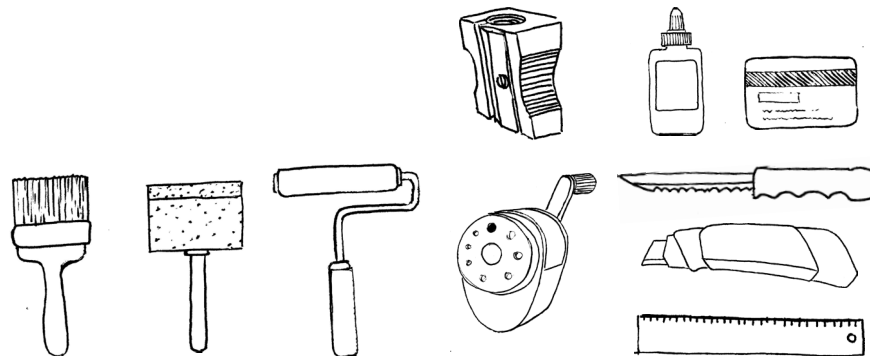


Building with Cardboard

Quick Start Manual for Experienced Builders



Dear Builder,

The techniques in this book are the basics, but you'll soon realize how much you can do with corrugated cardboard. Triple Wall (or Tri-Wall) corrugated cardboard is incredibly strong and versatile, and with the simplest tools you can turn ideas into attractive, functional, and long-lasting projects. It was a joy for me to discover the world of cardboard carpentry (it's been written about and enjoyed all-too-quietly for over 100 years) and, through Adaptive Design experience how much it means to focus on the specific challenges and vast potential of individual children.

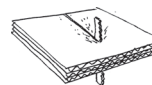
Enjoy!

Paul

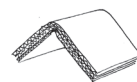
Contents



1. Corrugated Build Strong pg 1-2



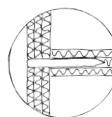
2. Cutting Be Careful pg 3-4



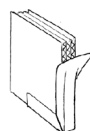
3. Bending Mind the Grain pg 5-6



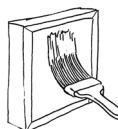
4. Joining Make it Strong pg 7-10



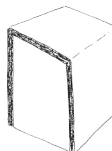
5. Reinforcing Make it Stronger pg 11-12



6. Edging Close it Up pg 13-16



7. Finishing Make it Last pg 17-18



8. Exploring Build for Others! pg 19-22

Resources pg 23

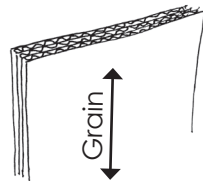
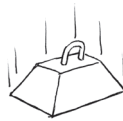
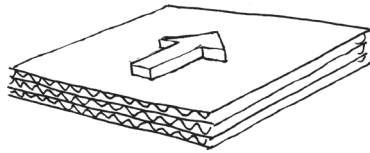
Corrugated

Build Strong

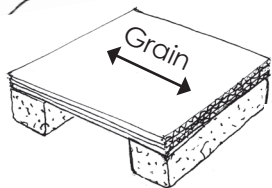
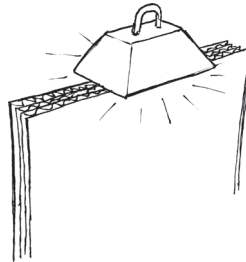
Thick corrugated cardboard (triple wall) can be very strong and can support up to 1000 lbs. per square inch. It all depends on the direction of corrugation (flutes).

Direction of Corrugation:

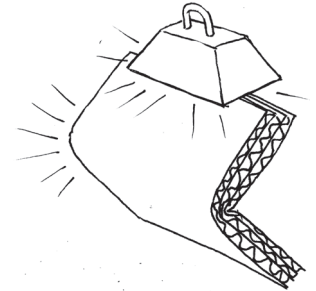
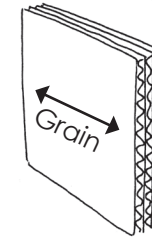
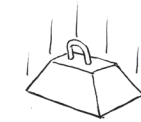
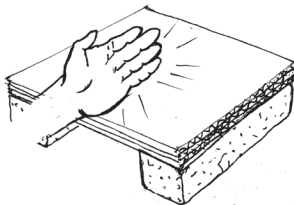
Determined by the direction of the flutes between layers



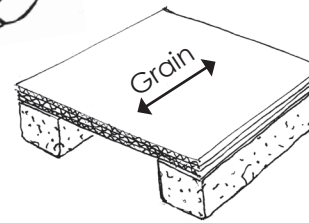
Bears most weight



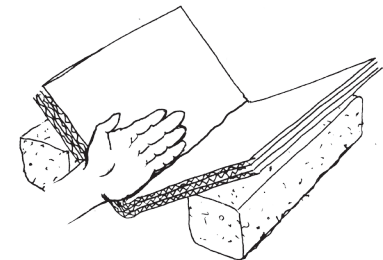
Resists bending



Bears less weight



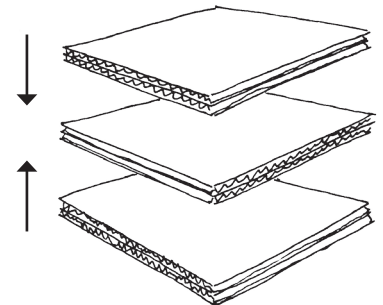
Bends easily



If you can't find commercial triple wall, you can glue layers of single-wall or double-wall to make thick, multi-layer corrugated cardboard.

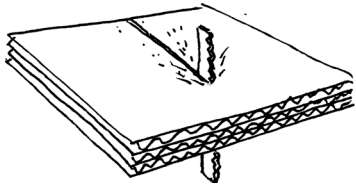


Crossing the grain when you glue layers will make the material super strong and helps resist bending under pressure.



Cutting

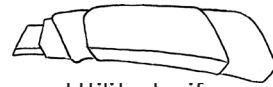
Be Careful



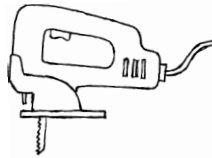
Cutting is one of the first things you will do when making a new object. It is very easy to cut cardboard and you can use a wide variety of tools. Make sure to stay safe and cut carefully.



