sample

Important:

McMaster Carr, a supplier whose part numbers are referenced throughout this document, can only ship within the United States. Builders outside of the U.S. must find an alternate supplier for the required hardware.

Hardware part numbers and availability are subject to change. Verify that all hardware or equivalents are obtainable prior to purchasing these plans.

Fescue

a balancing sculpture

design by Derek Hugger

The Basics

Contents

These plans include all the information required to build Fescue. They provide an outline of the build process, tips for an accurate and successful build, lists of required tools and off-the-shelf components, a complete parts list, full scale patterns for all plywood parts, and step-by-step assembly instructions.

Before Building

Read and understand all instructions before building. Failure to do so will lead to increased levels of frustration, lengthened build times, wasted material, and other vexing occurrences.

Build Process

1. Use a light duty/general purpose spray adhesive to temporarily bond the patterns to plywood. Apply the adhesive evenly and sparingly.
2. Cut out each of the seven patterns and drill all holes except for the two noted on the 1/8" plywood patterns.
3. Remove the patterns from the cut plywood parts, and then sand the parts to remove rough edges and any residual adhesive.
4. Following the Subassembly instructions and Blade Gluing guidelines in Tips + Tactics, glue and clamp each 1/8" part to its corresponding 3/8" part. Once the glue has dried and clamps have been removed, sand the parts such that each 1/8" part is flush with its corresponding 3/8" part, and then drill the remaining 1/4" hole through each of the two larger blade assemblies.
5. Cut and tap all stainless steel tubes, and cut all brass tubes. Note that lengths will vary in most brass tubes. See Brass Tube Sizing in Tips + Tactics.
6. Build the remaining Subassemblies and the Top Level Assembly.
7. If desired, fully disassemble Fescue to finish the components. Stain and polyurethane will have a negligible effect on Fescue's balance.

Notes

Changing humidity levels can cause wood parts to swell and move. Some binding or changes in performance may occur with changes in humidity. As humidity levels return to normal, so too should the system's performance.

As there is only one 1/2" plywood part used to build Fescue, an acceptable alternative to purchasing a sheet of 1/2" plywood is to glue 1/8" and 3/8" plywood together.

The Fine Print

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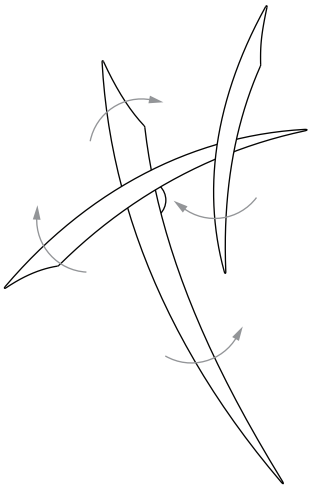
Tips + Tactics

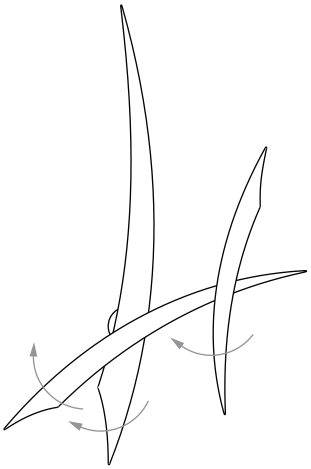
Wall Mounting

Use the counterbored hole in the Base to mount Fescue on a wall. Mount into studs or use appropriate anchors to ensure that Fescue will not fall or otherwise separate from the wall.

Balance Tweaks

Once the Top Level Assembly is complete, and Fescue is mounted on a wall, the angles of each blade should closely match those illustrated below. The images below also indicate the direction of angle change that will occur when removing material from each blade's steel weight. Note that an awl or small flat head screw driver may be used as a lever in the semi-circular cutouts in the plywood to help remove weights that may require modification.





Pattern Syntax

All patterns are labeled with a part name followed by a thickness dimension, and each hole has a specified dimension.
Example: The Thick Front Blade is cut from 3/8" plywood and has a 1/4" diameter hole.

Solid lines indicate a line to cut. Dashed lines indicate a theoretical line that will either be cut out or sanded to after assembly.
Example: Cut on the solid line of the Thin Rear Blade. After it is glued to the Thick Rear blade, it will be sanded flush and its hole will be drilled.

Dashed lines extending from a hole indicate a second smaller hole that is drilled from the side and into its 7/16" hole.
Example: The Thick Rear Blade has a 9/64" hole drilled from the side and into its 7/16" hole.

