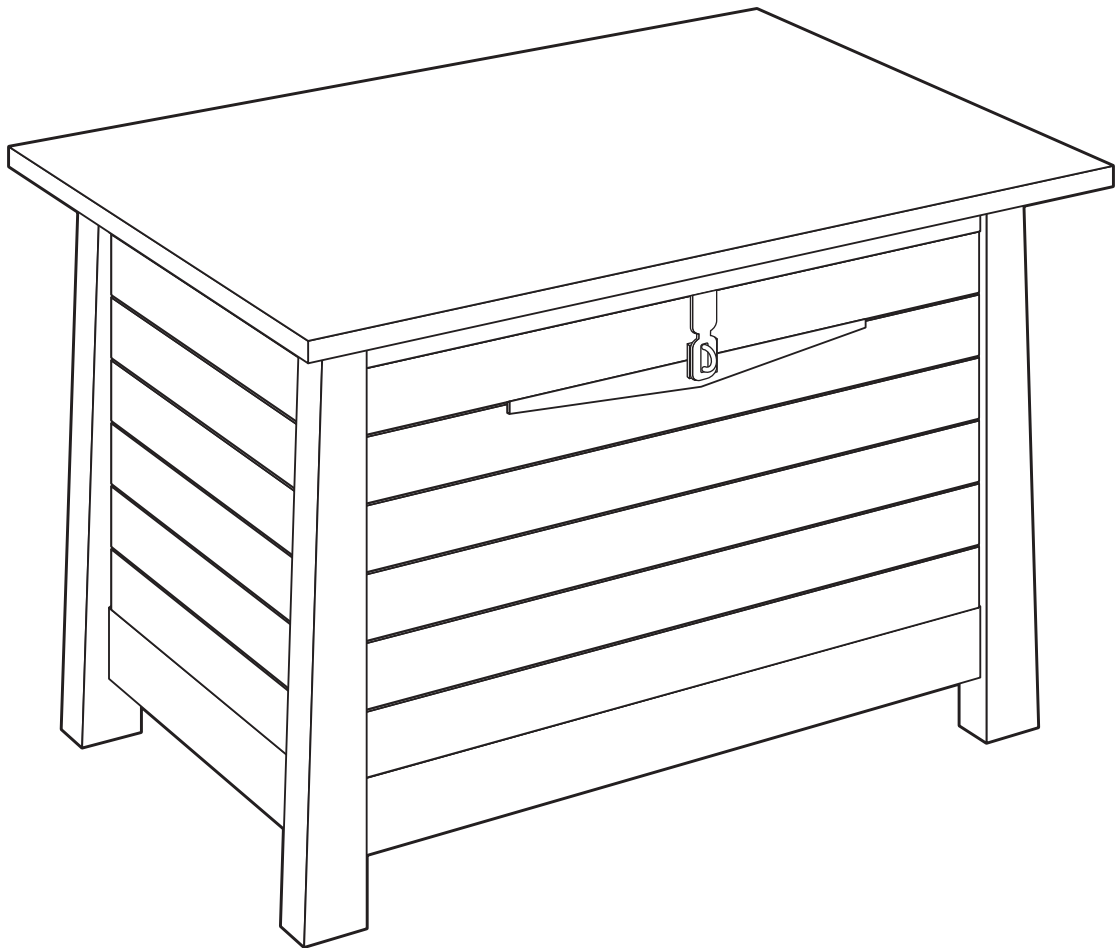




**WOODWORKS: INTERMEDIATE PROJECT 2007-2008**  
**OUTDOOR STORAGE CHEST**



Storage is like money; we never seem to have enough. Here's another truism: storage is where you find it, and a frequently underused area is outside the home. But instead of suggesting the usual toolshed, this project shows you how to make a beautiful chest for storing the smaller outdoor items that we use every day: cushions for deck furniture, pool toys or even gardening supplies. This elegant chest is a real eye-catcher, but it's also designed to keep the contents dry and clean and to last a long, long time.

In this intermediate-level project, you'll gain experience in making tongue-and-groove and mortise-and-tenon joints, tapering long pieces of wood, and making sure that water won't collect anywhere on the piece. And after you build it, you'll learn more about applying and using finishes to protect the wood and keep it looking beautiful.