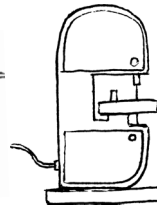
Steak knife



Utility knife



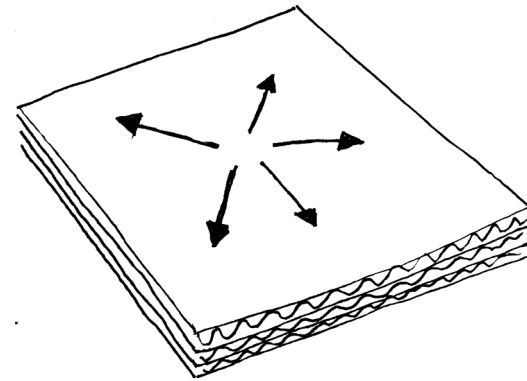
Jigsaw



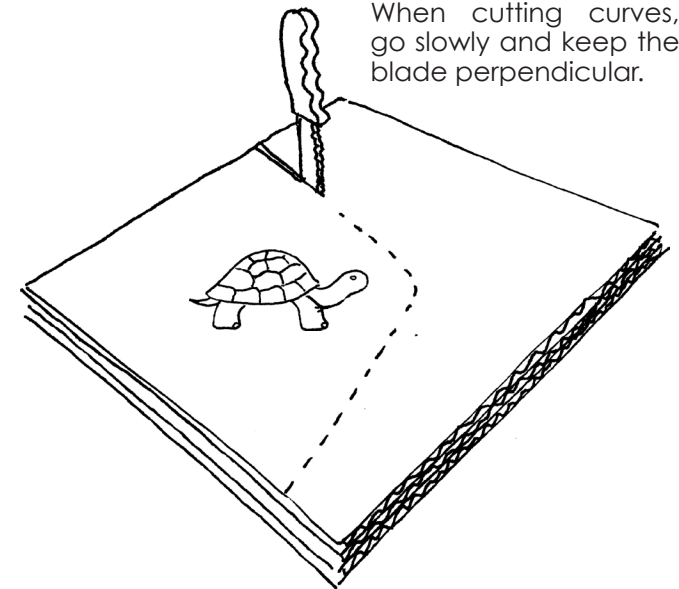
Band saw



Don't cut towards yourself.
Maintain safety according to
industry standards.



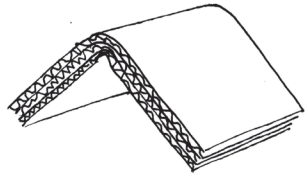
Corrugated cardboard can
be cut in every direction.



When cutting curves,
go slowly and keep the
blade perpendicular.

Bending

Mind the Grain



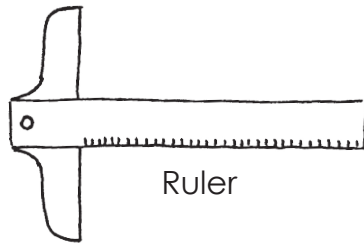
Bending allows you to make complex shapes while maintaining the original strength of the cardboard.



Pencil

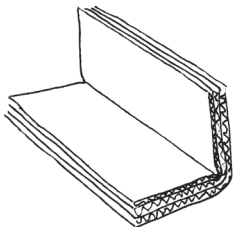
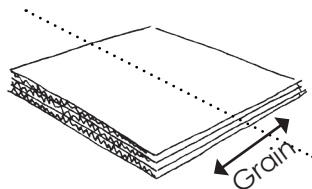
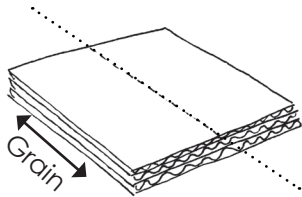


Spoon

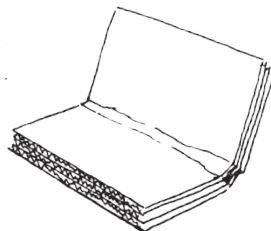


Ruler

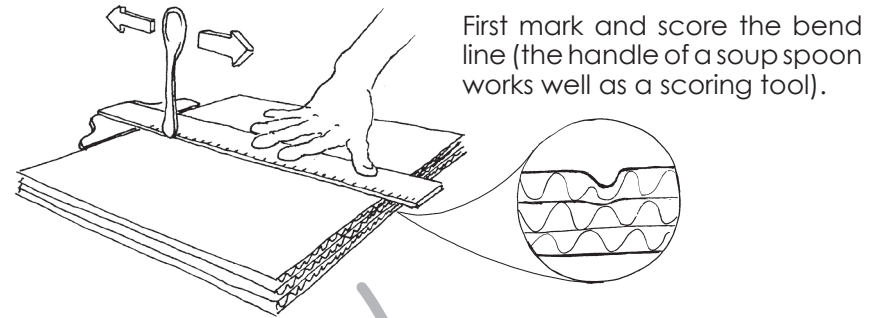
Quick Tip: It's easiest to bend in the direction of the grain!



Easier

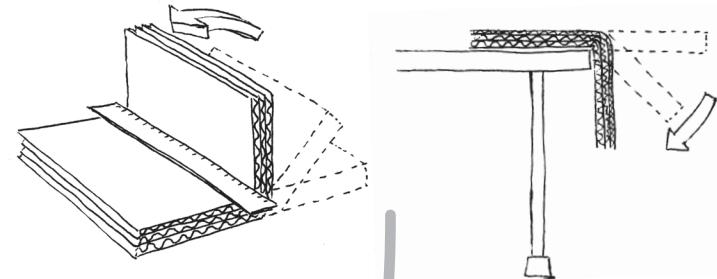


Trickier
(more resistant
to bending)

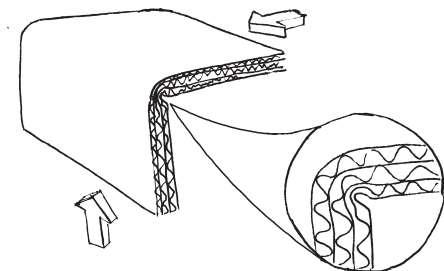


First mark and score the bend line (the handle of a soup spoon works well as a scoring tool).

