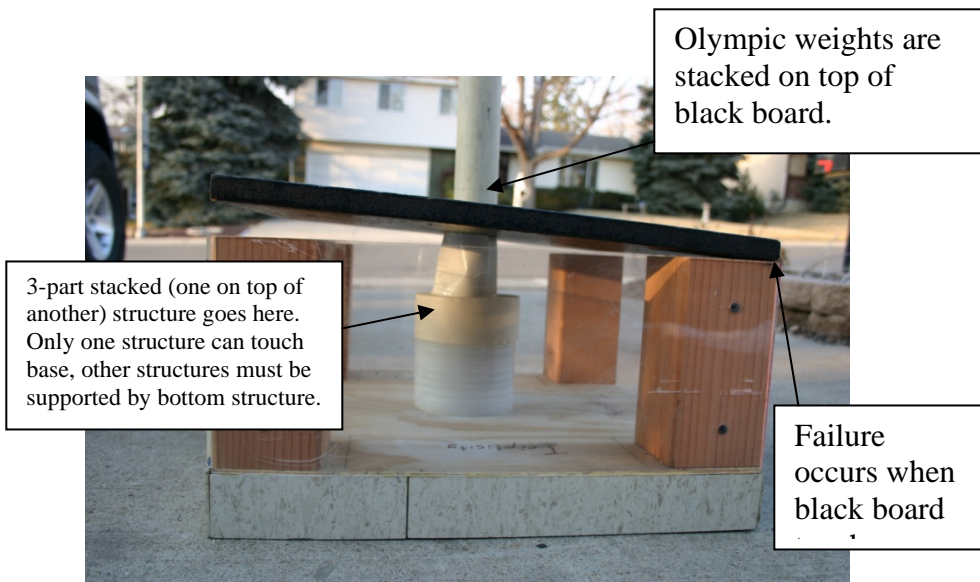


FIGURE 2.-Depicts failed 3-part structure. Failure occurs when any portion of black board touches part of one or more wooden corner blocks.