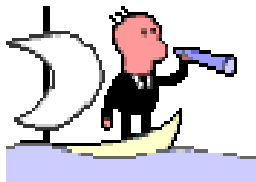


Heber Springs Area Chamber of Commerce



What Floats Your Boat

Cardboard Boat Basics

Construction Rules (Equal Opportunity)

- The ENTIRE BOAT must be built of CARDBOARD
 - Only exceptions are the paddles & decorations
 - Use Cardboard boxes, “blocks”, carpet tubes
 - NO pre-treated cardboard allowed
 - No SONA-TUBES, or waxed or ‘treated’ cardboard
 - NO wood, plastic or fiberglass
 - NO caulking compounds or two-part/mixed adhesives.
 - NO wrapping in duct tape, plastic or fiberglass

Construction Rules

(continued)

- Waterproof the boat with Varnish, Paint or Polyurethane (1-part, paint-like substance)
- Decorations are allowed - as long as they don't effect structural strength or buoyancy
- The crew compartment can NOT be ENCLOSED so as to interfere with escape
- Every crew member must wear a life jacket

Construction Materials

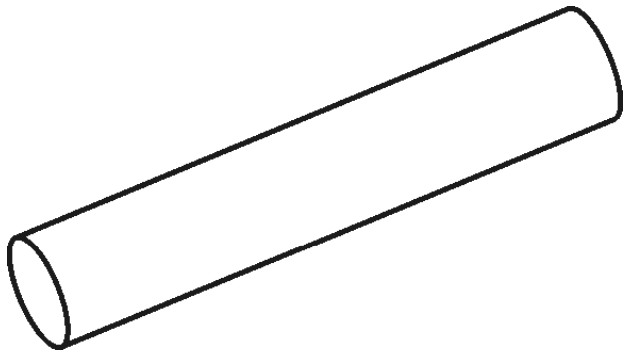
Permissible Materials

- Corrugated Cardboard
 - Appliance or Grocery Stores
- Cardboard “blocks”
 - Furniture stores
- Cardboard Tubes
 - Carpet/Linoleum stores
- Fastening material
 - Duct or masking tape
 - Liquid nails adhesive
 - Latex Paint, Varnish

Materials NOT Allowed

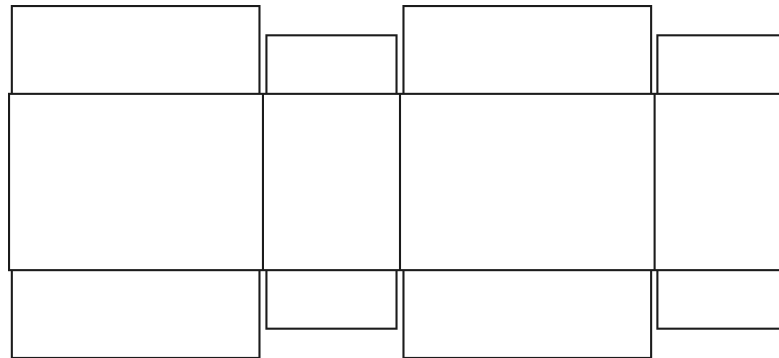
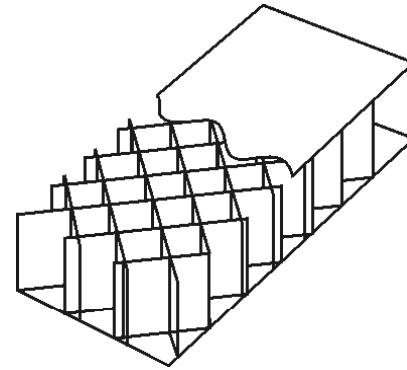
- Wood, Styrofoam
- Plastic sheathing
- Fiberglass
- Sona-Tubes, coated cardboard
- Silicon, Wax, Tar
- Caulking compounds
- Metal
- Staples, clamps, screws
 - * Judges decide on the interpretation of the rules

Construction Materials (continued)



Carpet Tube
(about 4 1/2" dia.)