**TOOLS REQUIRED****Hand Tools**

- Screwdriver
- 36" and 48" pipe clamps
- Mallet
- Block plane

**Power Tools**

- Router table
- Router with a 1/4" x 3/8" tongue-and-groove router bit set
- Band saw
- Power drill with drill bits and power screwdriver
- Drill press with a mortising attachment or a mortising machine
- Table saw
- Belt sander
- Orbital or finish sander

**Miscellaneous**

- Tape measure
- Pencil
- Safety glasses
- Waterproof glue
- 120-grit sanding belt
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits, for oil-based waterproofer
- Good quality, natural-bristle brush (for oil-based waterproofer) or synthetic-bristle brush (for water-based waterproofer)

**SHOPPING LIST****Recommended wood:** Pine**Alternate wood:** Fir or any type of construction-grade lumber

1' x 4' pine:	160 lin. ft.
1' x 6' pine:	20 lin. ft.

**Woodworker's Tip:** Knots can weaken a board and spell disaster, especially on furniture, so be sure to select boards with the fewest knots and to plan your cuts around any knots.

**HARDWARE (SEE SOURCES)**

- One pair of heavy-duty brass strap hinges
- One brass clasp
- Two lid supports
- Hardware cloth, enough to cover about 26" x 44"
- Stainless steel or galvanized screws, #8 x 1-1/4" flat-head, #8 x 5/8" washer-head
- Brass screws, #8 x 3/4" flat-head, #10 x 3/4" flat-head
- Space Balls, 100 pack

**CUTTING LIST**

Overall Dimensions: 29"h x 44-1/2"w x 26-1/2"d			
Key	Part	Pcs.	Dimensions
A	Lid	1	3/4" x 26-3/4" x 44-3/4"
B	Tongue-and-groove panel	12	3/4" x 3-3/8" x 36-3/4"
C	Tongue-and-groove panel	12	3/4" x 3-3/8" x 19-3/4"
D	Decking	12	3/4" x 2-3/4" x 19-1/2"
E	Lid batten	3	3/4" x 2" x 18"
F	Deck cleat	2	3/4" x 1-1/2" x 60"
G	Leg	4	2-1/4" x 3-1/4" x 28-1/4"
H	Bottom rail, front and back	2	1-1/2" x 4" x 38"
J	Bottom rail side	2	1-1/2" x 4" x 21"
K	Top rail, front and back	2	1-1/2" x 3" x 38"
L	Top rail side	2	1-1/2" x 3" x 21"
M	Clasp backer	1	1/4" x 1-3/8" x 19"

**WOOD FINISHING PRODUCTS****Recommended Finish**

Thompson's® WaterSeal® Advanced Tinted Wood Protector in Honey Gold. (Also available in Natural Cedar, Rustic Red, Nutmeg Brown and Coastal Gray.)

**Alternate Finish**

Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector with base in Clear and top in Rustic Red. (Also available in Honey Gold, Natural Cedar, Nutmeg Brown and Coastal Gray.)

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Build the Legs and Rails

**Woodworker's Tip:** *If your lumber is kiln-dried and the chest will be kept outdoors, stack your lumber in a covered area outside for several weeks before you build. This will allow the moisture content to stabilize and minimize wood expansion after the chest is built.*

1. Sort your wood and select the best-looking pieces for the lid (A) and front panel (B). Rough-cut your stock according to the CUTTING LIST, but leave everything oversize by at least 1/2" in length. Parts made from glued-up stock (G through L) should initially be cut an extra 1/2" wide.
2. Use a waterproof glue to face-glue three pieces of 3/4" stock for each leg (G). Glue up two pieces for the rail stock (H through L). Make an extra leg blank and an extra rail to test your setups. Mark the best-looking face on each piece.
3. Trim the leg blanks to size after the glue has dried. Don't cut the tapers yet. The grooves and mortises are cut while the leg blank is still square.
4. Lay out the groove location and the taper (Figs. 2 and 3) on each leg. Position the legs on your bench just as they'll be on the chest to make sure you've got everything oriented correctly.
5. Cut the stopped grooves on each leg (Figs. 2 and 4). It takes two fence settings to complete the two grooves. The first groove is cut with an outside face against the fence. The other groove is cut with the newly grooved edge against the fence. Be sure both grooves are equally set back on the legs. Rout stopped grooves on the legs to house the panels and the rail tenons. The grooves are too long to use a stop block. Instead, mark where the groove ends on the edge of the leg. Make another mark on the router table across from the front of the bit, as shown in Fig. 4. When the two marks meet, stop the router and remove the leg.
6. Use a 1/2" chisel to square the corners where each routed groove ends.

