Lightweight folding chair with Glastonbury type arms.

Designed by Rick Strehl 2013

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Material list

Legs- 50 inches of 6x1 yielding short and long legs:

Short legs (ripped from 6inch stock) rip 1 23 ½ x6x1

Longer legs rip 1 26½x6x1

Arms, cut both arms from one 1x6x36 yielding 2 25 ½ x4 1/8 x 1

Threaded rod sheath 19 inches of nominal 1x2 stock

Back rails, 52 inches of nominal 1x2 stock

Rod sheath cover 19 inches of 2x ½

Stretcher ½ by 3(nominal) by 19

Cleat and cleat rest 16½x2x1 & 17½x2x1

¾ inch hardwood dowel 45 inch (19 inch 21 ¼ inch and two 2 inch lengths, as pivots)

Back slats (1) 19x5x½, (2) 19x3x½, (1) 17x2½ x½

Threaded rod sheath, bottom 19x3/8x2

Threaded rod ¼ inch 20 tpi 2 ft.

Seat, 54 inches of 1x6 (combined lumber to make 16½wx17 ¾)

50 inches of nominal 1x2 (to make 2 back uprights 2 inch nominal 25x1)

6 Decorative connecting bolts, “Pivot joints” with 20 tpi thread ¼ x 20(tpi) x 40 mm antique brass or other, requires 5/32 or 4mm Allen wrench

8 Decorative connecting cap nuts ¼” end caps w 20 tpi thread (HM brand?) requires 5mm Allen wrench

Glue, assorted sandpaper, #0 biscuits

Screws “Primeguard Ten” 2inch exterior screws, 4 per chair

#3 finishing nails, #2 finishing nails (optional)

Two 3 inch sections of 1/16 wire, or 2 bobby pins

Tools

Biscuit cutter (plate joiner)

Compound miter saw, with finishing blade, table saw with combo blade

Drill press, hand drill, forstner bits, standard bits, sanding drum for drill press, power sander (oscillating), hammer, nail set, counter-sink drill bit.

Pencil & paper for helpful sketches or dimensions.

Allen wrenches to fit both sides of connecting nut and cap combo 4mm (interchangeable with 5/32) for bolt, 5mm (no SAE equivalent) for nut, Philips head screwdriver.

Hacksaw, to correct length of all-thread, and to correct the length of 2 connecting bolts, and “chase the threads” after cutting.

Notes

Drilling and cutting to exact dimensions and very tight tolerance will reduce “wiggle” and improve life and quality of the chair.

Before gluing dowels and stretchers to legs, make sure a pieces are square and true (both 90 degrees and not racked side to side).

After cutting and drilling, sand the wood very lightly to reduce splinters, but do not over-do it.

Measure holes for legs utilizing the centerline from the bottom.

Dowels for legs need to be ¾ or larger for strength, thus the legs need to be 2 inch actual width (not 2 inch nominal). To achieve this rip the legs from 6 inch nominal x 1 inch nominal stock (approx. 5¼ inch by ¾ actual).

The arms may be cut with a jigsaw from nominal 6inch stock, flipping the pattern to maximize wood.

Drill holes for connecting end caps larger from one side than the other, for strength, drill a 3/8 inch hole on the side receiving the nut ½ inch deep, and finish the last ¼ inch with a ¼ inch drill.

Use scrap wood backing below holes while drilling to reduce “punch out”.

Arms

Mark out the arms on a 1x6 inch board rotating the arms to maximize wood efficiency. Cut the arms out with a jig saw, utilizing the flipped first cut arm to trace the pattern of the second arm. The arms are 25¼ inches long, with ¼ inch holes drilled 1 &3/8 inch from the bottom and 1 inch from the top. The arms can be clamped together and sanded on a drum sander to provide symmetry.

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Legs

Cut 1x6 leg stock to approximately 51 inch length. Rip 6 inch legs sections to 2 inch width. Cut the 45 degree angles alternately to increase wood use efficiency.

