

CARDBOARD BOAT BUILDING 101

United Way
of Jackson County



**“WHAT FLOATS YOUR
CARDBOARD BOAT?”**

**UNITED WAY
CAMPAIGN KICK OFF**

**SEPTEMBER 9, 2016
STARTING GUN
4:00PM**

Construction Rules

1. The entire boat must be built of cardboard, duct tape and one-part polyurethane. Only exceptions are the paddles and decorations.
2. Use cardboard boxes, blocks, carpet tubes
3. No pre-treated cardboard allowed
4. No Sona-Tubes, waxed or treated cardboard
5. No wood, plastic or fiberglass
6. No caulking compounds or two-part/mixed adhesives
7. No wrapping in duct tape, plastic or fiberglass
8. Duct tape may be used to reinforce seams
9. Waterproof the boat with varnish, paint or polyurethane
10. Decorations are encouraged as long as they don't affect structural strength or buoyancy
11. The crew compartment **cannot** be enclosed for safety reasons



Participation Rules

1. Crewmembers must be 18 years of age or older (insurance regulation)
2. Every crewmember is **required** to wear a personal flotation device and water shoes or protective foot wear

3. Each crew member must be able to swim and sign the participant waiver in advance of the race
4. No intentional boat crashing, pushing or paddling inside of the competitor's boat.



Construction Materials

Permissible Materials

- Corrugated Cardboard

Material Not Allowed

- Wood, Styrofoam

Acquired from Appliance or Grocery stores

- Cardboard “blocks”

Acquired from furniture stores

- Cardboard Tubes

Acquired from carpet/flooring stores

- Fastening material

Duct or masking tape

Liquid nails adhesive

Twine, rope, string

- Styrofoam

- Plastic sheeting

- Sona-tubes, coated cardboard

- Silicon, wax, tar

- Caulking compounds

- Metal, staples, clamps, screws, washers

- NeverWet

Please note: Judges decide on the interpretation of the rules.

Judges' Decisions are Final!