Two concentric circles indicate a hole with a counterbored.
Example: The Base has a 5/32" hole with an 11/32" counterbore that is 3/16" deep.

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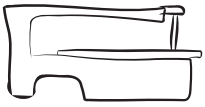
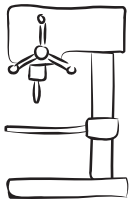
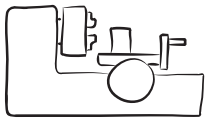
Tools

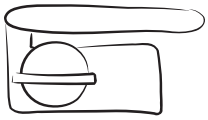
Power Tools

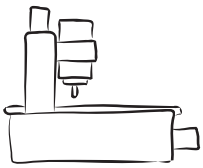

bandsaw


scroll saw


drill press


metal lathe


belt/disc sander

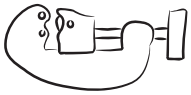

cnc router***

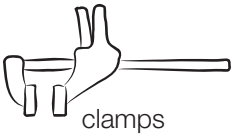
General


drill bits
9/64", 1/4", 5/32", 7/16"
#29 (0.1360") for tapping**

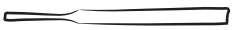

brad point drill bit
11/32"

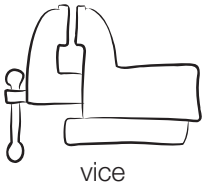

tap 8-32**

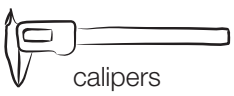

tube cutter


clamps


hacksaw


precision files


vice


calipers

Drivers


phillips #1*


hex 5/64"

Supplies


sandpaper


wood glue


spray adhesive


duct tape

* Assumes a philips head screw for wall mounting.

** For drilling and tapping into stainless steel, cobalt steel drill bits and taps are required.

*** A CNC router is an optional replacement for the bandsaw and scroll saw for cutting the plywood parts.

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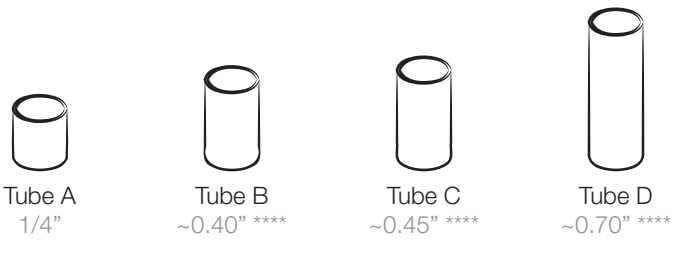
Hardware + Metal

Description	Qty	McMaster Carr P/N *
LSHCS low socket head cap screw 8-32 x 1/4”	3	93615A317
Set Screw 8-32 x 3/16” **	2	92313A189
Needle Bearing 1/4” ID, 7/16” OD, 5/16” wide	2	5905K21
Brass Tube | see Tubes below 9/32” OD, 0.253 ID	~2”	8859K25
Steel | see Weight Front below 3/8” x 1/4”	~3”	98491A138
Steel | see Weight Middle/Rear below 3/8” x 1/2”	~9”	98491A167
Stainless Steel Tube | see SS Tubes below 1/4” OD, 0.12” ID	~4”	B004XN8ODA ***

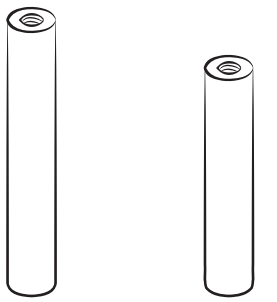


Tube A
1/4”

Tube B
~0.40” ****

Tube C
~0.45” ****

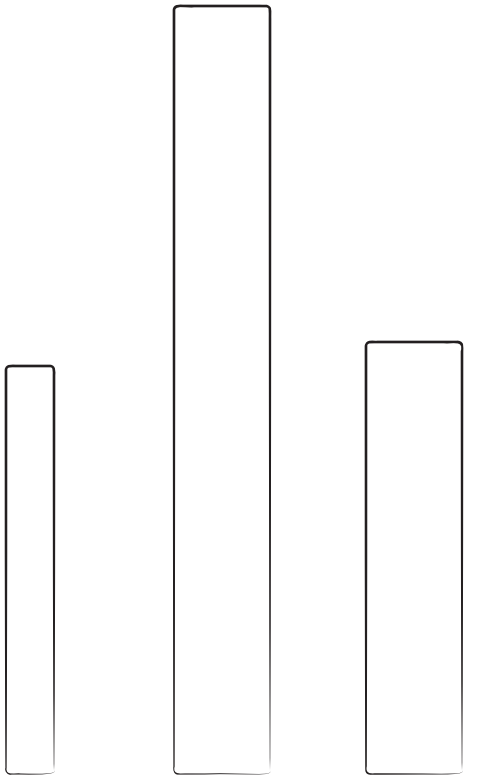
Tube D
~0.70” ****



SS Tube A
1 3/8”