Drill ¼ inch holes as per photo, for the short legs drill one hole 18 3/8 from center bottom.

Drill ¼ inch holes on the longer legs at 21 1/8 and 24 ¼ inch from center bottom.

Measure 3 inches from center bottom and drill for ¾ dowels, more than one should be drilled at a time to ensure they match up. Pivot dowel drilling is the same position (11 ¼

from center bottom) for all legs.

Drill center hole for pivot dowel at 11 1/8 inch center height in all legs.

For shorter back legs (top of leg at back of chair) drill ¼ inch hole at 18 3/8 from center bottom. Re-drill ½ inch of the inner side of these holes at 3/8 inch with a forstner bit, this will allow the connecting cap nut to recess in the wood.

For front (longer) legs, drill ¼ inch hole at 21 1/8 (see note for 5 degree seat tilt) and 24¼ from center bottom. Re drill ½ inch of the outer side of the 21 1/8 inch hole at 3/8 inch and re-drill ½ inch of the inner side of the 24¼ hole at 3/8 inch.

Use compound miter saw to take off 5/8 inch of corners at a 45 degree angle from both top corners of the legs, this will speed the sanding process.

Use a drum sander mounted in a drill press to round the tops of the legs.

Cut cleat rest at 17 ½ inch length, from the excess stock from ripping the 6 inch stock for legs.

On back legs, position cleat rest at a 45 degree angle. This is a tricky positioning, parts must be square. Using 2 screws per side here, pilot drill the holes and drill a shallow counter-sink, allowing 1/16 inch of wood putty to conceal the screws, use glue also for strength, pilot drill holes while in a jig. A long dowel may be placed in the rails to help

square up the leg assembly. Make sure the assembly is square and not racked while drilling and gluing.

Mark and cut inside dowels at exact length.

Position the stabilizing dowel, and drill a 1/16 inch pilot hole from the bottom edge of the wood, into the center of the dowel, mark the dowel and wood to ensure alignment. Do this for both sides. Add glue to the dowel or hole and assemble and secure with a #3 finishing nail, counter sinking by a sixteenth to an eighth of an inch. Remember to make sure the assembly is square while the glue dries.

After the inside leg set has dried, remove clamps and any excess glue. Position the outer leg assembly against the inner leg assembly and record exact measurements for the support stretcher and long dowel. Leave 1/32 clearance for urethane.

Cut the ½ by 3 inch stretcher to length. Position the bottom of the stretcher 4¼ inches from the center dowel hole at a 7½ degree angle. Trace the position of the stretcher on both legs, mark the center point of the stretcher position on each leg. Carefully cut the biscuit slots in inner side the legs and in the edges of the stretchers. Position the dowel, check alignment and glue the outer leg unit. Remove excess glue.

After the glue has dried on the outer leg unit, position the legs in their proper foldable arrangement. Place dowels in the pivot holes and mark their exact length for cutting. Mark and cut the dowels to the exact length. Drill a 1/16 inch pilot hole in the underside of the outer longer leg, as the pivot dowel is in position. Mark/index the position of the dowel in the leg. A wire section or bobby pin should be inserted in the pilot hole to aid in assembly. Do not glue the pivot dowels until chair is finished, stained and urethaned.

The seat should be assembled with biscuits to make the desired width.

Cut the seat cleat from 1x2. Cut the cleat to the same length as the seat width. Attach the seat cleat to the back edge of the seat with biscuits and glue.

Cut the sheath and cover for the threaded rod to length (19 inches).

On a table saw or router table, cut a ¼ inch wide groove down the center of the sheath and cover. The groove should be just over 1/8 inch deep on each piece and should be rounded for strength. Place/sandwich the threaded rod in the sheath and cover to test for fit. Test the fit of the length of the sheath in the outer leg assembly. If the rod fits properly, pilot drill approximately 7 holes 1/16 in diameter to hold the sheath and sheath cover

together. Glue and nail the cover down. If you are using #2 finish nails; counter sink the nails by 1/16 inch at this time, if using #3 nails, leave the heads proud/exposed until later.