Then bend against any hard edge.

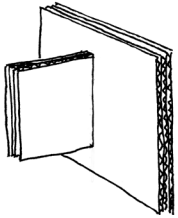


Bending shortens the piece about 3/8" to 1/2." Use a test piece first to check measurements.

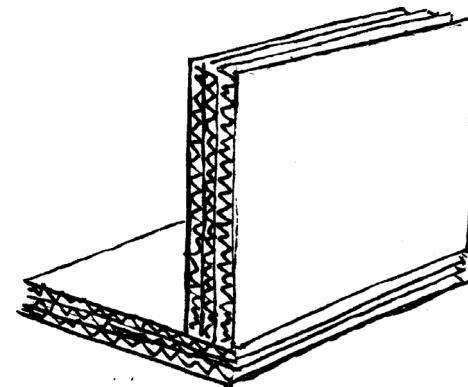
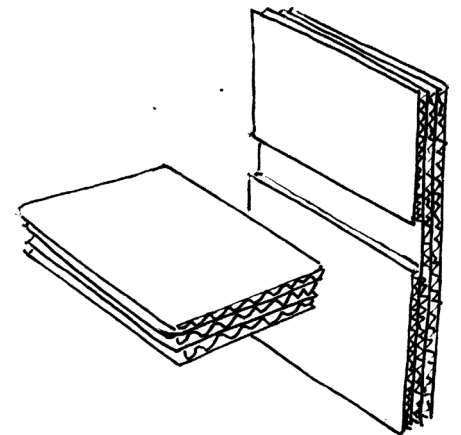
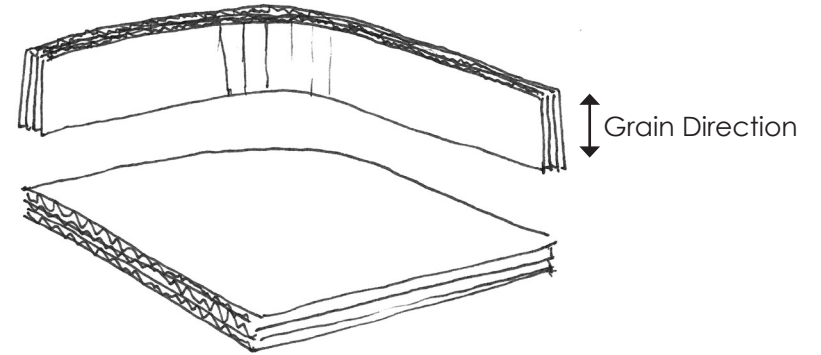
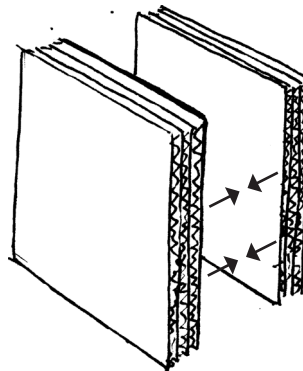
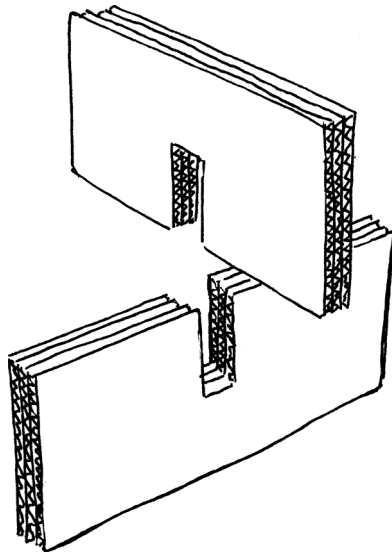
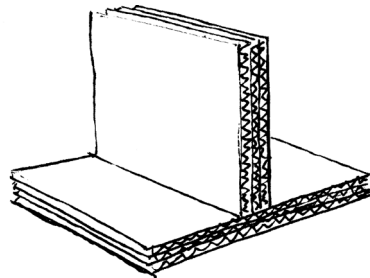


Joining

Make it Strong



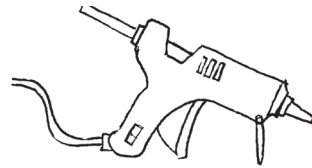
These are some of the many ways to connect cardboard pieces. You can use different combinations to make pieces stronger.



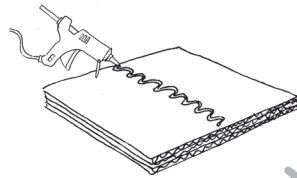
Joining

Continued

Hot glue dries very quickly and is very strong. It adds thickness to the connected pieces, so make sure to apply it evenly.



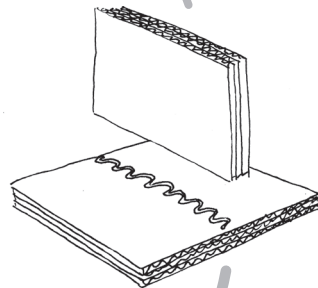
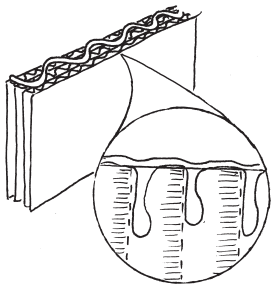
Hot glue gun



Work fast!



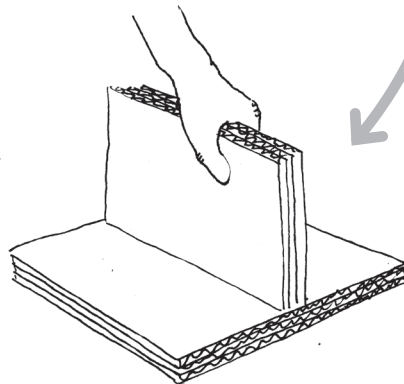
Try not to apply glue on top of the corrugations because it will drip into the open flutes.