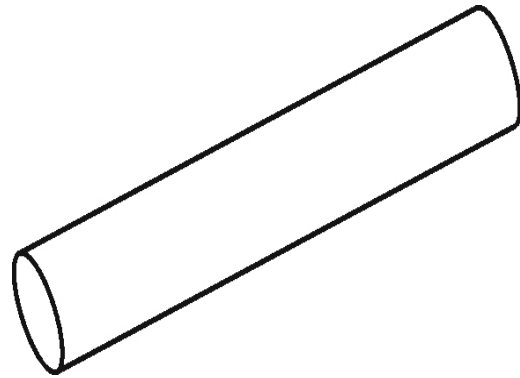


Construction

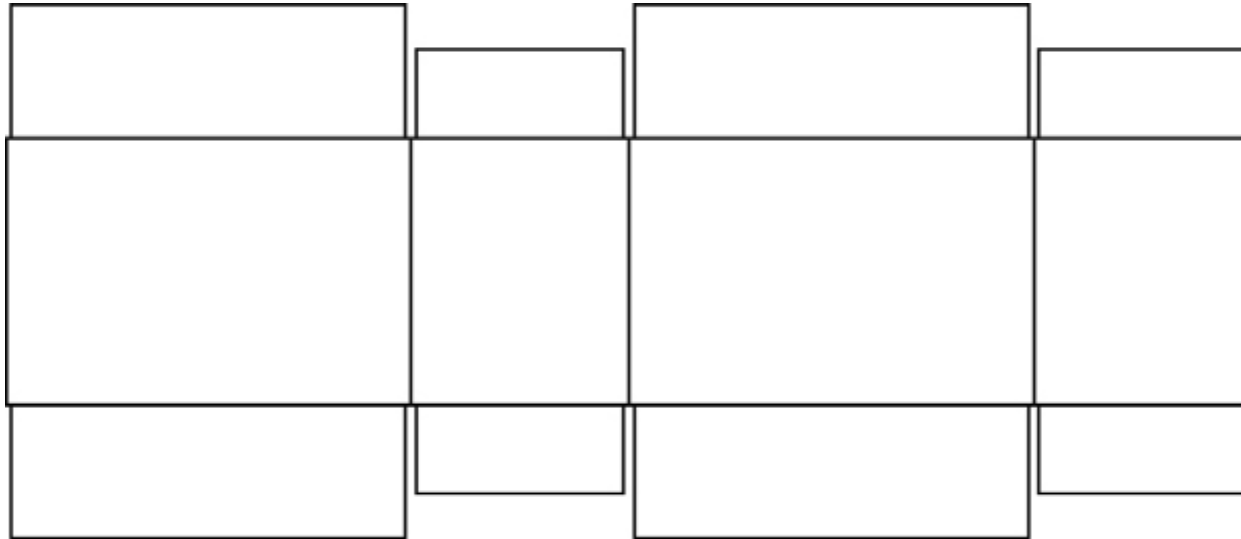
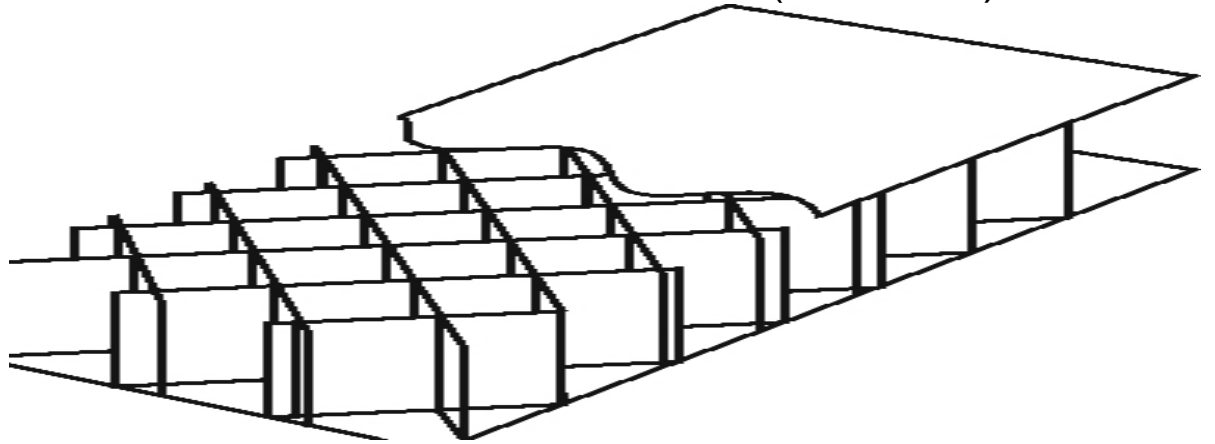
Materials

Examples:

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



Cardboard Block (2-3" thick)



Cardboard Box -cut open

Cardboard Boat Design

Consider size in terms of building and transporting:

- Big enough to hold crew, small enough to carry
- Less than six foot wide
- No surfboard style designs are allowed
- Raft designs are allowed
- Consider total weight of all material when wet

Everything must be removed from the pond following the race.