7. Use the drill press to cut the mortises (Fig. 3). The mortise is really just a deeper part of the groove that accepts the tenon. Cut the mortises on the drill press with a mortising attachment fitted with a 1/2" chisel and bit. The groove guides the chisel so you don't get slightly staggered holes. A stop block ensures that each mortise is the same distance from the end.

8. To finish machining the legs, cut the taper on the band saw. This can easily be done freehand, so there's no need for a tapering jig. Use a 1/2" or wider blade and follow the line carefully. Guide the cut with a 1/2"-tall fence that will contact only the bottom board. Belt-sand the sawn surface smooth. Note: Save the offcuts to use as clamp pads during assembly.

9. Now that the legs are finished, turn your attention to the rails. Lay out the tenons (Figs. 5 and 6) on each end and cut them on the table saw. Use a test piece to check the fit of the tenons in the leg grooves. Shoot for a snug fit accomplished without a mallet.

10. Lay out and cut the tenon haunches on the band saw. The haunch fills the groove made on the router table and strengthens the joint by increasing the glue surface. After cutting the tenons on the table saw, band saw notches to create the haunches.

11. Dry-fit all the legs and rails to ensure all goes well at assembly. If a tenon bottoms out in the mortise before the joint is tight, trim 1/16" off the tenon length.

**Woodworker's Tip:** *It's a good practice to put a slight chamfer on the tenons' ends to help them slide into the mortise.*

### Machine the Panels

12. Machine the tongue-and-groove joints in all the panel pieces (Fig. 7) using a tongue-and-groove router bit set. Use a chamfer bit to ease the edges where the boards meet.

**Woodworker's Tip:** *Featherboards help to keep the stock flat and straight on the router table to ensure straight tongues and grooves.*

13. Don't forget to machine the groove in the bottom of the upper rail (Fig. 5) and to put a 30-degree bevel on each bottom panel board where it mates with the 30-degree bevel on the bottom rail (Fig. 7).

14. Using the table saw, shave 1/8" off the length of each tongue. This is necessary to make room for the Space Balls (see **Sources**) that fit between each tongue-and-groove panel board. Any wood will move with changes in temperature and humidity, and these panels are trapped in their frames. Space Balls are like little rubber blueberries that keep an even gap between the boards but allow for seasonal expansion and contraction.

15. Cut rabbets on the ends of each panel board so they fit snugly into the leg grooves (Fig. 7).

**Assemble the Chest**

16. Sand all the box parts, finishing with 120-grit sandpaper.

17. Assemble the two end panels with waterproof glue and clamps. It's easiest to assemble the chest upside down. Glue the top rail into one leg. Then stack the panel boards adding three or four Space Balls in each groove. Slip the bottom rail into the leg, add the second leg and clamp the assembly.

18. After the two end panels are complete, assemble the rest of the chest in the same fashion. Set both front and back rails and panels into one end panel, add the second end panel and clamp. Be sure to check that your assembly is square.

**Build the Lid**

19. While the glue dries, edge-glue the boards for the lid. Align each board flush. It's best to glue-up one board at a time for this operation.

20. Sand the top to a 120-grit sandpaper finish.

21. Cut the battens (E) and chamfer the outside edges (Fig. 1).

22. Pre-drill countersunk holes in each batten on the drill press. Note: Be sure to elongate the screw holes on the ends of each batten to allow the lid to expand and contract (Fig. 1).