Place the guard in outer leg assemble and place threaded rod through all three pieces. The threaded rod may be cut to length after end caps have been fitted and measurements checked. Cut the rod with a hack saw. ”Chase the threads” of the freshly cut rod to allow ease of threading. The end caps may be temporarily screwed on at this time.

Use clamps to lock the legs at a 90 degree angle.

Flip the assembly on to a table edge corner, make index marks on the seat bottom and the sheath, and ensure all fittings are square and level.

When the sheath is centered and aligned, attach it with biscuits to the chair bottom, counter-sink nails.

The back rails are cut from 2 pieces of “nominal” 1x2 26 inches long. The lower end needs a ¼ inch hole drilled ¾ inch from the bottom. It will also require another hole drilled 17 1/8 in from the bottom, the upper hole needs to be drilled on the inside at 3/8 inch for the first ½ inch and at ¼ inch for the remaining ¼ inch. The bottom hole needs to be recessed on the outside using a ¾ inch forstner bit.

Round the bottom and top of the chair rails using a drum sander, possibly trimming ½ inch excess at 45 degrees prior to sanding.

The 2 connecting bolts that allow the back to pivot need to be shortened by 3/8 inch each. Cut with a hacksaw and smooth the ends with a grinder and wire brush. The threads should be “chased’ with a hacksaw blade to allow ease of threading. When at the proper length, color the freshly cut tips with a black or brown marker. These two bolts need to be shortened to allow the chair to fold past the bolts.

Back slats

Two of the nominal half by 3 inch slats should be cut at 19 inches. One nominal half by 6 inch slat shall be cut 19 inches. One more 3 inch slat should be cut at 17½ inches, to allow placement of the cap nuts.

Position the top three stats on a flat surface, square them up, and place the shorter slat to allow ¾ inch clearance on each side. Place index marks on the upper pieces, preparing them to be cut for biscuits.

Biscuit and glue the three upper sections together to make one upper back insert. Clamp this unit and allow glue to dry.

Cut slots for biscuits in the edge of the bottom slat. Cut slots for biscuits in the chair rails, for the bottom slat. After the glue has dried on the upper slat assembly, position and mark the assembly and the chair rails for biscuit slots. Cut the remaining biscuit slots in the slats and in the rails. Glue, clamp and allow to dry.

Lightly sand all pieces and dry fit using connecting bolts and end caps. Remove hardware and pivot dowels. Perform final sanding, stain the ends of the pivot dowels. Stain and urethane the component sections. Allow the urethane to dry before final assembly.

Attached conversion chart for nominal vs actual size lumber

1x Lumber Dimensions	
Nominal Size	**Actual Size**
1x4	¾ x 3-1/2
1x6	¾ x 5-1/2
1x8	¾ x 7-1/4
1x10	¾ x 9-1/4
1x12	¾ x 11-1/4

Shop tips

I have a laser light guide on my jig saw. I am unable to turn it off for making round free style cuts, so careful application of duct tape shuts down this function

When drilling, always use a piece of backing board.

Connecting bolts require ¼ inch hole, connecting nuts require 3/8 inch hole, for added strength, only drill the first ½ inch for connecting bolts at 3/8 inch, drill the last ¼ inch at ¼ inch diameter.

Two of the connecting bolt holes need to be recessed by 3/32 inch; the recess should be drilled with a ¾ inch forstner bit, this is at the back/seat pivot point. This pair of bolts needs to be reduced in length by ¼ inch to a reduced length of 1 and 7/16 inch. The recessed connecting bolt allows the chair to fold over the connector. Shorten the connector bolts with a hacksaw and “chase” the threads with the saw blade.

Additional photos: (staged photos, the blade has stopped, SAFETY FIRST**)**

“back cut” the 45 degree angle, and sand the leg ends to minimize splitting

Temporarily pin the dowels to assist in positioning

Sheath to cover the threaded rod

Positioning the threaded rod for final assembly

Extra photos: