THE GREAT CARDBOARD BOAT RACE

CONSTRUCTION GUIDE

United Way

Crossroads United Way

Serving Elkhart, LaGrange
& Noble Counties

CONSTRUCTION

(CONTINUED ON NEXT PAGE)

- ❒ **The ENTIRE boat must be built of cardboard, duct tape, and one-part polyurethane.** (Any part of your boat that touches the water must be cardboard. This includes the hull, decking, keel, cowling, superstructure, oar locks, seating and rudder. Nuts, bolts, washers and staples are **NOT** allowed in hull construction. The cardboard may be as thick as you want, but may **not** be glued or attached to wood, plastic, fiberglass, etc.)
  - ❒ Only exceptions are the oars/paddles & decorations
- ❒ Do use cardboard boxes, “blocks”, carpet tubes
- ❒ NO pre-treated cardboard allowed
- ❒ NO Sono -Tubes, waxed or ‘treated’ cardboard
- ❒ NO wood, plastic, Styrofoam, or fiberglass
- ❒ NO caulking compounds, two-part/mixed adhesives, or rubberizing paints/sprays
- ❒ **NO wrapping in duct tape, plastic, shrink wrap, fiberglass or similar product**
- ❒ Duct tape may be used to reinforce seams (Gorilla or similar-style tape is also acceptable)
- ❒ **Duct tape, masking tape, or adhesives such as ‘liquid nails’ CAN be used to connect cardboard to cardboard and CAN be used to reinforce all seams and stress points. It CANNOT be used to waterproof by wrapping an entire boat.**

CONSTRUCTION

(CONTINUED ON NEXT PAGE)

- ❒ Do waterproof the boat with varnish, paint, or polyurethane (or any one-part, paint-like substance). If you don't want your boat to sink, waterproof the entire boat with any paintable one-part substance like varnish or polyurethane inside and out
- ❒ Decorations are encouraged! They cannot, however, effect the structural strength or buoyancy unless made of cardboard
- ❒ Boats CANNOT tow anything behind them for the safety of other boats
- ❒ The crew compartment CANNOT be enclosed so as to interfere with escape
- ❒ Boats should weigh less than 200 lbs. This rule is for us (in case you need help out of the pond)
- ❒ Boats should be less than 6 feet wide – Here more is not better (or faster!)
- ❒ Care should be taken that construction does not include pointed objects and sharp edges that could injure anyone
- ❒ Surfboard style designs are NOT allowed. Consider "staying dry" part of the challenge. Feet and all should be out of the water.
- ❒ Raft style designs ARE allowed. (The distinguishing feature of a raft design as opposed to a surfboard style is the use of cardboard "logs" and other such accoutrements. Think Huck Finn.)

MATERIALS

PERMISSIBLE MATERIALS

- ❒ Corrugated Cardboard
  - ❍ Appliance or grocery stores
- ❒ Cardboard “blocks”
  - ❍ Furniture stores
- ❒ Cardboard Tubes
  - ❍ Carpet/linoleum stores
- ❒ Fastening material
  - ❍ Duct, masking, clear or similar tape
  - ❍ Liquid nails adhesive
- ❒ Latex Paint, Varnish

NOT ALLOWED

- ❒ Wood, styrofoam
- ❒ Wrapping boat with duct tape, plastic, etc.
- ❒ Fiberglass
- ❒ Sona -Tubes, coated cardboard
- ❒ Silicon, wax, tar, rubberizing product
- ❒ Caulking compounds
- ❒ Metal
- ❒ Staples, clamps, screws

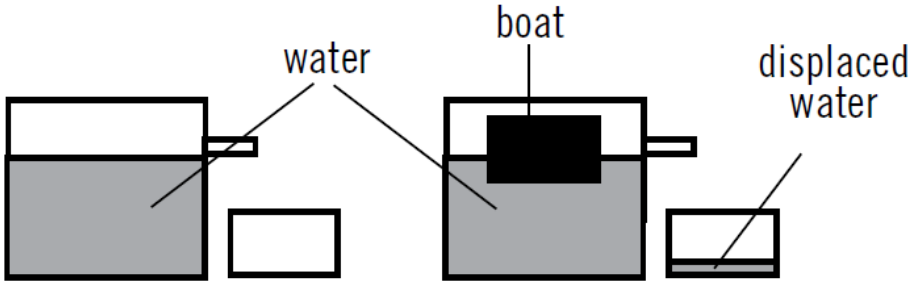
*If there is any doubt about the construction, the judges reserve the right to use a probe, such as an ice pick, to test and verify that only cardboard has been used. Failure to abide by any design, race rule or the direction of a race official shall be cause for disqualification. The Judges’ decision is final. Please contact the United Way office at give@crossroadsuw.org or at 574-295-1650 if you have any questions.