Apply pressure!

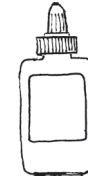


1 Min

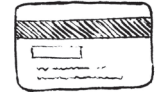


With White Glue

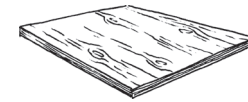
White glue is very strong but takes longer to dry. It can be spread very thin, so it is perfect for making multi-wall corrugated cardboard, as shown in this example.



Glue

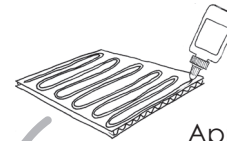


Plastic card

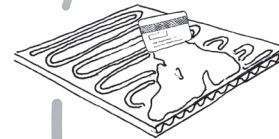


Plywood

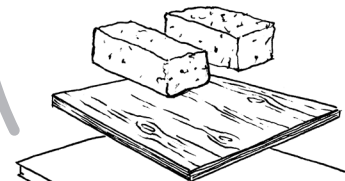
Weights



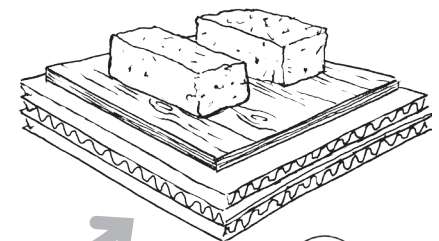
Apply glue



Spread evenly



Add weight and press firmly. Plywood distributes the weight so the whole surface sticks evenly.

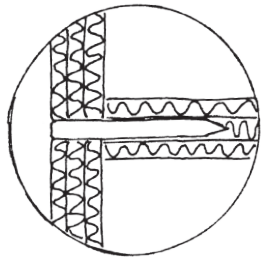


Press for at least 60 Min

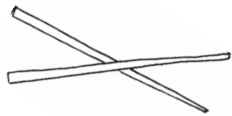
(but overnight's better)

Reinforcing

Make it Stronger



Wooden nails made from dowel rods will make your glued connections stronger and the joints more durable.



Quick Tip:

Chopsticks also work great, either cut into shorter nails or used full-length.



3/16" - 1/4" diameter
wooden dowel rods



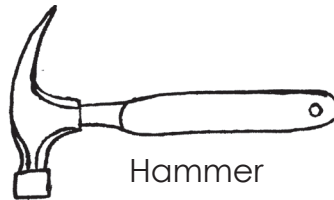
Awl

Or

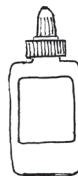


Phillips
screwdriver

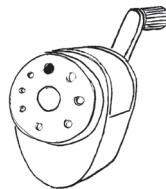
Must be thinner than dowel



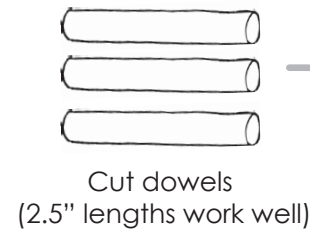
Hammer



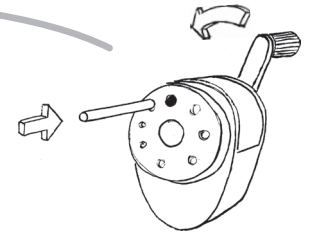
White glue



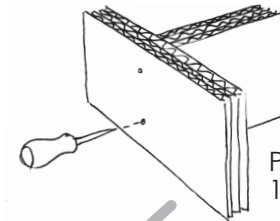
Pencil
sharpener



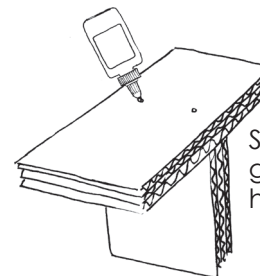
Sharpen one end of
each nail



Wooden Nails

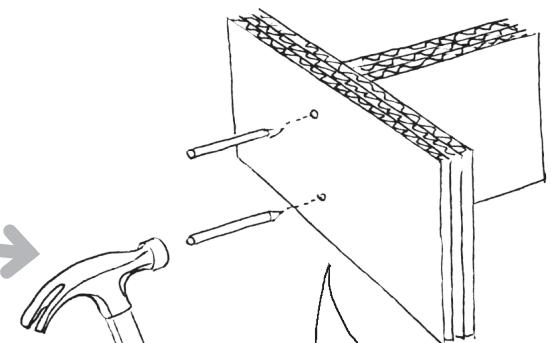


Poke pilot holes about
1" into glued joints.

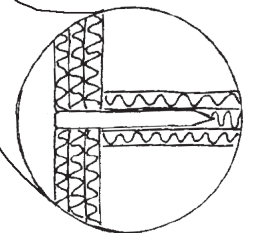


Squeeze white
glue into pilot
holes.

Hammer dowels
flush with surface.

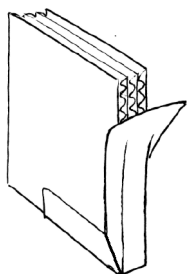


Aim for the middle
of the corrugated
layers.



Edging

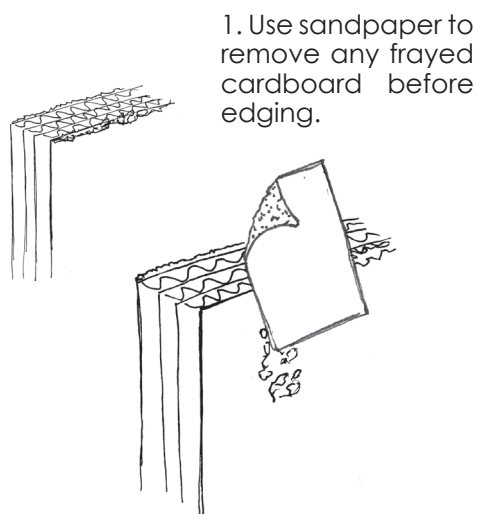
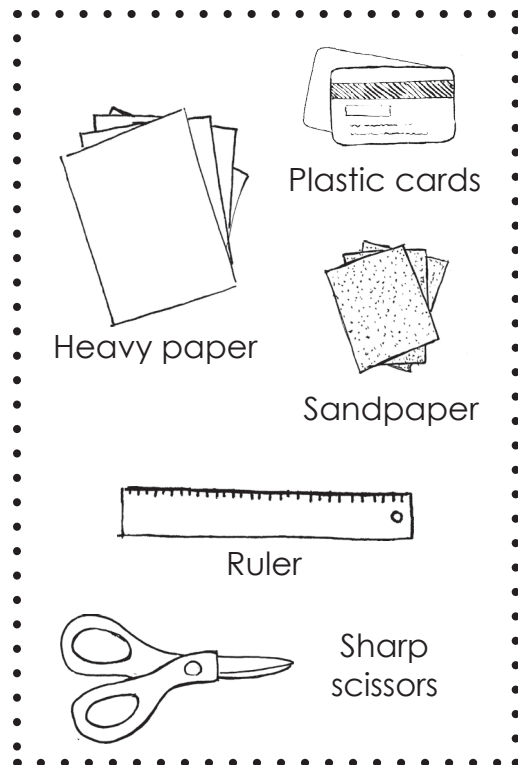
Close it Up



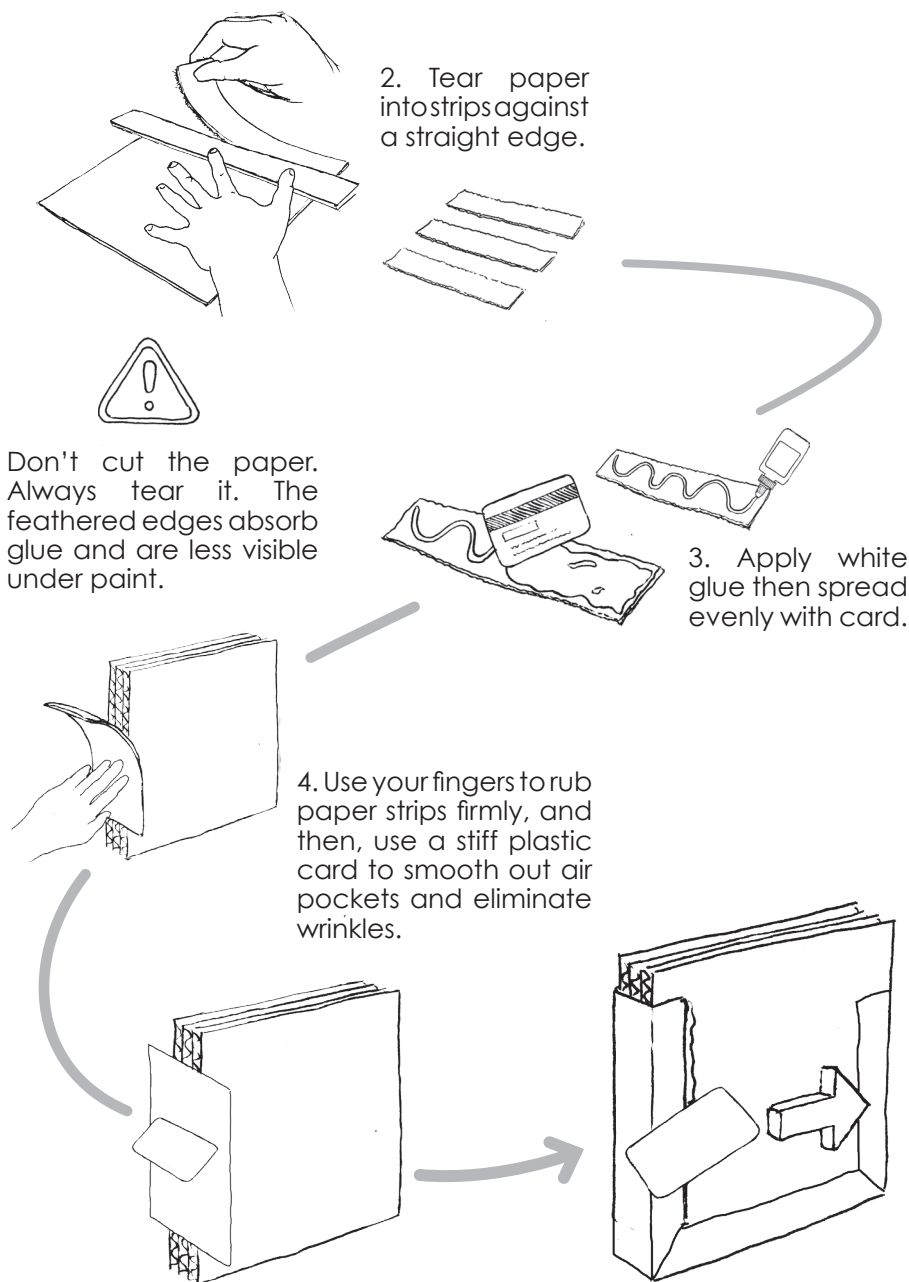
Edging covers all open corrugation which seals and strengthens the structure, and prepares it for finishing.



Quick Tip: Good papers for edging include kraft paper, paper bags, magazines, masking tape, and other strong papers.



1. Use sandpaper to remove any frayed cardboard before edging.



Don't cut the paper. Always tear it. The feathered edges absorb glue and are less visible under paint.

2. Tear paper into strips against a straight edge.

3. Apply white glue then spread evenly with card.

4. Use your fingers to rub paper strips firmly, and then, use a stiff plastic card to smooth out air pockets and eliminate wrinkles.

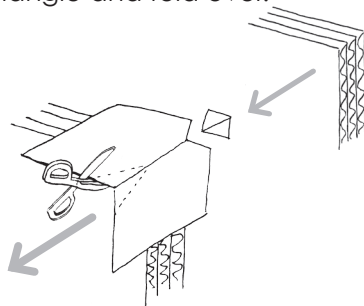
5. Press paper from edge to the center of the cardboard.

Edging

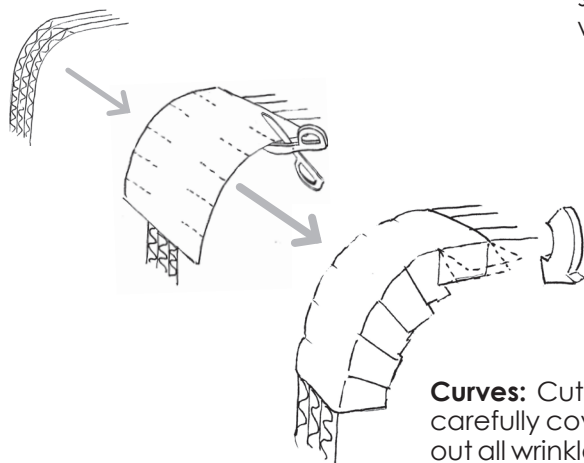
Continued

For corners and curves, repeat tearing paper and spreading white glue on strips, and remember to smooth all edging with plastic card as you go.

Corners: Cut, discard triangle and fold over.



Edging should be so smooth that it's almost invisible under the final finish!



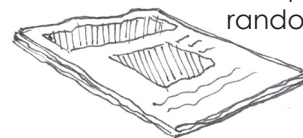
Curves: Cut slits in paper and carefully cover edges. Smooth out all wrinkles to ensure a neat and invisible finish.

Quick Tip:

Edging will seal and strengthen your project. Be sure to press firmly with the card, and smooth out flaps and wrinkles.

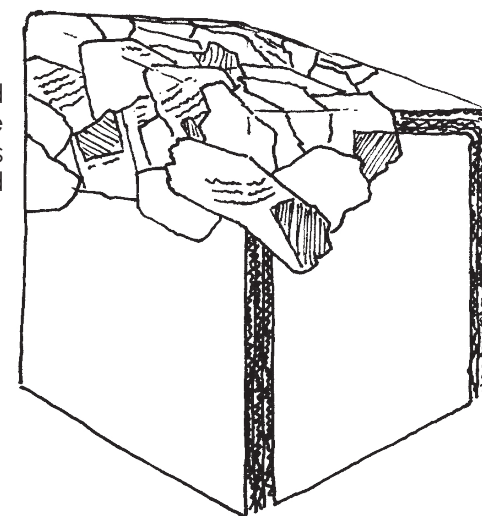
Alternate Seal: Cover the whole project with torn paper.

Tear paper into random pieces.



Immerse paper pieces briefly in white glue diluted with water.

"Collage" dampened paper pieces over entire project. Be sure edges overlap so no cardboard shows.

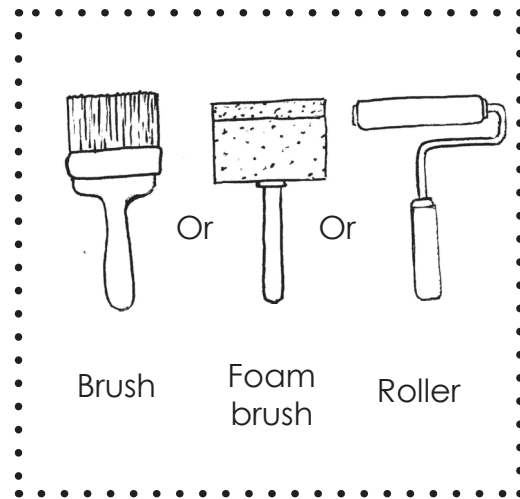
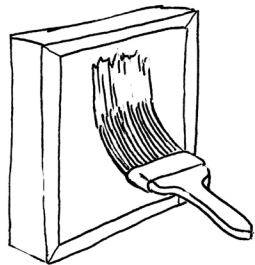


Important note about edging:

Becoming an expert edger takes practice. Poor edging can ruin your finished item. Always take time to do an excellent job. If you don't have the patience to be neat, ask someone to do this step for you. Many people find edging fun and relaxing.

Finishing

Make it Last



Brush

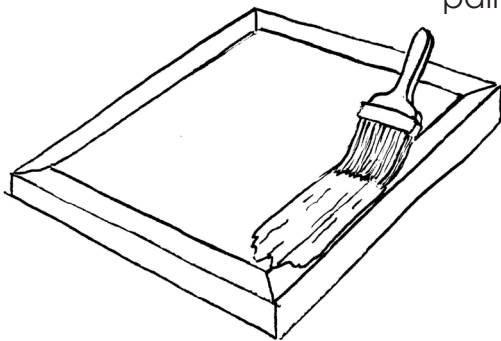
Foam brush

Roller

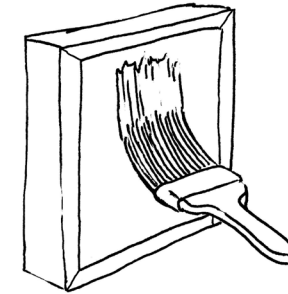
Finishing is very important for making your projects last. It hardens the surface and makes it waterresistant (not water proof) so you can wipe it clean with a damp cloth.

Application:

Use thin, even coats of water based primer, paint and polyurethane



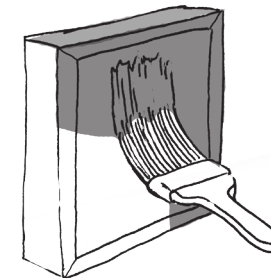
Only use water-based paints and polyurethane!
(NEVER use oil based paints)



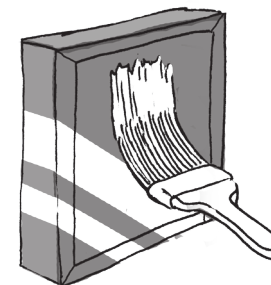
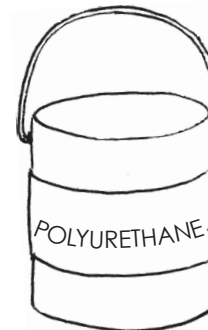
Dry Time