Cardboard
Block
(2-3" thick)



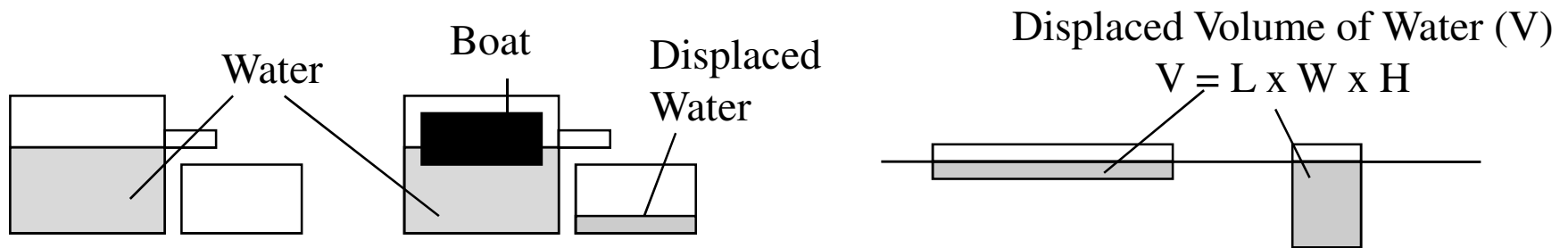
Cardboard Box - cut open

Cardboard Boat Design

- Consider its Size - building & transporting
 - Big enough to hold crew, small enough to carry
 - Wider is better, but still be able to paddle
 - no surfboard style designs are allowed
 - Rafts ARE allowed
 - Consider total weight of all materials when wet
 - EVERYTHING must be removed from the lake
- Boat decorations & crew costumes are encouraged
 - use your imagination

Cardboard Boat 'Physics'

- “How much will you sink? - Displacement



Weight of Water =
62.4 pounds/cubic-foot

$$\text{Water Displaced(ft}^3\text{)} = \frac{\text{Weight-of-boat-\&-people-lbs}}{62.4 \text{ lbs/ft}^3\text{-H}_2\text{O}}$$

$$\text{Depth(ft) boat sinks} = \frac{\text{Water Displaced(ft}^3\text{)}}{\text{Length X Width of boat (ft}^2\text{)}}$$

Example:

Box boat, 3 ft X 6 ft, 1ft tall (high)

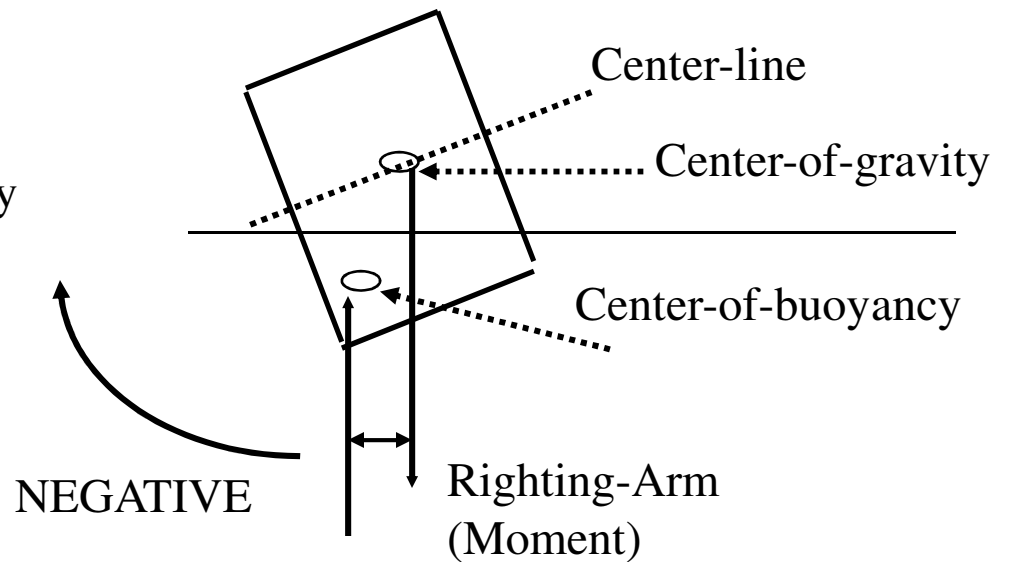
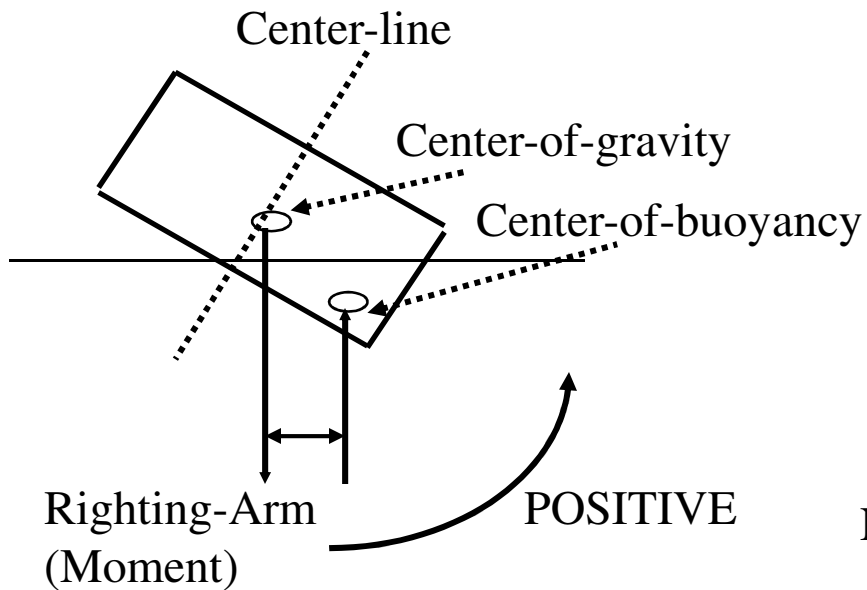
Boat volume = 3' X 6' X 1' = 18 ft³

Boat displacement = 18 ft³ X 62.4 lbs/ft³ = 1123.2 lbs

Which equates to 93.6 lbs per inch of boat height

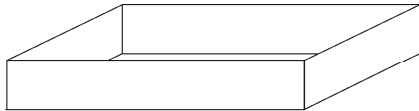
Cardboard Boat 'Physics'

- “Wider is Better” - Center of Buoyancy

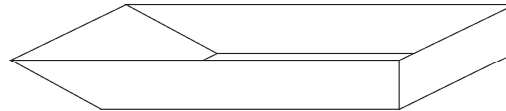


Cardboard Boat 'Physics'

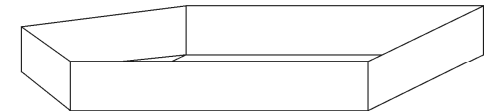
- Movement Through the Water



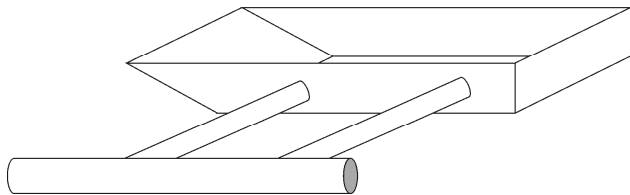
Simple
Box



Slanted
Box



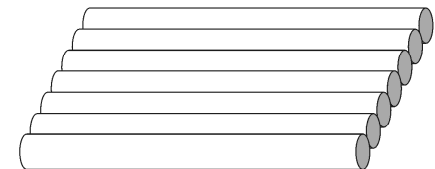
V-Shaped
Bow



Outrigger
Design



Pontoon
Design



Raft
Design

Cardboard Boat

Design Suggestions

- Set the Design Goal: FUN, Speed or looks
- Sketch out your design
 - build a scale model from manila paper:
 - estimate materials or plan how to use what you have
 - plan out what construction techniques will be used
- 1'x1'x3' box: will float 187 lbs.
 - if it'll hold you, it's big enough to float
- Flat bottoms, sit-to-paddle - are the best/easiest
- Rudders help keep you straight but make turning difficult and adds complexity to your design.

Cardboard Boat

Suggestions (cont'd)

- Long boats go fast - but are harder to turn
- Short boats (<10') - are difficult to keep straight
- Best Length: 8-12 feet
- Best Height: 18 inches
 - allows room to sit/kneel & still paddle over the edge
- Best Width:
 - 18"-30"(max) for 1 person
 - 48" wide for 2 people side by side
- Kneeling is a “power” position but sitting is more comfortable

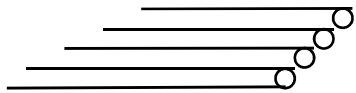
Construction Tips & Techniques

- Cover edges of cardboard - acts like siphon
- Cardboard Tubes make great frames
 - Cutting for joining & bending
 - Fastening tubes together
- Cardboard Hull
 - 1-2 layers, fasten & cover the seams
 - With 2 layers, overlap the seams
 - Decorate, paint & varnish
- Reinforce the area where you sit, kneel or stand