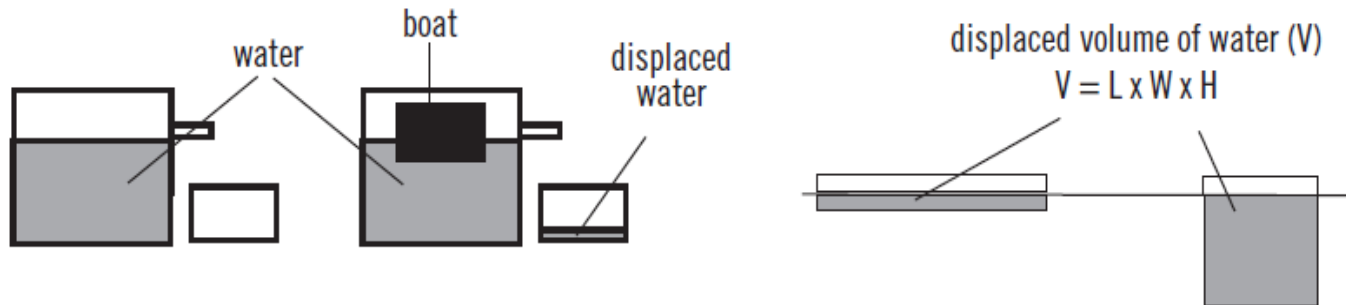
Boat decorations and crew costumes are encouraged. Use your imagination and you might be rewarded for your creativity! **Most of all....."HAVE FUN"!!!**



CARDBOARD BOAT

PHYSICS

“How much will you sink?”
Displacement



Weight of Water= 62.4 pounds/cubic-foot	Displaced (ft ³) =	Weight of boat & people=lbs 62.4lbs/ft ³ -H ₂ O
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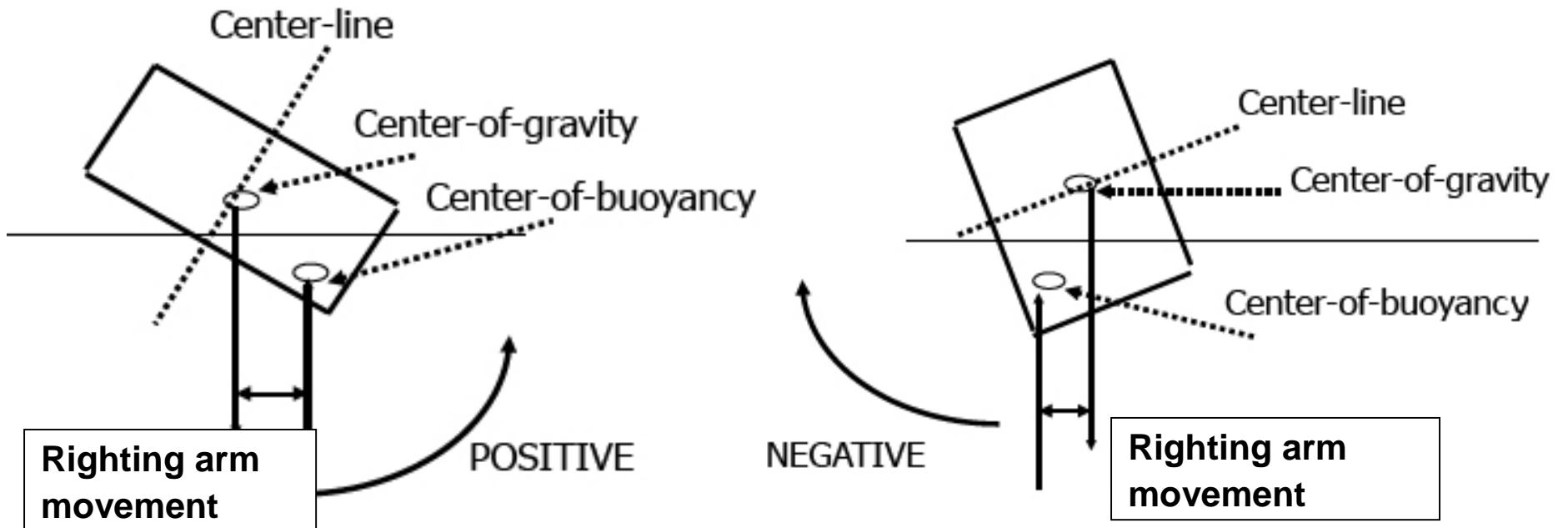
Depth (ft) boat sinks _____

EXAMPLE:

Box boat, 3ft x 6ft, 1 ft 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

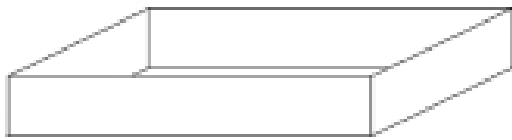
More Cardboard Boat Physics

“Wider is Better” – Center of Buoyancy

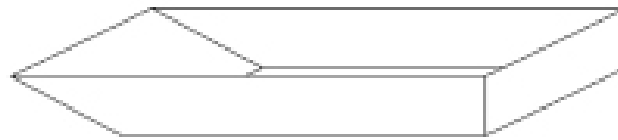


Even More Cardboard Boat Physics

Movement Through the Water



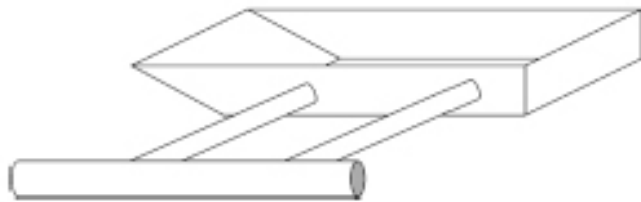
Simple
Box



Slanted
Box



V-Shaped
Bow



Outrigger
Design



Pontoon
Design



Raft
Design

Cardboard Boat Design Suggestions

Set the Design Goals:

- **Fun, speed and appearance**

Sketch out your design:

- **Build a scale model from poster board**
- **Estimate materials or plan how to use the materials you have**
- **1' X 1' X 3' box will float 187 lbs**
- **If it'll hold you, it's big enough to float**

Flat bottom, sit-to-paddle & canoe styles are the best/easiest

A rudder helps keep you straight but makes turning difficult and adds complexity.



More Cardboard Boat Design Suggestions

Long boats go fast, but these boats are harder to turn

Short boats less than 8 feet are difficult to steer straight

Best Width:

- **18" to 30" for one person**
- **48" for two people side by side**

Best Length:

- **8'-12'**

Best Height:

- **18"**
- **Allows room to sit/kneel & still paddle over the edge**
- **Kneeling is a power position but sitting is more comfortable**

Construction Tips And Techniques I

Cover all edges of cardboard – Openings act like a siphon

Cardboard tubes make great frames:

- **Cut for joining & bending**
- **Fasten tubes together**

Cardboard Hull:

- **1-2 layers, fasten & cover the seams**
- **Width 2 layers, overlap the seams & polyurethane in between**
- **Decorate, paint & varnish**

Reinforce the area where you sit, kneel or stand



Construction Tips And Techniques II

Carpenter's glue and liquid nails work well:

- **Hot glue melts in the heat and sun**

Duct tape only non-painted surfaces (tubes or frame that will be covered)

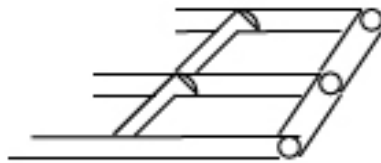
- **Duct tape shrinks when painted**
- **Duct tape should be covered with masking tape if you need to paint it**
- **Clear tape melts when painted**
- **Masking tape works well on glued edges & seams**
- **Craft paper with spray adhesive may also be used**



