

## Portable Carving Bench

### INTRODUCTION

This workbench was developed in 2018 to support Chuck Rinehart's classical carving classes at the Guild of Oregon Woodworkers in Portland, Oregon. Eight were built and are still being used.

The driving need was to teach in traditional school classrooms that had no workbenches. When using the woodworking benches at the Guild shop, we tied up the entire facility precluding all other users. With these new portable benches we untethered ourselves from the Guild and were able to teach virtually anywhere, but most importantly at the nearby Multnomah Art Center, a repurposed elementary school where we rented classrooms.

Portability with speed of assembly were very important, as were height adjustability and sturdiness for mallet use. Standing student heights varied by 18" so one bench height would not work.

Four-hour-long classes were taught over three weeks in rented space so benches had to be quickly setup and torn down before and after each. Between classes the disassembled benches had to be transported and stored in the Guild Annex where space was scarce. Plywood stored flat became the solution for storage, strength and budget.

Design experimentation started in May 2018, construction was done during the summer with the Guild's Project Build Team, and first classroom use was October 2, 2018.

Jeff Harness provided the essential idea of making a bench sturdy by standing on its platform, inspired by his in-the-round stand pictured here. The plywood base where the user stands is obscured in the photo.



The final bench in use



Jeff Harness' standup carving platform



An early mockup with strap clamps and threaded rods

**CAUTION:** There might be dimensional or other factual errors in this first version of the document. If any are found, please contact the author at 503-312-7745.

## Portable Carving Bench

### Flexible Carving Bench - (Original article)

#### STURDY, PORTABLE, ADJUSTABLE, ECONOMICAL

Three years ago we built eight carving work benches for \$75 each to un-tether classes from the Guild of Oregon Woodworkers Shop, allowing us to teach carving in the Multnomah Art Center classrooms or any similar rooms that have good lighting and a sweepable floor.

The carver's weight standing on the base provides the mass above the plywood's 75 lb., so the effective weight on average is 200-250 lb.

The standard height is 39" but with shorter sides and spacer blocks the height range is 34" to 45" to support taller and shorter students. The ratchet strap shown at the right provides the flexibility to vary the height while providing enormous strength to clamp the top to the base using eye hooks at either end.

With practice a bench can be assembled or disassembled in 5 minutes, which is important in shared classrooms. A typical class will span three Saturdays, and in-between the dissembled plywood is stacked on moving dollies for temporary storage. Longer term storage is off-site, and eight benches and supplies can be transported in a van or pickup.

The bench top is two plywood sheets which can be together or separated with spacer blocks, adjusting the height by 6". The overhangs at the front and sides provide clamping space, and when separated, the topmost sheet can be offset at the front to provide handle clearance for C or F clamps.



The top has 1/8" plywood strips on three edges to keep tools from rolling off.

For hardware, the plywood base and top have recessed T-plates for threaded eyebolts to hook the ratchet strap, which creates enormous pressure to sandwich the top to the base between the core box column in the middle. Two 1/2" horizontal threaded rods on each side of the core box make that assembly solid. The rods use washers and hex nuts, with a pair of wrenches for assembly. An upper shelf and a plywood spacer at the bottom keep the core from being deformed by the threaded rod tension. The picture above shows a "box rod handle nut" on the right side to speed assembly. Each bench is provided with an Ikea LED gooseneck lamp.

This design is the fifth prototype. The essential idea for the user's own weight to provide the mass came from carving instructor Jeff Harness, which might have originated with Chris Pye. The ratchet strap idea to provide adjustable height with strength was new. Future improvements would include better shelving and modular side storage for personal supplies.

## Portable Carving Bench

### Credits:

As with most projects, little is original. The essential idea of using a carver's body weight for mass came from my mentor and carving instructor, **Jeff Harness** of Hillsboro, Oregon, now of Sun City West, AZ. He had built a tripod structure with a small base to stand on to carve objects in-the-round. He also was the one who introduced me to the "box rod handle nut" because it was used for carving vises in his studio. Wink's Hardware in Portland was how I finally found the name so I could order them.

**Chuck Rinehart's** classical carving classes were the motivation for building these in the first place and his input and feedback were part of the process.

**Chris Pye** should be recognized for his emphasis on having a heavy workbench, one that is weighted if not anchored to the floor.

My brother-in-law, **Mike Headley**, is a retired mechanical engineer who is also a skilled woodworker. He and I worked through several design variations before I came up with this approach. His creativity was surely an inspiration.

I think I'll take credit for using the ratchet strap as the essential mechanism for being able to handle the variable height requirement. This partly came from working with my friend Sam Lanahan on a high tech startup in Corvallis in the 1990s. Sam was an aide to Buckminster Fuller after college and learned about the design strength of simultaneous compression and tension. The tension of the ratchet strap acting against the plywood core provides the strength.

### Future Improvements:

Design improvements I would like to see are:

- a replacement for the bottom spacer board to make it less tricky and faster to assemble the core
- More thoughtful storage shelves
- Hangers or cleats off the sides for storage of personal belongings
- Electrical cable management so adjacent benches can be connected and to avoid tripping hazards
- A first-principles look at how and where tools are stored. Is the top big enough? Should there be troughs to separate tools?
- Mostly, think through faster but economical clamping alternatives rather than C or F clamps.
- Coffee cup holders!



