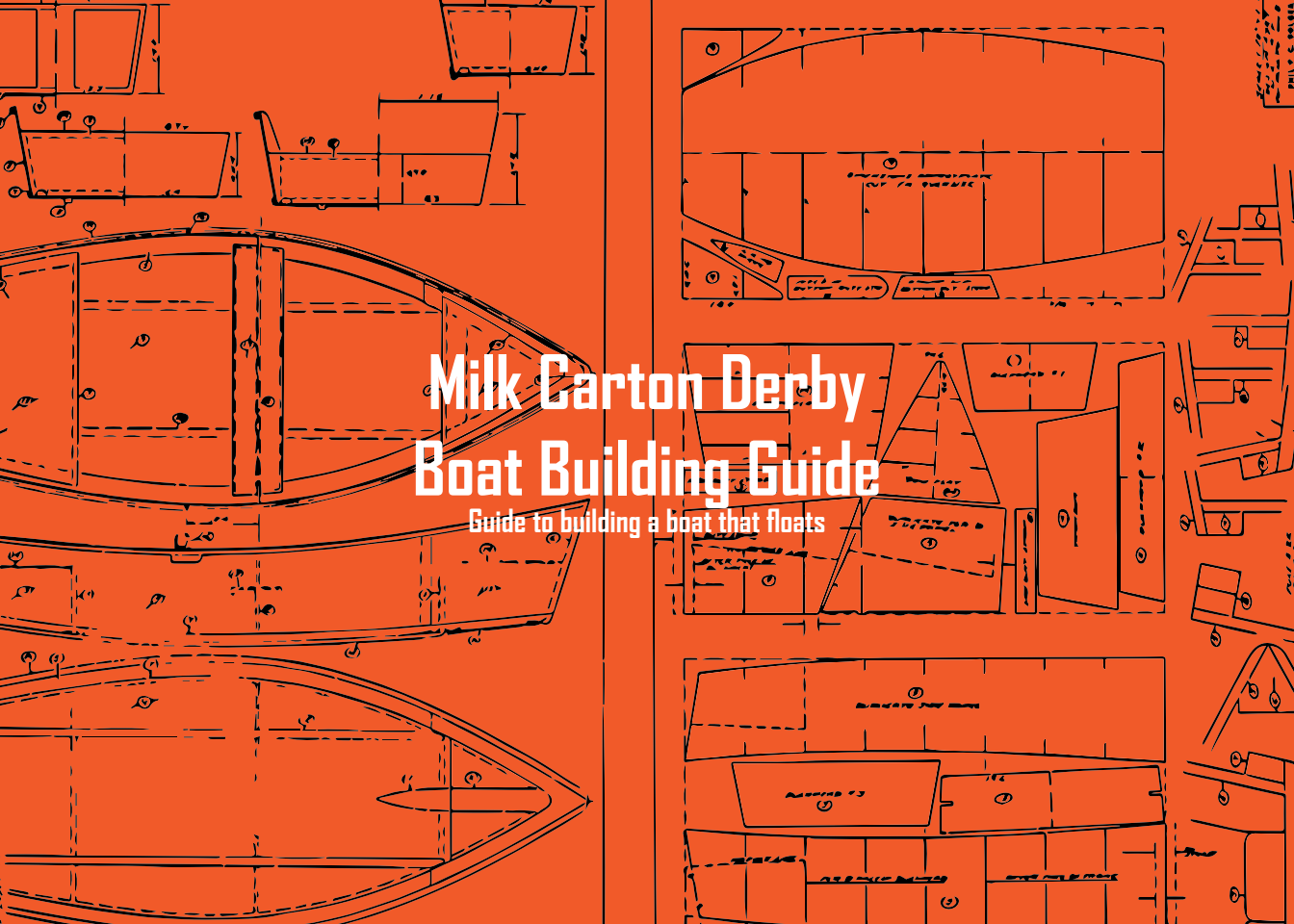


Milk Carton Derby Boat Building Guide

Guide to building a boat that floats

Welcome

Have you ever wanted to build a boat out of Milk Cartons? Well here's your chance, grab your friends, family, or co-workers. This booklet will help you get started designing your new watercraft. Join us at the Annual Lucerne Milk Carton Deby presented by Safeway Albertsons at Green Lake Aqua Theater in Seattle, WA.

Categories

- Youth (13 and younger)
- Adult (14 and over)
- Mixed Age Division
- Military (free registration)
- Commercial - $250
- STEM
- Non-profits sponsored by Capital One
- Team Challenge (Build at race sight)

Awards

Do you have a need for speed? Do you like to make your own wind?
OR
Do you find yourself watching Bob Ross reruns? Do you like to show the world your creative side?