Construction Tips and Techniques III



Solid Tube Frame



Center/Cross Beam Frame

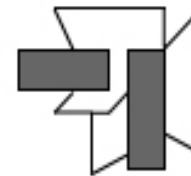
FRAMES

CONNECTING TUBES

Cardboard Wrapper for Tubes End-to-End

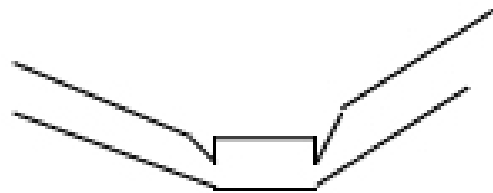


Cardboard Wrapper for Tubes At Right-Angles

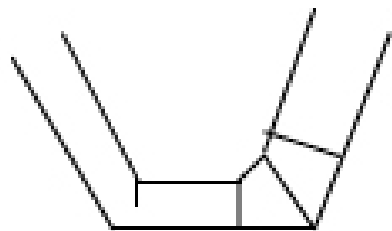


Construction Tips And Techniques IV

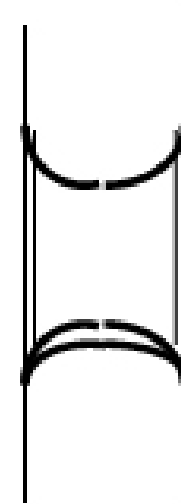
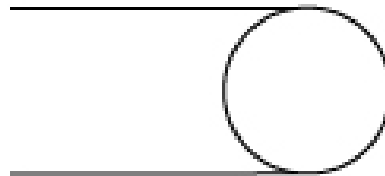
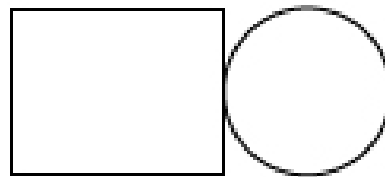
FRAME ANGLES