60 min



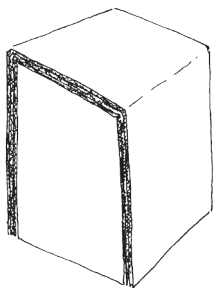
120 min



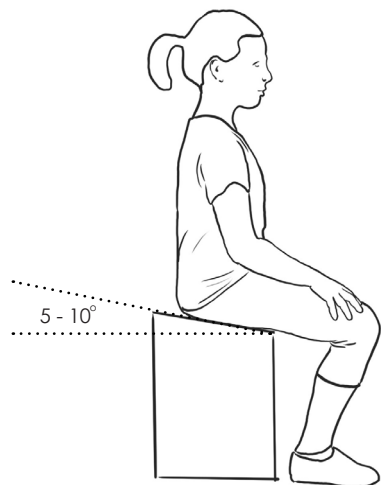
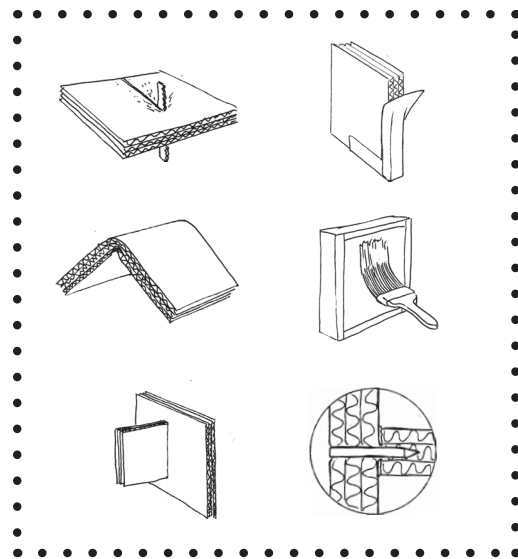
120 min

Exploring

Build for Others!



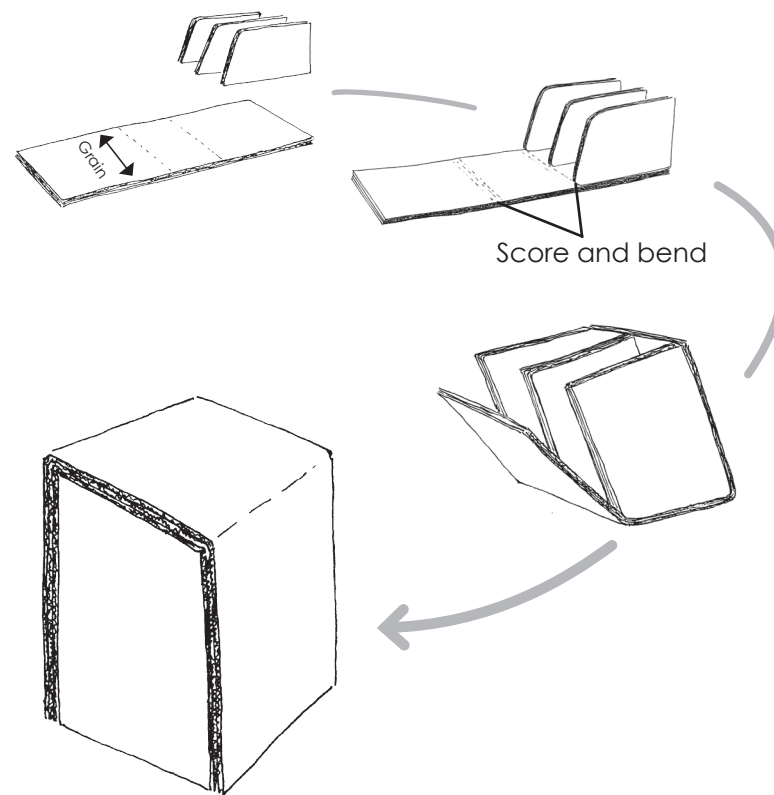
A custom perch is a great project to build for yourself and others. You can customize every detail- Height, width , depth, seat angle- to your exact dimensions and preferences.



Most people find forward-tilt seats energizing and super comfortable. This seems to be because a slight forward angle:

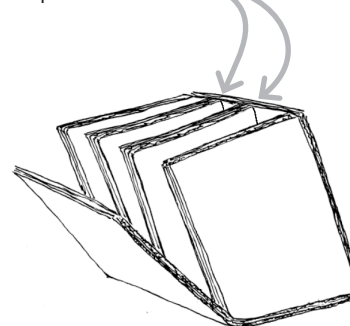
- Helps align the pelvis, back and neck
- Promotes circulation in legs
- Relieves strain in the lower spine
- Promotes relaxed abdominal breathing
- Encourages keeping weight in the feet

Custom seats and perches can make a world of difference in your energy, comfort and attention when you work, eat or study.

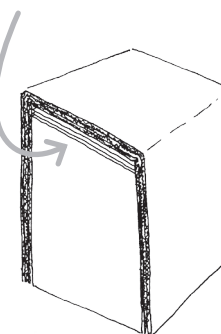


Quick Tip: Large perches will need more support.

You can add extra panels inside.



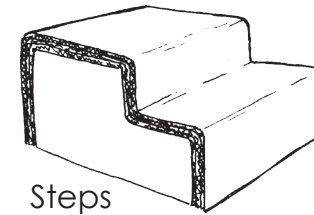
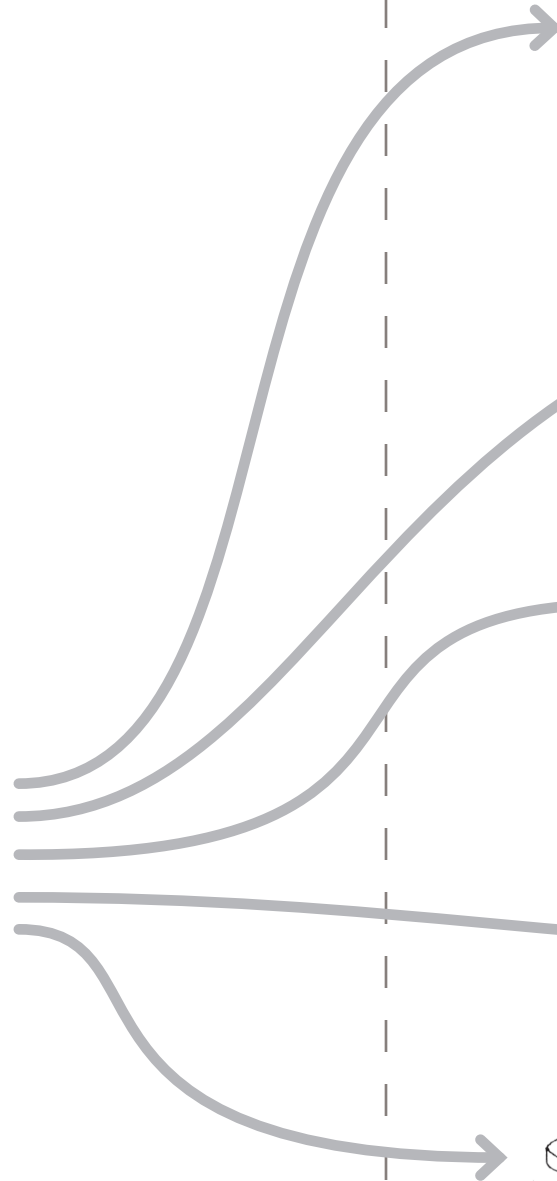
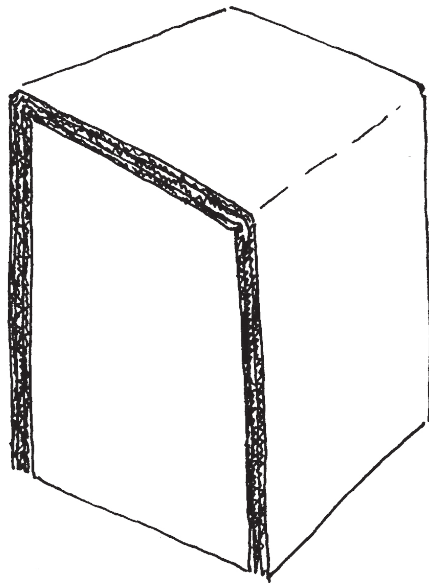
And/or add a cross-layer panel onto or under the seat surface.



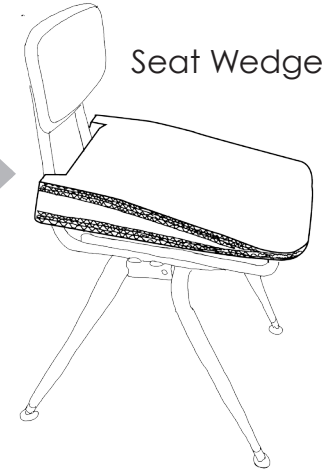
Exploring

Each project can launch many more. Once you start building you'll get new ideas and probably lots of requests!

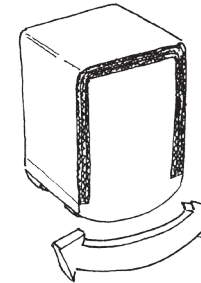
You'll quickly discover countless combinations of shapes, sizes, and techniques and the joy of turning questions into much-needed solutions.



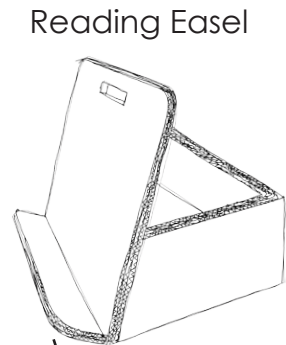
Steps



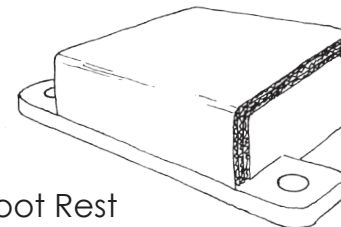
Seat Wedge



Rocking Perch



Reading Easel



Foot Rest

Quick Tip:

Take time to round off sharp corners. Projects wear better with round corners.

Resources

- Altshuler, N. (2002). *Adaptive seating using triplewall*. Clinician's View.
- Bergen, A. F. (1980). *Triwall®: Adaptive Equipment Without Tools*. NDT newsletter.
- Campbell, M., & Truesdell, A. (2000). *Creative constructions: Technologies that make adaptive design accessible, affordable, inclusive, and fun*. Cambridge, MA: author.
- Caston, D. (1985). *Easy to make aids for elderly people*. London, UK: Souvenir Press (Educational & Academic)Ltd.
- Cope, G., & Morrison, P. (1979). *The further adventures of cardboard carpentry*. Arlington: MA: Learning Things, Inc.
- Dilger, N., & Rowe, L. (1987). *Equipment fabrication with Triwall®*. New York: Support Surface, Inc.
- Flammang, R. (2013). *Designing for rehabilitation*. Hamden, CT: Rose Flammang.
- Packer, B. (1995). *Appropriate paper-based technology (APT): a manual* (second Ed.). London, UK: Intermediate Technology Publications.
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- Westmacott, J. (2015). *Assistive Cardboard Equipment using Appropriate Paper-based Technology*. Galashiels, UK: Meigle Colour Printers Limited.

Dear builder,

We are all people with different shapes, sizes, skills and interests, and it can be impossible to find commercially made products that fit our specific needs. I've written this book to introduce you to the essentials of cardboard carpentry, and to encourage you to build custom solutions for yourself and for people close to you.

During my internship at Adaptive Design I discovered that people everywhere need one-off solutions, and I also learned that with basic tools, techniques, and corrugated cardboard you can make a drastic difference in the lives of others. The experience of creating custom solutions is infinitely rewarding and the possibilities are endless. HAVE FUN and please share your stories!

Written and Illustrated by Paul Reamey
Adaptive Design Intern May-July 2016
From Pratt Institute - Graduate Industrial Design



To share your story or connect with Paul and the team at Adaptive Design, please email info@adaptivedesign.org or call (212) 904 1200