Cardboard Bridge Activity

Age level: K – 3rd grade
Time required: 1-1/2 hours, may require 2 sessions
Adult supervision required: Yes, basic carpentry skills

Introduction

In this activity children will fabricate framing members from cardboard sheets and a use these to construct a small deck that will span a clear area between two supports. The bridge should be sufficiently strong to hold the weight of one child at a time; however, it should be suspended just a couple of inches above the floor in case it deflects excessively. The glued members will need to dry overnight. For a single-session activity, let children glue boards, then assemble the bridge using pre-made boards. The 1" thick cardboard deck boards will be attached to 1-1/2" wide by 4" deep cardboard joists using 16d nails. Children should have no problem driving these with small hammers through cardboard. Figure 1 shows the completed bridge (4' long by 2' wide).

Figure 1. Cardboard Bridge

Material List

Cardboard, 1/4" thick	56 sf
Glue	1 gallon
Nails, 16d	2 lbs.
Scrap 2x4s, plywood for weighting	
Wide putty knives	
Hammers	
Patio blocks	
8x8x16 concrete blocks	2 ea.

Preassembly Cardboard Strip Cutting

Before engaging the children, procure the cardboard and cut it into 4”-wide strips. For this example, the used, double-wall cardboard was procured from various big-box stores. The corrugations in the cardboard must run in the long direction as shown in Figure 2. Cut the strips from cardboard sheets that are 2’ and 4’ long; shorter pieces can be used if the joints are staggered throughout the thickness of the piece. Bridge dimensions can be adjusted based on the length of material used. Adult volunteers should pre-cut cardboard with a knife, shear, scissors, or a circular saw using a fine-toothed blade before engaging the children.

Figure 2. Cut 4” wide strips aligned with the corrugations, as shown

Cardboard Lumber Fabrication

The joists and deck boards will be made by gluing the 4” wide strips of corrugated cardboard together. Cover the work surface to protect it from excess glue. Place one 4’ strip of cardboard on the table. Apply two beads of glue to the cardboard and spread the glue to cover the entire surface using a wide putty knife. (Figure 3). Adjust the amount of glue so that a continuous, thin layer can be easily achieved on each piece.

Figure 3. Apply a thin layer of glue over the entire surface

Place a second strip of cardboard on the first and align the edges. Apply a layer of glue to this piece and repeat the process until the board is 1-1/2" thick. Place a 4'-2x4 on the completed piece for weight while the glue dries (Figure 4).

Figure 4. Weight the completed piece and allow to dry

Fabricate three 4'x4"x1-1/2" boards and twelve 2'x4"x1" boards. Sets of 2' boards were covered with sheets of plywood and weighted as shown in Figure 5.

Figure 5. Weight the deck boards to dry

Place in a warm, dry place for the glue to dry overnight. If the children are not able to return on another day to assemble the bridge, provide pre-made boards and save these for another group to use.

Cardboard Bridge Assembly

Mark nail locations on the 2’ deck boards with a permanent marker (Figure 4). There will be three rows of nails: 3/4” from each side and along the middle. Place nails approximately 3/4” from the edges of the deck boards, as shown in Figure 6.

Figure 6. Mark nail locations in deck boards

Drive 16d nails into the deck boards at the marked nail locations. Protect the underlying surface from the nail tips using scrap plywood (Figure 7).

Figure 7. Start nails in deck boards

Lay the three joists on end about 8” apart as shown in Figure 8.

Figure 8. Align joists

Place deck boards at the two ends and secure each with 3 nails. Ensure that the assembly is square before driving the other nails (Figure 9).

Figure 9. Align the joists and deck boards

Install the remaining deck boards leaving small, uniform spaces between them as shown in Figure 10.

Figure 10. Completed bridge

Load Testing

Place the ends of the joists on patio blocks that are about 2” thick as shown in Figure 11. Allow 2” on each end for bearing.

Figure 11. Install the bridge over a gap

Proof test the bridge with two standard concrete blocks placed one at a time near the center (Figure 12). These typically weigh about 37 pounds each. Remove the blocks and allow individual children to walk across the bridge. The strength of the bridge will depend on the quality of the cardboard and construction. By keeping the bridge no more than a couple of inches above the ground, sudden failure should not create safety issues.

Figure 12. Proof test the bridge with 2 standard concrete blocks