Awards will be given to the top 3 fastest teams per category and to the Top 3 overall most creative boats

Rules of the Trade

All entries must soley rely on milk cartons for floatation and human power for propulsion. Above the waterline is free game, show off your creativity.

- Cartons may not be filled with anything
- Do not enclose the bottom of the vessel
- You may use chicken wire or plastic mesh to hold cartons in place
- No engines or motors
- Sails will be for decoration only
- Milk or Juice jugs may be used for flotation

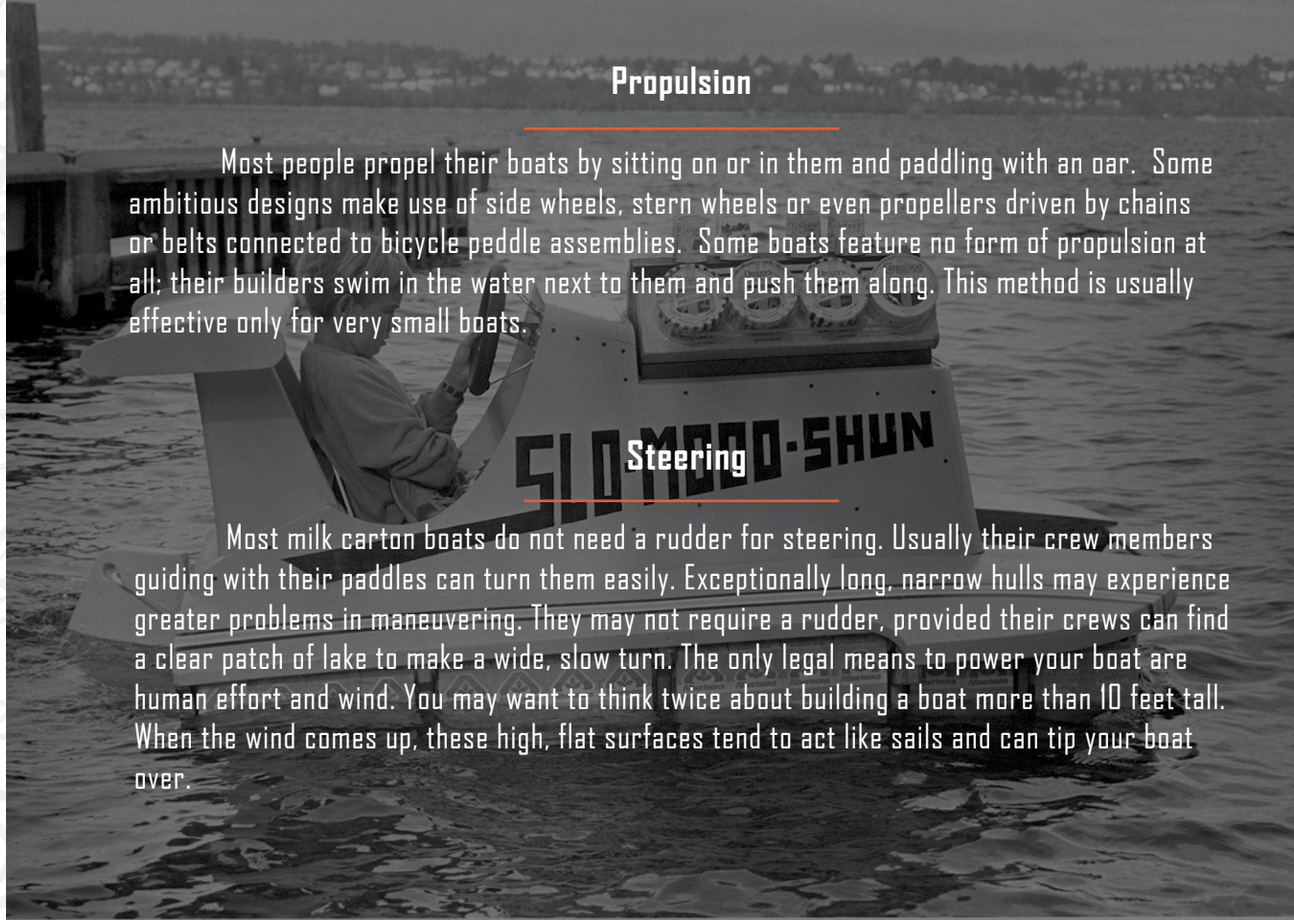
*Please refer to Rules and Regulation for all rules

Let's Get Started

Before we start designing your boat and talking materials there are a few considerations we need to take: Boat Stability, Propulsion, and Steering

Boats Stability

A boat that is too narrow for the weight it must carry (especially if that weight is carried high above the waterline) will capsize. This is a danger for racing boats with their long, slender hulls. A potentially unstable boat that rocks from side to side as it moves through the water will be slower than a stable boat that glides smoothly over the water on an even keel. Assuring adequate stability in a long, sleek hull is why many racers adopt catamaran designs or outriggers.