23. Attach the battens to the lid with screws.

**Install the Bottom**

24. Cut the hardware cloth and screw it onto the bottom of the deck cleats.

25. Cut the deck cleats (F) and install them with screws along the bottom edge of the bottom rails (Fig. 1).

26. Cut the decking (D) to fit. Pre-drill countersunk holes in the ends of each deck board and attach to the deck cleats. Use 1/4"-thick spacers to maintain even gaps between the deck boards.

**Add the Hardware**

27. Mount the hinges on the chest (Fig 1). Use steel screws first then replace them with the brass screws. The steel screws pave the way, making it easier to drive the softer brass screws without breaking them.

28. Glue the clasp backer (M) to the upper panel board and add the clasp (Fig. 1, Detail).

29. Position and attach the lid closers.

**PROTECTING YOUR PROJECT**

Any type of wood that's used outdoors needs protection from water damage. There are a variety of protective coatings available, including clear and tinted wood protectors and semitransparent and solid stains. Each of these finishes has a different look and maintenance requirement.

To provide complete protection for your project, use Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector. Both products not only prevent water damage, but also resist damage from mildew and UV (ultra-violet radiation in sunlight), and they exceed industry standards for waterproofing on wood. Plus, the transparent tint will give plain pine just the right amount of rich wood tone. These products are available in five beautiful sheer wood tones.

**Woodworker's Tip:** Always be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.

**FINISHING TIPS**

- Coverage: The approximate coverage of Thompson's® WaterSeal® Advanced Tinted Wood Protector and Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector on pine is 200 square feet per gallon.
- Do not mix Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector with other waterproofing products, because variations in the final appearance of the surface being treated may result. Also, do not thin these products.

**Recommended Finish**

For the best protection against sun and water damage, use Thompson's® WaterSeal® Advanced Tinted Wood Protector (also available in Natural).

30. Before applying Thompson's® WaterSeal® Advanced Tinted Wood Protector, the wood surface must be free of all dirt, wood dust and contaminants. This product can be applied to damp, freshly cleaned wood. Read and follow the directions found on the back of the can. Then do a trial test before full application. The surface may darken slightly with application and color appearance is different when the coating is fully dry.

31. When applying this product, do not use it with other waterproofing products, as variations in the final appearance of the wood may result. Do not thin. To ensure good penetration, do not apply in direct sunlight or on hot days. Do not apply if rain is expected within 48 hours. Also, temperature must be above 50° F and remain above freezing for 24 hours.

32. Shake or stir contents for a minimum of 2 minutes before use. Intermix all containers (of the same color) to be used to assure color uniformity.

33. Apply using a paint pad or brush. Do not apply using a roller. For small projects, a brush is the preferred applicator.

34. Apply only one thin, even coat. DO NOT APPLY A SECOND COAT. A heavier or additional coat will not improve performance or appearance. Avoid puddling. Tackiness will result if over-applied. Tackiness may also occur after application if overnight temperature falls below 50°F within 48 hours of application. Drying time will vary depending on wood surface and humidity. Allow a minimum of 12 hours before using the chest.

35. Brushes and equipment used for water-based products must be cleaned with soap and water. Dry product can be removed with mineral spirits.

#### Alternate Finish

36. Before applying Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and for 48 hours after application. And, if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

37. The surface must be free of all dirt, wood dust and all other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

38. Do not mix the product with other waterproofing products because variations in the final appearance of the surface being treated may result.

39. Before applying the product over the entire surface, a small trial patch is recommended.

40. In most applications, only one light coat is necessary. Apply with a brush, roller or applicator pad. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

41. Oiliness and tackiness will result if over-applied, or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application.

42. Allow at least 48 hours to dry before you use the chest.

43. Brushes used for oil based finishes must be cleaned with soap and water. Dry product can be removed with mineral spirits.

**NOTE:** The length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

#### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER:** Rags, steel wool and other waste soaked in these products may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool and waste after use in a sealed, watertight, water-filled metal container. Dispose of in accordance with local fire regulations.