SS Tube B (2x)
1 1/8”

All SS Tubes: drill and tap one end for
8-32 thread, minimum thread depth 1/4”



Front Weight
2 1/8”

Middle Weight
4”

Rear Weight (2x)
2 1/4”

* Part numbers referenced are from www.mcmaster.com.
** A set screw is required only if the Needle Bearings do not press tightly into the blade assemblies.
*** Part number referenced is from www.amazonsupply.com.
**** Lengths will vary. See Brass Tube Sizing in Tips + Tactics.

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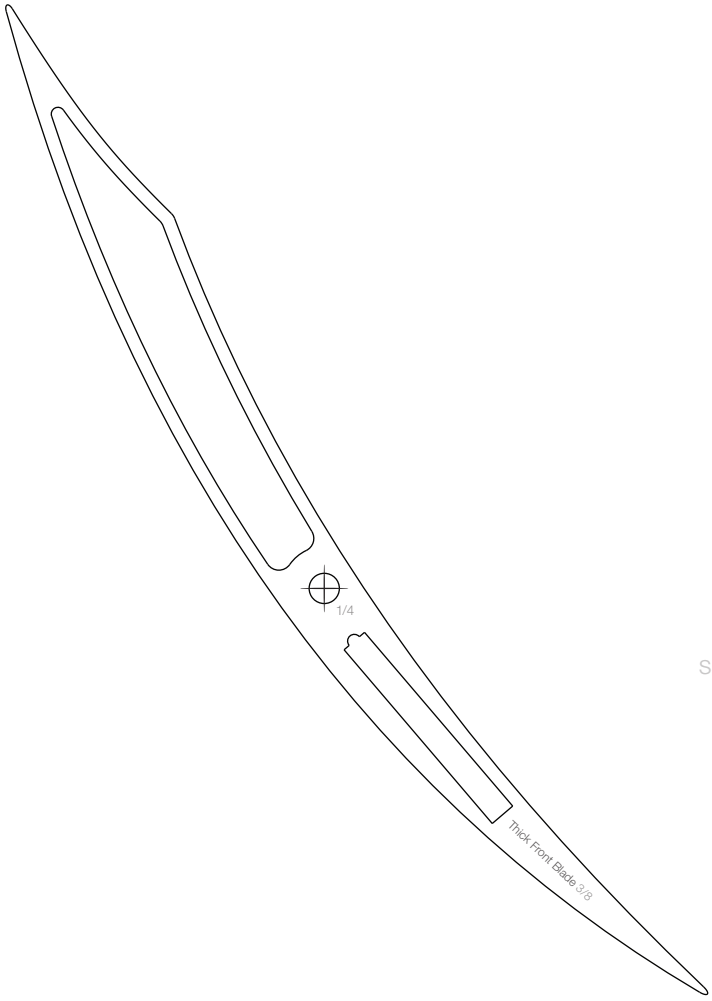
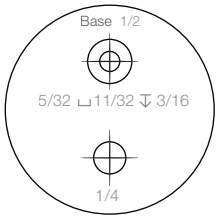
Pattern

Samples

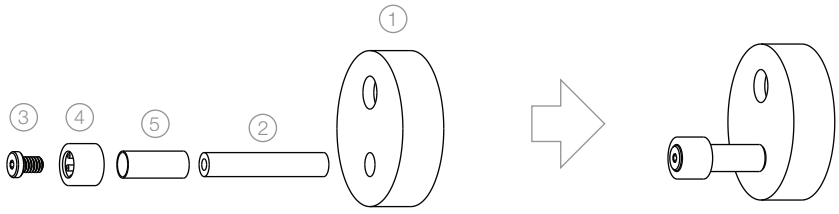




sample patterns not to scale

Assembly

Sample



Base Asm

#	Required Parts
1	Base
2	SS Tube A
3	LSHCS
4	Needle Bearing
5	Tube D

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