Propulsion

Most people propel their boats by sitting on or in them and paddling with an oar. Some ambitious designs make use of side wheels, stern wheels or even propellers driven by chains or belts connected to bicycle peddle assemblies. Some boats feature no form of propulsion at all; their builders swim in the water next to them and push them along. This method is usually effective only for very small boats.

Steering

Most milk carton boats do not need a rudder for steering. Usually their crew members guiding with their paddles can turn them easily. Exceptionally long, narrow hulls may experience greater problems in maneuvering. They may not require a rudder, provided their crews can find a clear patch of lake to make a wide, slow turn. The only legal means to power your boat are human effort and wind. You may want to think twice about building a boat more than 10 feet tall. When the wind comes up, these high, flat surfaces tend to act like sails and can tip your boat over.

Materials

Once you have designed your boat, it is time to gather materials so the building can begin. A supply of 300 empty, sealed, half gallon milk cartons are available to each registered team, thank you to Safeway Albertsons.

Hull (Main boat structure)

- Ply wood
- Chicken Wire
- Metal
- Tape
- Nails
- Staples
- Hot Glue
- 2x4 wood

Above the water:

Show off your creativity, just about anything goes.

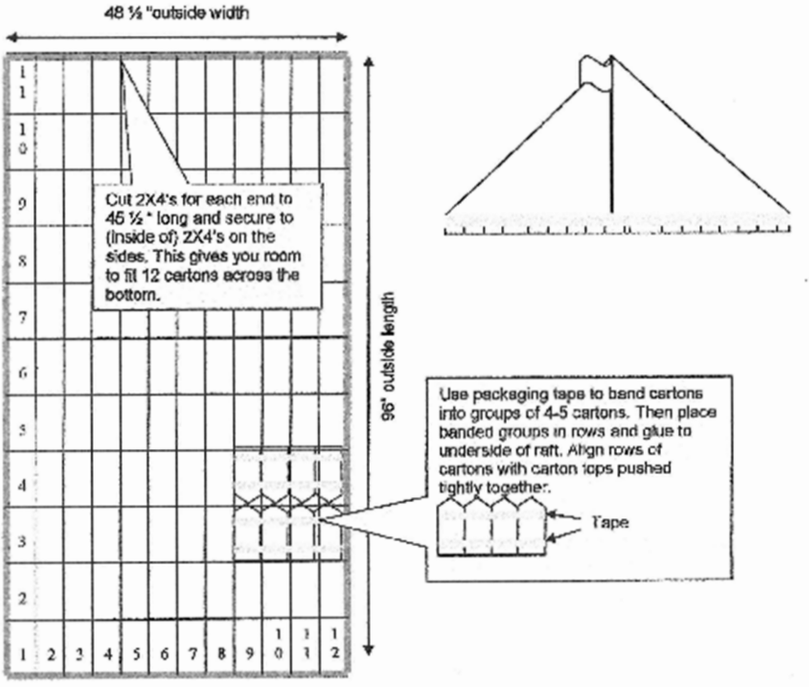
- Paint
- Chairs
- Toys
- Plants
- Duct Tape
- Cloth

Construction Tips

- Build the hull as one piece
- Securely join hulls together using nails and screws, tie-downs and brackets will provide added strength
- Duct tape bundles of 4 cartons together fastening them to the hull.
- Wrap the bottom of your boat with plastic mesh or chicken wire to prevent cartons from breaking free.
- For easier transportation- Make the decorations separate and attach day of

Milk Carton Derby Raft

The rectangular raft is a simple platform that floats on milk cartons. The number of milk cartons determines the weight that can be carried by the boat. This raft, which is made from a 4 x 8 sheet of plywood with a 2 x 4 frame, is floated by 132 cartons (11 rows with 12 cartons each). The approximate boat capacity equals the total carton displacement minus the boat weight and the difference divided by 1.5 (minimum). For this boat the approximate flotation capacity equals 528 lbs (132 x 4 lbs per ½-gal = 528 lbs displacement) – 77 lbs (wood weight) – 451 ÷ 1.5 = 300 lbs. We recommend that you test the boat to determine how the crew weight affects stability and handling.



Materials:
3 – 2x4x8 studs (weight 9 lbs each)
1 – sheet 4x8 plywood, ½" thick (weight of OSB sheet = 50 lbs each)
½ lb – 3" nails or screws to secure 2x4's
1 lb – 1 ¼" nails or screws to secure plywood to frame
132 – ½-gal milk cartons
30 – hot glue sticks to seal cartons and to secure cartons to underside of raft
6 rolls – clear packaging tape to band cartons

Milk Carton Derby Raft - Options

Build a raft with a bow
Cut a point on a 4 x 8 sheet of plywood that runs from the center out to each side. Frame the bow with 2 x 4's as shown in diagram. Secure the plywood to the frame using nails or screws. Add cartons to fill the bow area. You may need to deform cartons to make them fit into voids. Materials are same as raft, except add one more 2x4 (total 4-2x4x8's). This boat will have 9 rows that are 12 cartons wide (108 cartons) plus 10-12 cartons in the bow. The approximate capacity of this boat = 472 lbs (118 x 4 lbs per ½-gal = 472 lbs total displacement) – 77 lbs (wood) = 395 ÷ 1.5 = 263 lbs.

Build a smaller boat
Build a narrower boat that is 10 cartons wide. Cut the 4 x 8 plywood to 41" wide by 96" long. Add a point and build a frame as shown above. This boat will have 9 rows that are 10 cartons wide (90 cartons) plus 6-8 cartons in the bow (total carton displacement = 384 lbs). Materials are same as raft with bow. The approximate capacity of this boat = 384 lbs (96 x 4 lbs per ½-gal = 384 lbs total displacement) – 77 lbs (wood) = 307 ÷ 1.5 = 204 lbs.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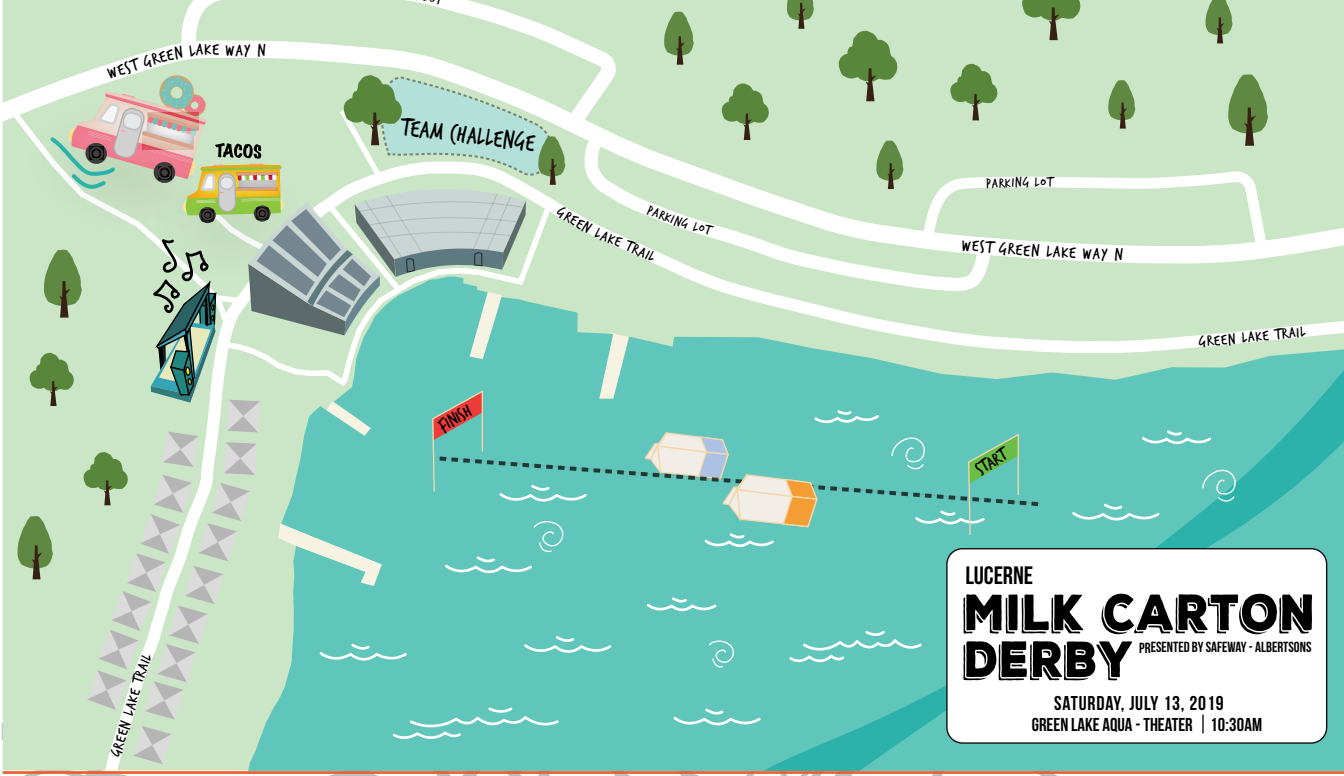

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