#### When using oil-based wood protector:

**Cautions:** Contains **ALIPHATIC HYDROCARBONS**. Keep away from heat and open flame. Use only with adequate ventilation. For Exterior Use Only. To avoid overexposure, if treating enclosed exterior rooms or porches, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Causes skin and respiratory tract irritation. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

#### DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

#### When using water-based wood protector:

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

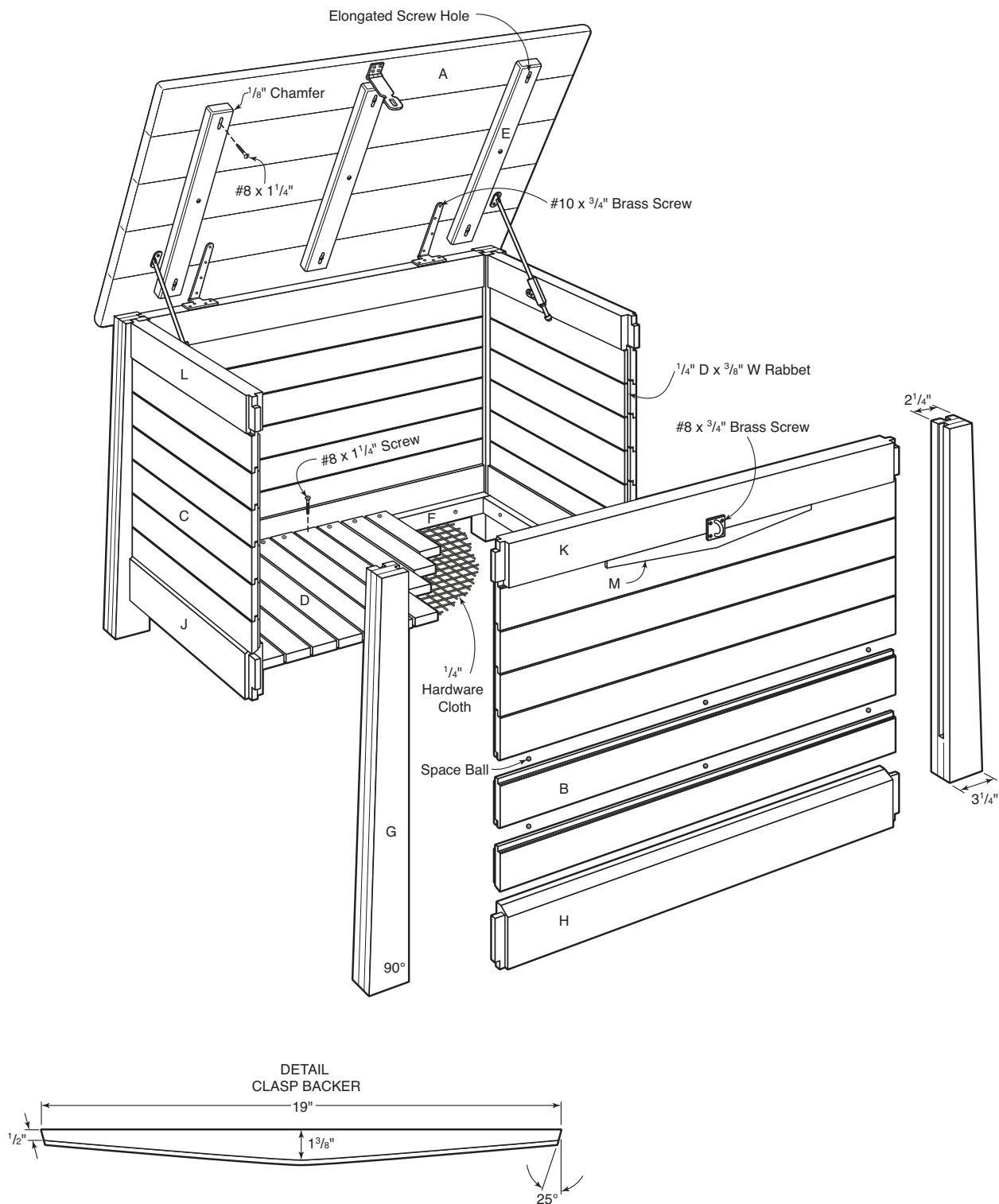
#### Sources

Lee Valley Tools  
1-800-871-8158, [www.leevalley.com](http://www.leevalley.com)  
Pair of 4" x 8" brass T-hinges, #01H14.30, \$37  
1-1/8" x 4" brass safety hasp, #01H15.04, \$12  
Two pairs of flap stays, #00U06.01, \$28.