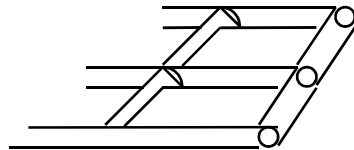
Construction Tips & Techniques

- Carpenter's glue works well, liquid nails
 - hot-melt glues melts in the sun
- Duct tape only non-painted surfaces (tubes or frame that will be covered)
 - Duct tape shrinks when painted
 - Duct tape can be covered with masking tape if you need to paint it.
 - No Clear tape - it melts when painted
 - Masking tape for glued edges & seams
 - Kraft paper with spray adhesive also

Construction Tips & Techniques



Solid Tube
Frame

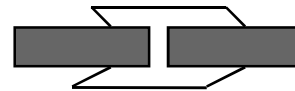


Center/Cross
Beam
Frame

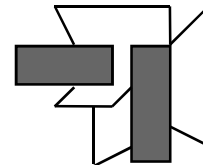
FRAMES

CONNECTING TUBES

Cardboard
Wrapper for Tubes
End-to-End

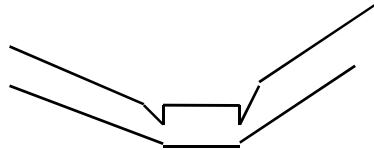


Cardboard
Wrapper for Tubes
At Right-Angles

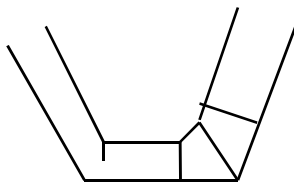


Construction Tips & Techniques

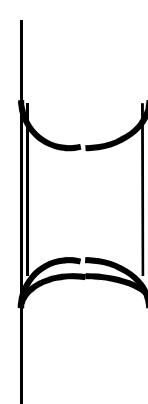
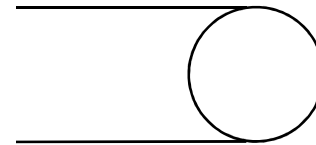
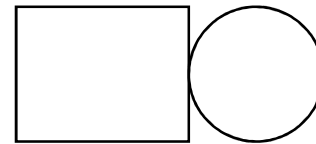
FRAME ANGLES



V-Shaped Cuts

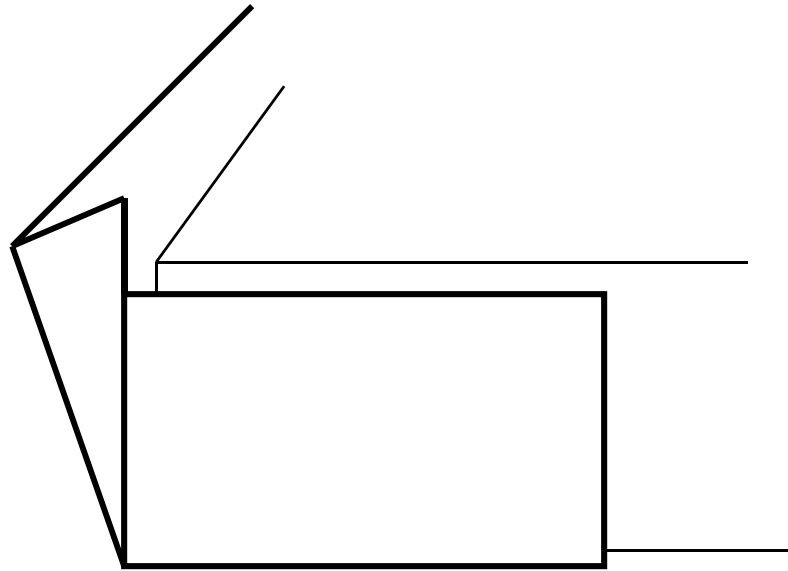


Multiple Cuts
for Sharper Angles



**TUBE CUTTING
TEMPLATE**

Construction Tips & Techniques

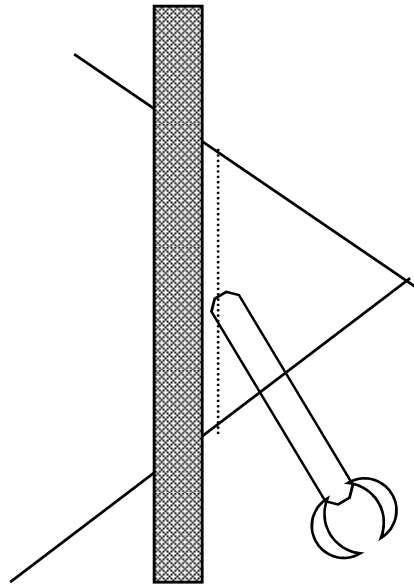


**FOLD & OVERLAP
CARDBOARD
AROUND CORNERS**

Construction Tips & Techniques

**Crease/Score a line
for a nice**

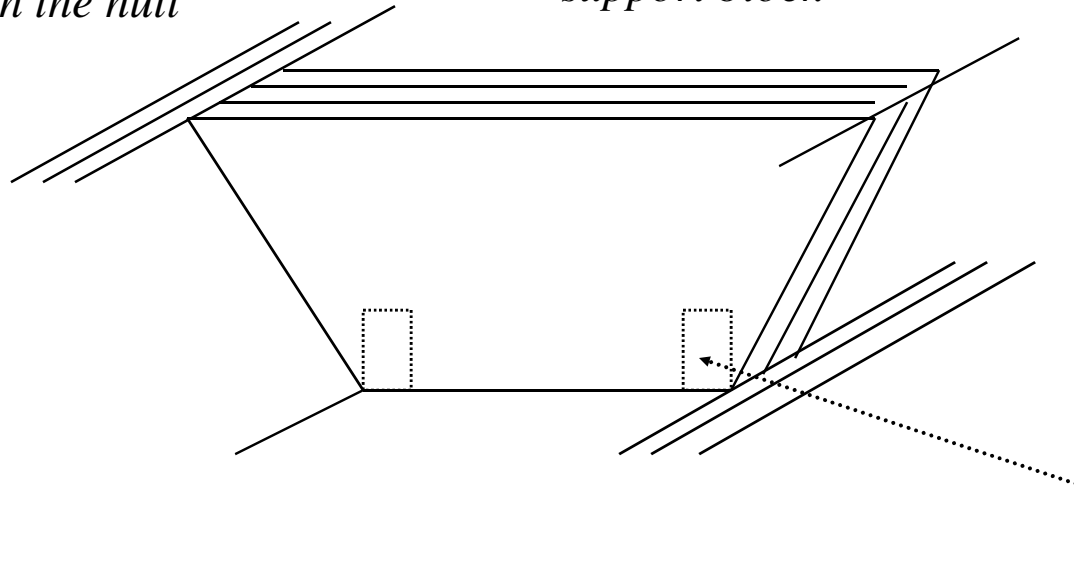
**STRAIGHT
FOLD**



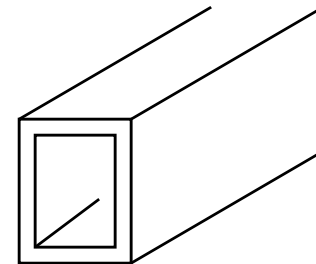
Construction Tips & Techniques

Multiple cardboard layers
“glued” together on the sides
strengthen the hull

Multiple trapezoid-shaped pieces
“glued” together to form a
“support block”



A sheet of cardboard
could be folded &
“glued” together to
form *tubes/beams*



BOAT LENGTH + WIDTH: 8ft. by 2ft.

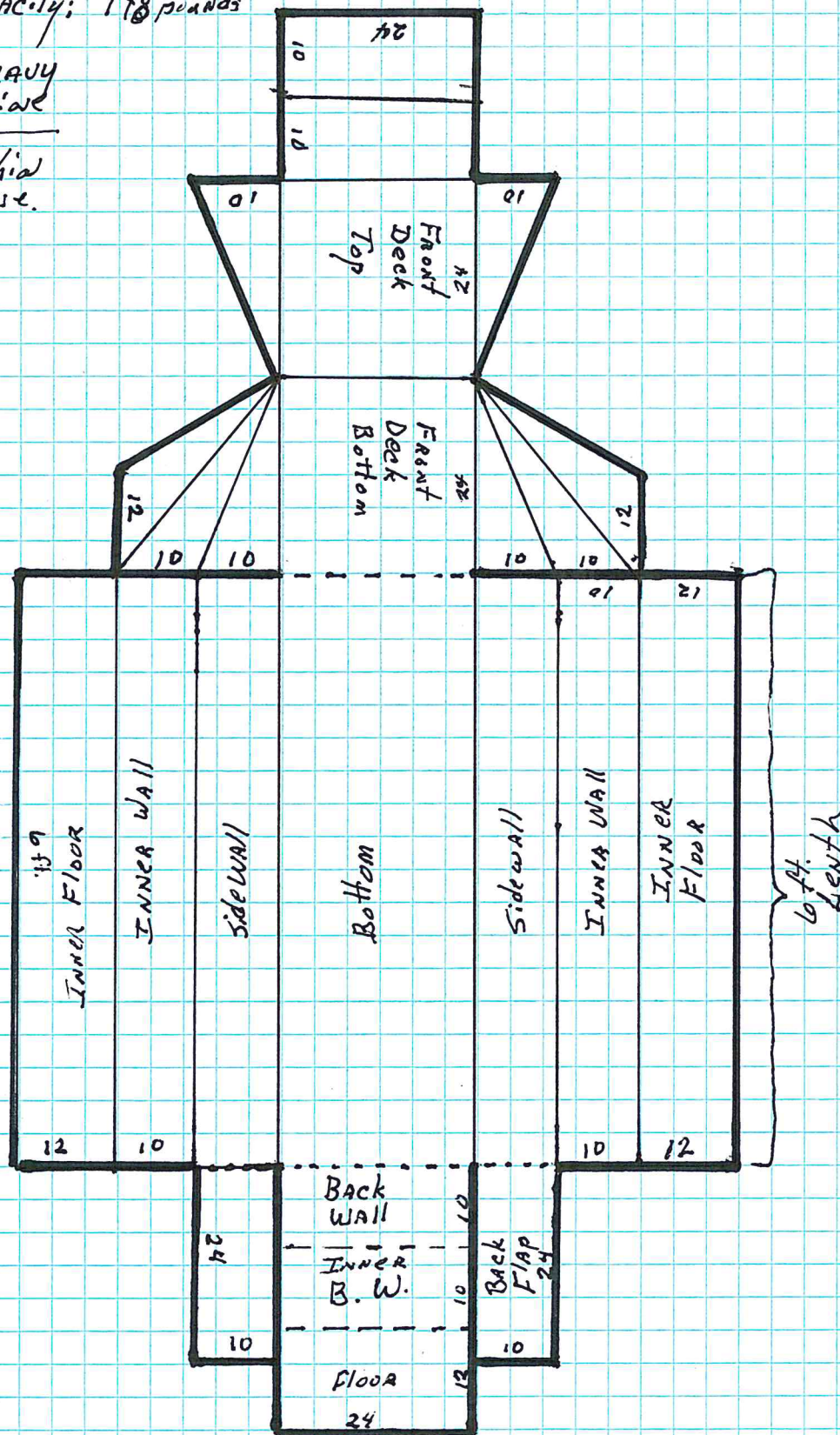
Length: 14 ft 4 inches
Width: 79 4 inches

Pattern Length + Width

Load Capacity: 748 pounds

Cut on heavy
Black Line

Fold on thin
Black Line.



Cardboard Boat Festival

If it's a boat, it will float....sometimes!

Construction

All boats must be built of corrugated cardboard and, if the judge deem it necessary, must pass the dreaded "Icepick Test" to verify that the boat is constructed of only cardboard. No motors.

Your cardboard boat may be as thick as you want it to be. Thickness of cardboard doesn't matter at all. Remember, it must be all cardboard—not cardboard and wood or cardboard and metal. **The entire boat must be built of corrugated cardboard.**

The only exceptions are: oars and not part of the boat proper and can be constructed of materials other than cardboard.

If you don't want your boat to sink, the Committee urges you to waterproof the entire boat with a paintable one-part substance. (A two-part substance would include those that require the addition of a catalyst or hardener.... This **eliminates** epoxy glue, fiberglass, and certain varnishes. One-part waterproofing substances are easily obtained at a paint or hardware store.)

You cannot wrap the entire boat with plastic or duct tape or any similar tape or wrap. Duck tape can only be used at the seams and stress points. However, you are allowed to reinforce all seams and stress points with tape before waterproofing.

Contestants are not allowed to use any substance which might be harmful to the environment. Contestants should take care to ensure that the construction of your boat does not include pointed projections and sharp edges that might cause personal injury.

How To Be A Winner

- 1. Decide on design and sketch it. It can be any size. Let your imagination go wild!**
- 2. Do the bottom of the boat first. Two to three layers of cardboard glued together and weighed down—let set.**
- 3. Cut side pieces. Cut against the grain of the corrugated cardboard to insure durability. Use dull side of knife when scoring to make a fold—makes it easier to bend pieces in proper shape.**
- 4. Glue sides to bottom. Let glue set.**
- 5. Carefully cover any seam with duct tape.**
- 6. Waterproof inside and out with any single substance compound.**
- 7. Paint and decorate the boat**