V-Shaped Cuts

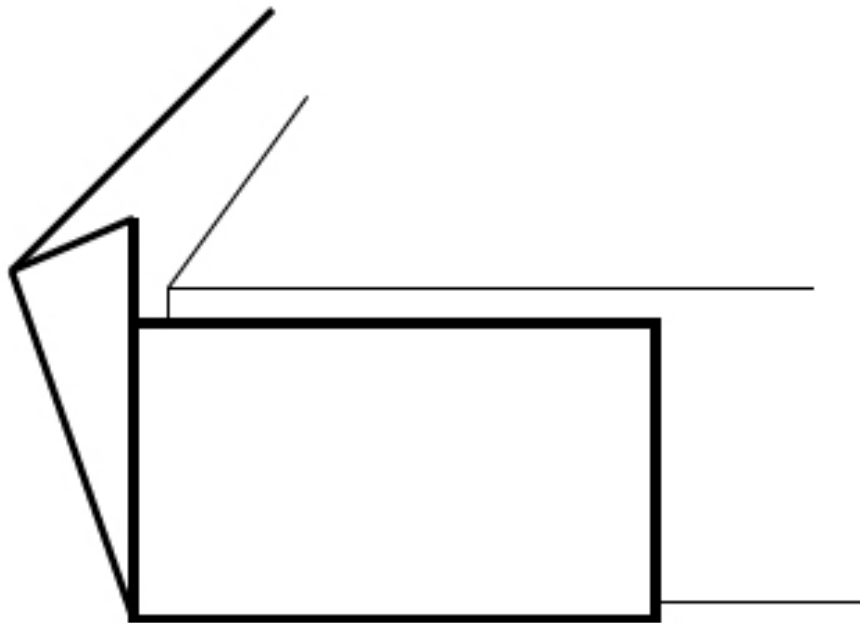


Multiple Cuts
for Sharper Angles



TUBE CUTTING TEMPLATE

Construction Tips and Techniques V



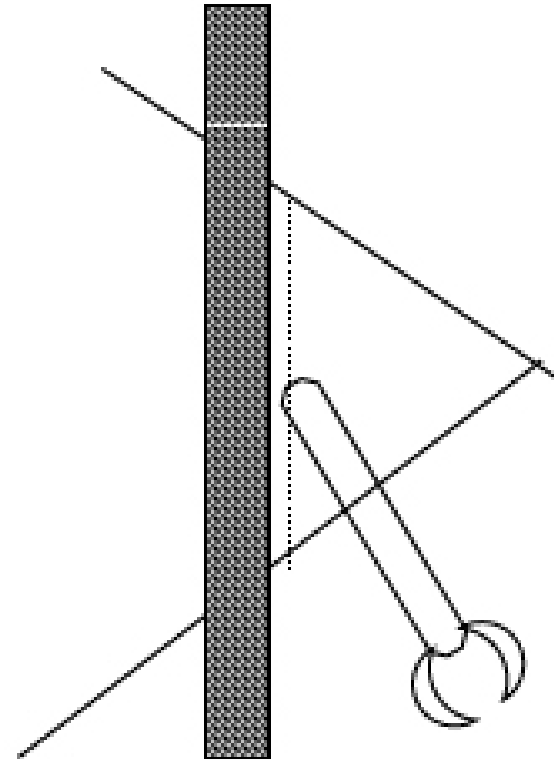
FOLD & OVERLAP
CARDBOARD
AROUND CORNERS



Construction Tips And Techniques VI

Crease/Score a line
for a nice

**STRAIGHT
FOLD**

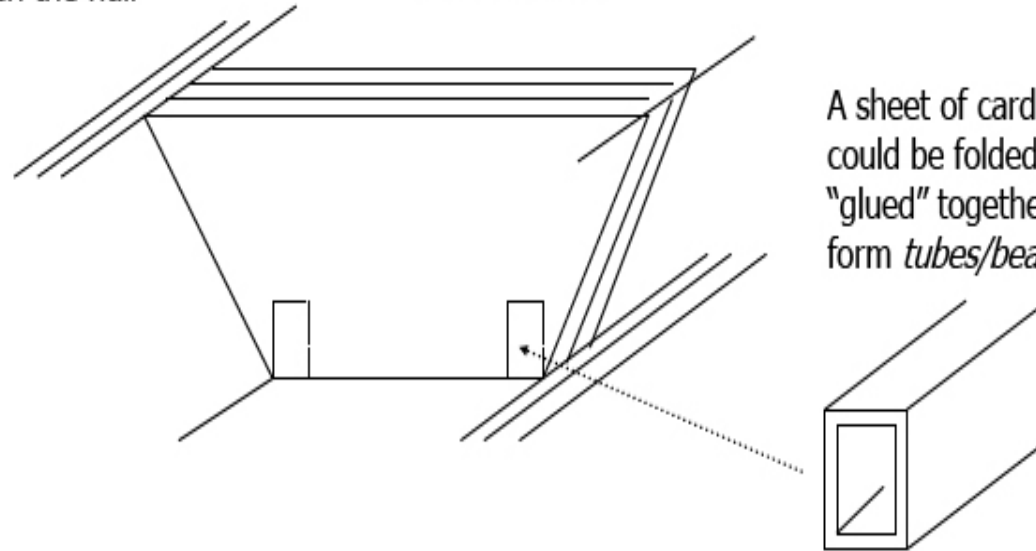


Construction Tips and Techniques VII

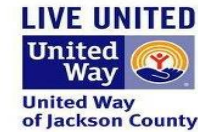
Multiple cardboard layers
"glued" together on the sides
strengthen the hull

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

A sheet of cardboard
could be folded &
"glued" together to form
tubes/beams



Go Build Your Boat!



Most of all...“Have Fun”!!!

WE’LL SEE YOU ON THE CASCADES URBAN FISHERIES POND

Friday, September 9, 2016

RACE DAY SCHEDULE:

1:00 p.m. - Boat drop-off for judging and inspection. One team member must stay with the boat.

3:30 p.m. Entire crew check-in

3:45 p.m. Crew Safety Briefing... All Hands on Deck!

4:00 p.m. RACE BEGINS!!!! Boats will be assigned to a heat. The winner of each heat will move on to the final race.

Awards Ceremony & Campaign Kick-off will begin after clean-up. Award categories are:

1st place, 2nd place, Judges Choice, People’s Choice and “The Most Spectacular Sinking”!

If you have questions, contact:

United Way of Jackson County - Beth at 796-5119 bshafer@uwjackson.org or Stephanie at 796-5120 sschiro@uwjackson.org