#### Mcfely's

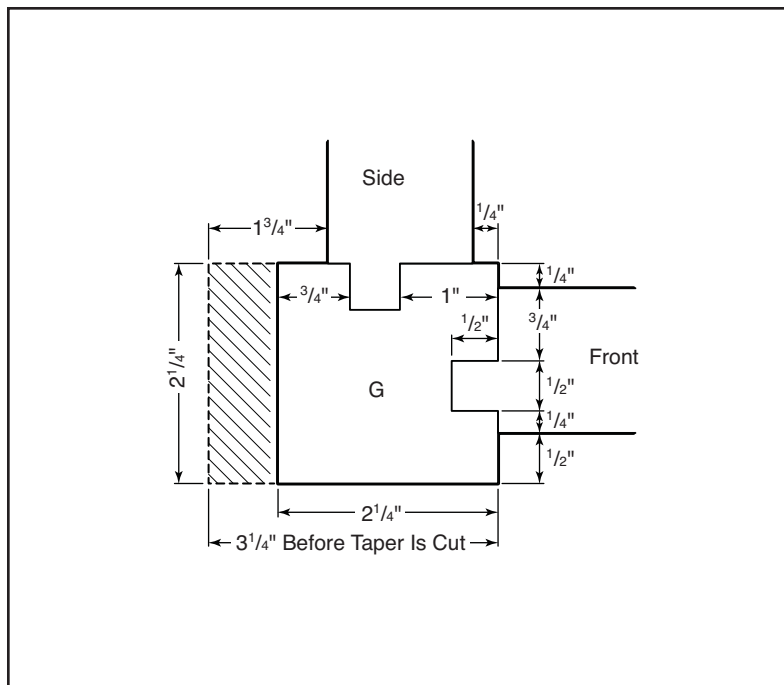
1-800-443-7937, [www.mcfelys.com](http://www.mcfelys.com)  
Space Balls, 100 pack, #PBS-1000-C, \$5  
#8 x 1-1/4" No-Co-Rode flat-head screws, 100 pack, #0812-FNC, \$5  
#8 x 5/8" No-Co-Rode self-drilling washer-head screws, #0805-WNC, \$5  
#8 x 3/4" brass flat-head screws, 25 pack, #0806-FSW, \$2  
#10 x 3/4" brass flat-head screws, 25 pack, #1006-FSW, \$2.

**FIG 1. CHEST DETAIL**

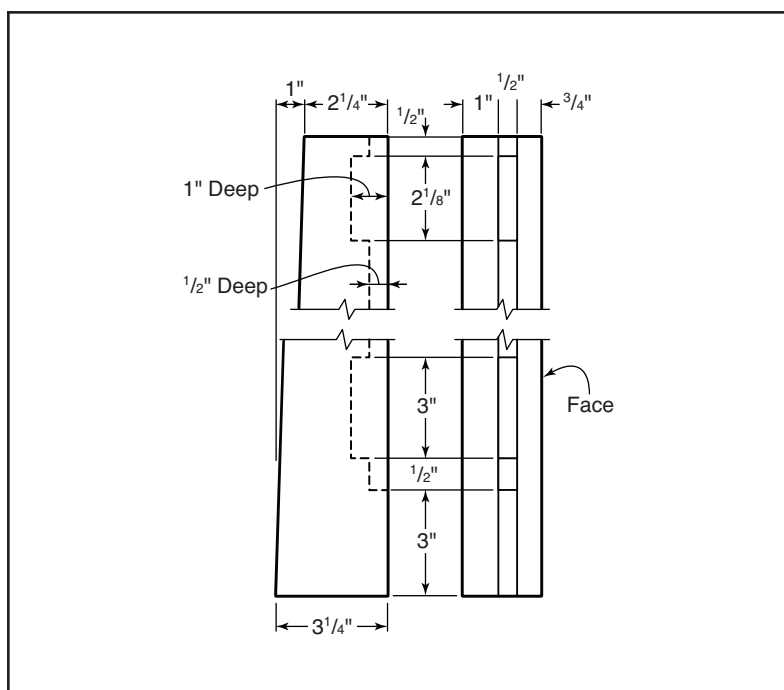


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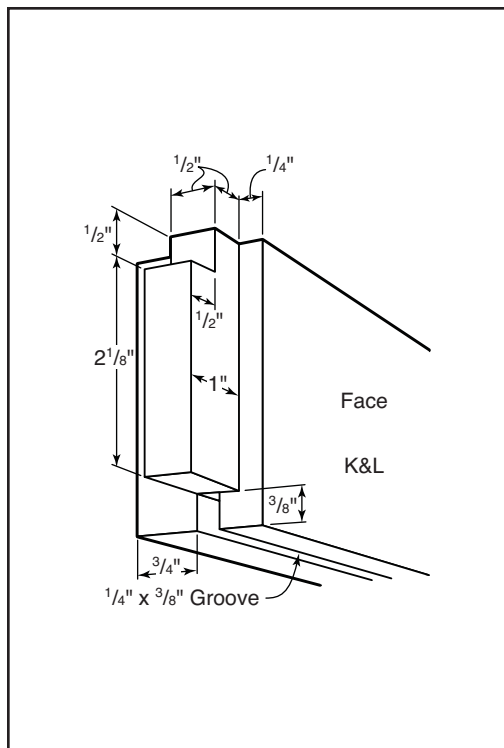
**FIG 2. LEG GROOVES**



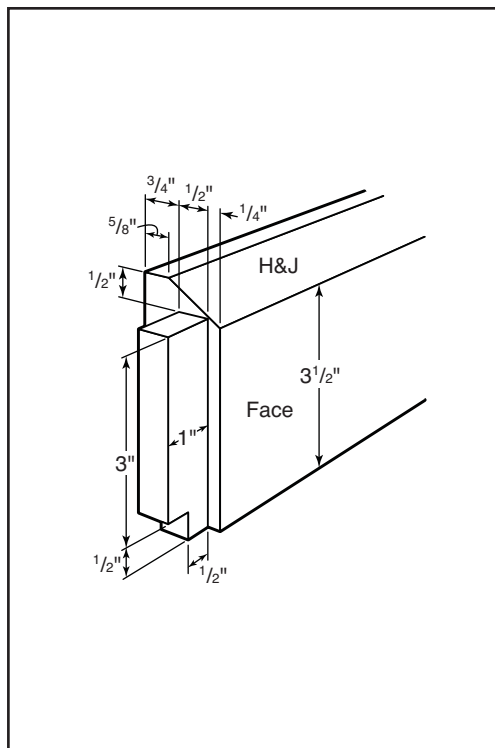
**FIG 3. MORTISE & GROOVE PLACEMENT**



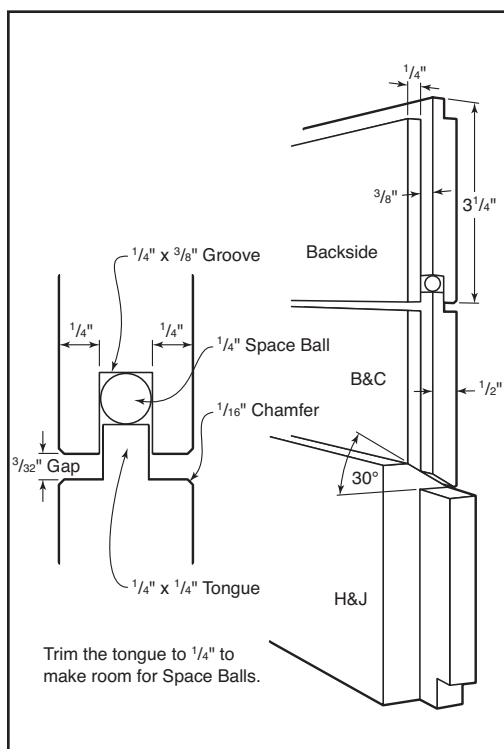
**FIG 4. STEPPED GROOVE SETUP**



**FIG 5. TOP RAIL TENON**



**FIG 6. BOTTOM RAIL TENON**



**FIG 7. PANEL T&G JOINT**