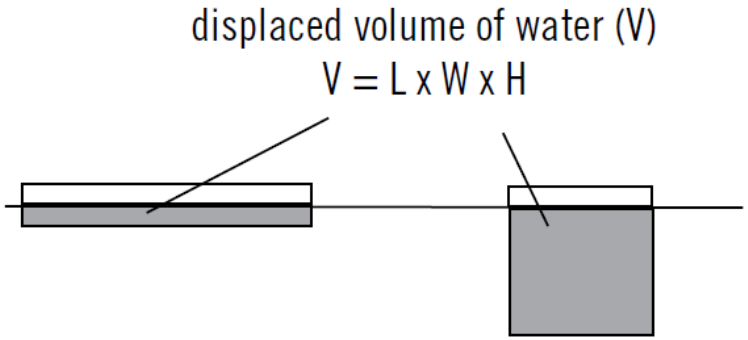
DESIGN

- Consider the logistics of building and transporting the boat
  - Big enough to hold crew, small enough to transport and carry
  - Wider is better for stability, but still must be able to paddle and turn
    - **No** surfboard style designs are allowed
    - Rafts are allowed
  - Consider total weight of all materials when waterlogged
  - EVERYTHING must be removed from the pond
- Boat decorations and crew costumes are encouraged - use your imagination; you may be rewarded with the LIVE UNITED Award
  - Incorporating the Boat Race's theme (changes year to year) will help you win this award

DISPLACEMENT

How much will you sink? - Displacement





Weight of Water =
62.4 pounds/cubic-foot

Water Diplaced (ft^3) = $\frac{\text{Weight-of-boat-\&people-lbs}}{62.4 lbs/ft^3\text{-}H2O}$

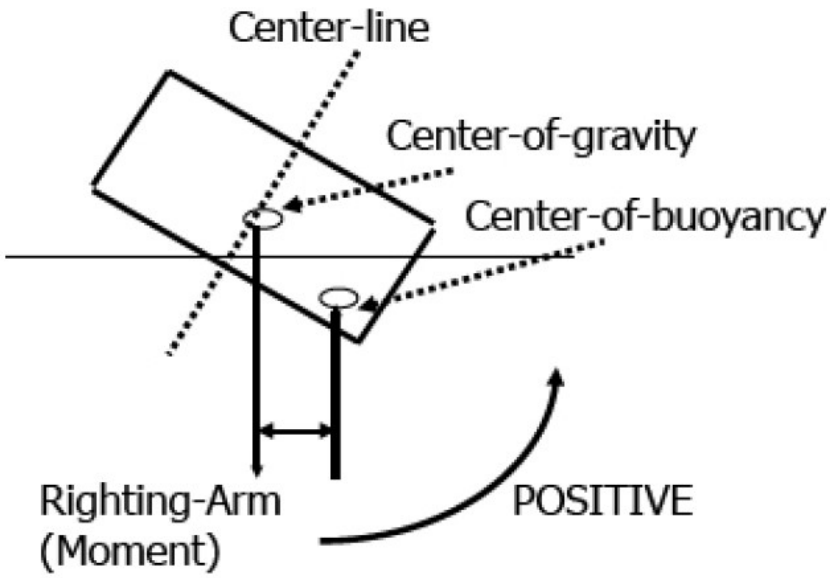
Depth (ft) boat sinks _____

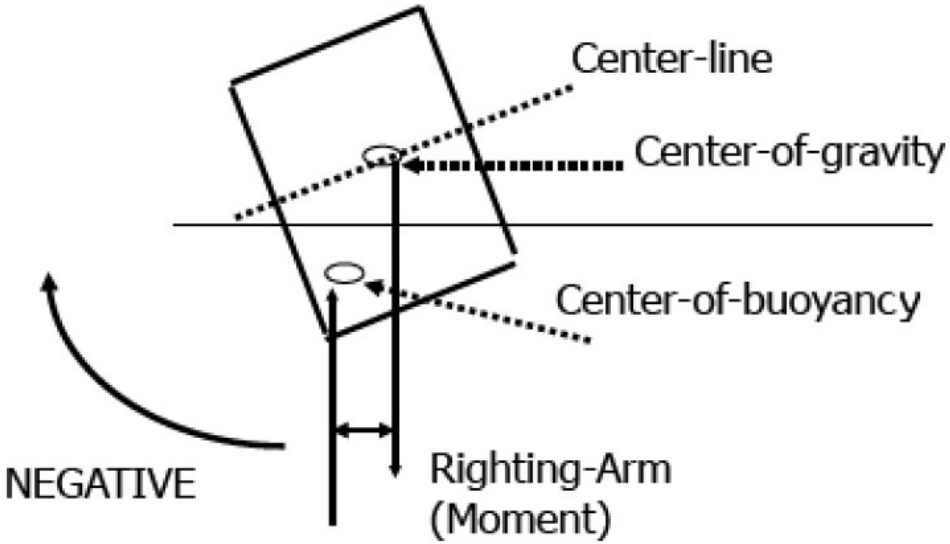
EXAMPLE:

Box boat, 3ft x 6ft, 1 ft tall (high)
Boat volume= 3' x 6' x 1' = 18 ft^3
Boat displacement= 18 ft^3 x 62.4 lbs/ft^3 = 1123.2 lbs
Which equates to 93.6 lbs per inch of boat height

PHYSICS

Wider is steadier— Center of Buoyancy





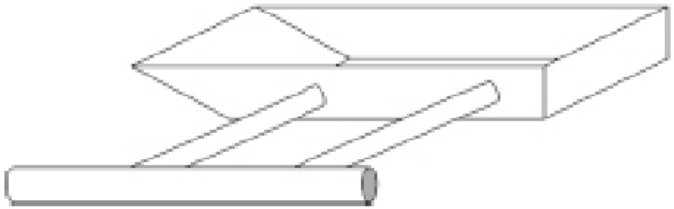
DESIGN

Basic boat styles

Simple Box

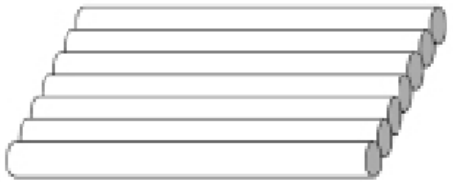
Slanted Box

V-Shaped Bow



Outrigger Design

Pontoon Design



Raft Design

DESIGN

Suggestions & Considerations:

- ❒ Set the Design Goal: Fun, Speed and Appearance
- ❒ 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's big enough to hold you, it will float
- ❒ Flat bottom, sit-to-paddle & canoe styles have been the most popular and successful designs in the past
- ❒ Rudders help keep you straight but make turning difficult and adds complexity to your design
- ❒ Long boats go fast - but are harder to turn
- ❒ Short boats (<8') - are difficult to paddle 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 2 or more people in a row
  - ❍ Minimum 48" wide for 2 people side by side
- ❒ Kneeling is a "power" position but sitting is more comfortable

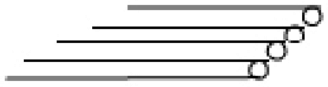
CONSTRUCTION

Construction Tips & Techniques:

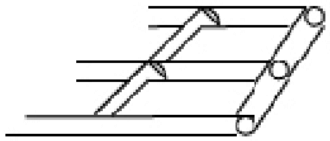
- ❒ Cover all edges and joints — cardboard acts like a siphon
- ❒ Cardboard Tubes make great frames
  - ❍ Cut for joining & bending
- ❒ Cardboard Hull
  - ❍ 1 or more layers, fasten & cover the seams
  - ❍ With 2 layers, overlap the seams & polyurethane in between
  - ❍ Decorate, paint & varnish
- ❒ Reinforce the area where the crew will sit, kneel or stand
- ❒ Carpenter's glue and liquid nails work well
  - ❍ hot-melt glues will melt 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
  - ❍ Kraft paper with spray adhesive may also be used

CONSTRUCTION

Construction Tips & Techniques:



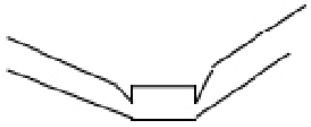
Solid Tube Frame



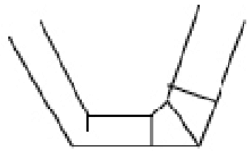
Center/Cross Beam Frame

FRAMES

FRAME ANGLES



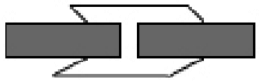
V-Shaped Cuts



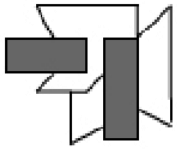
Multiple Cuts for Sharper Angles

CONNECTING TUBES

Cardboard Wrapper for Tubes End-to-End

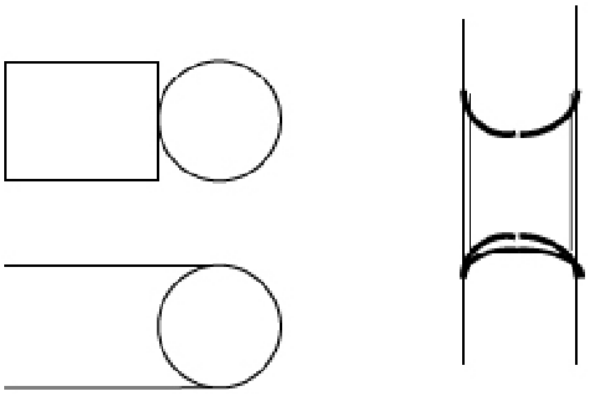


Cardboard Wrapper for Tubes At Right-Angles

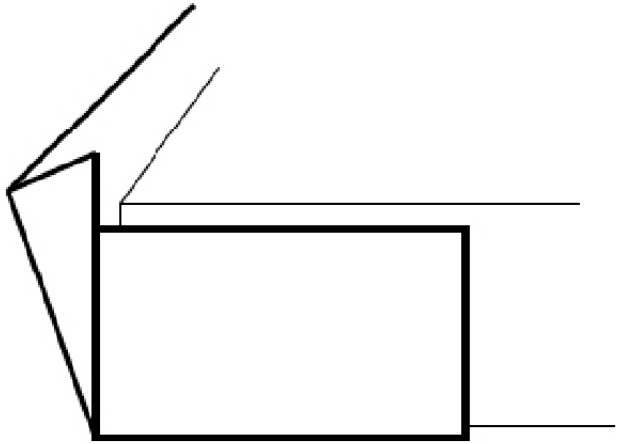


CONSTRUCTION

Construction Tips & Techniques:



TUBE CUTTING TEMPLATE



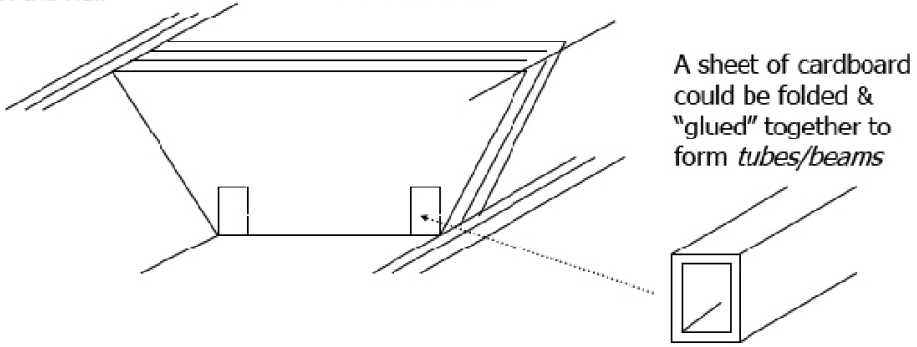
FOLD & OVERLAP CARDBOARD AROUND CORNERS

CONSTRUCTION

Construction Tips & Techniques:

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

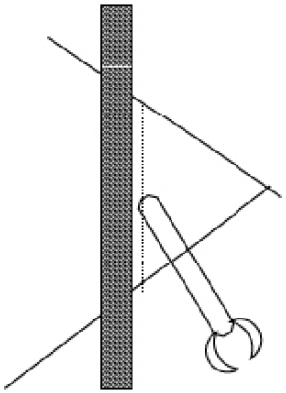
Multiple trapezoid-shaped pieces "glued" together to form a "*support block*"



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

Crease/Score a line for a nice

STRAIGHT FOLD



GO BUILD YOUR BOAT!

THE GREAT CARDBOARD BOAT RACE

United Way

Questions? Contact Us:

Crossroads United Way
601 CR 17 Elkhart, IN 46516
574-295-1650
give@crossroadsuw.org
www.crossroadsuw.org/race