An early prototype to test height and sturdiness

## Portable Carving Bench

### Construction notes:

- use a router to round over all edges, including handle holes, typically 1/8" radius
- The photos of the top and sub-top show extra bolt holes on the left and right. These were used to bolt the two pieces together but were found to be unnecessary.
- Ratchet straps usually come with very long belts. The photos show the excess taped for convenience but could be cut.
- The most difficult assembly and disassembly steps involve the ratchet strap. Assembling it is awkward to reach down into the core to hook the bottom into the eye bolt, and to get the slack out of the connection. For disassembly, releasing the ratchet takes a lot of strength and the release mechanism is not easy to understand at first.
- All plywood is 3/4"
- Get the dados right, not too tight, not too loose. Practice on identical, scrap plywood. Expect the plywood to warp over time.

### Usage Notes

- I plan to produce a short training video to show the sequence for assembly and disassembly. There are some nuances that affect the speed, and knowing how to do the final tightening of the ratchet strap.
- Between weekly classes the knocked-down benches are stored on two or three moving dollies and parked in the classroom corner. Because the base platforms are required first for assembly it is important that other pieces of plywood not be stored on top. I usually would put other classroom supplies or sharpening systems on top of the stack of base platforms.
- User Training. I asked students to show up 15 minutes early for the first class and did an assembly demo, then helped them, but other students usually pitched in to help those who were struggling or missed the demo.
- The core is held together with two threaded rods with nuts and washers on the outside. If traditional hex nuts are used two wrenches are needed, whereas if box rod handle nuts are used (cost is about \$12 for the pair), only one wrench is needed. One could argue that a second wrench is cheaper than the handle nut. Ratchet wrenches are highly desirable but cost more. I suggest a set of wrenches for every 2-3 benches.
- Without the bottom spacer board to keep the sides apart, over tightening the threaded rods will bend and possibly ruin the plywood sides (simultaneous compression and tension again).
- Floors are usually uneven so shims are provided to stabilize the benches after assembly. These are common shims from a Big Box store, nothing fancy, easily disposable.
- I purchased the plywood, threaded rods and ratchet straps at Home Depot. The box rod handle nuts were mail order.

### CONCEPTUAL ARCHITECTURE:

Think of the bench as consisting of three subassemblies,

- Base
- Top
- Core held between by the ratchet strap and two eye bolts

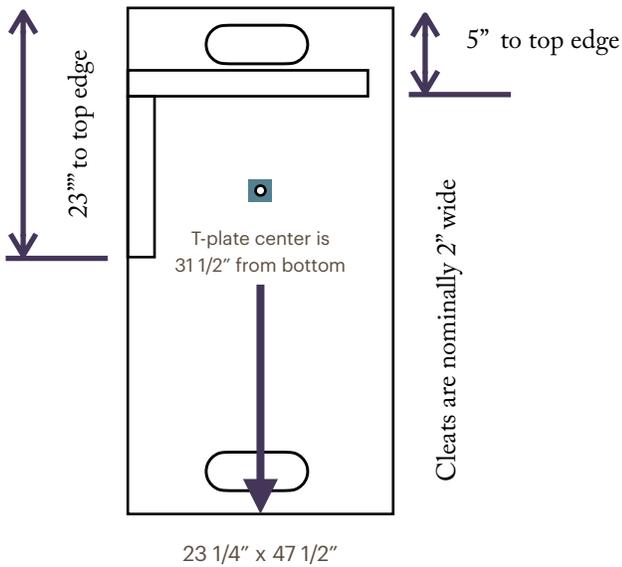
The Base is a single sheet of plywood with two cleats.

The Top is built out of two pieces of plywood and possibly some spacer blocks between to vary the height.

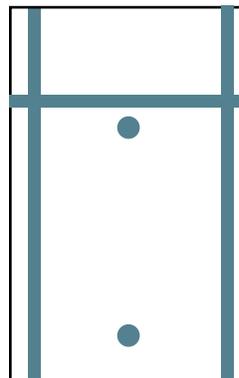
The core is built up from two sides, a front and back, a spacer block and shelf inside to keep it from being crushed by the threaded rods, along with the threaded rods, eye bolts and ratchet strap.

**Portable Carving Bench**

**Bottom**



**Sides (2)**

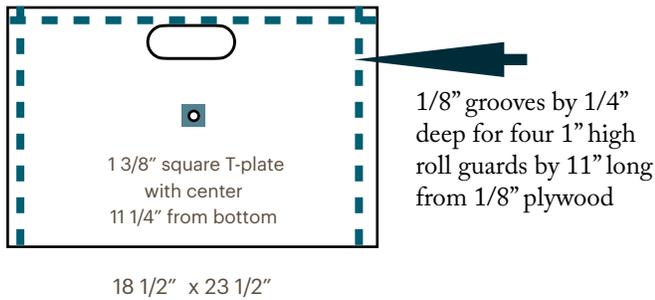


Side dados spaced 1" to nearest edge, shelf dado 7 1/2" from top

- Holes for threaded rods are 1/2" diameter, centered 6" and 28 1/4" from the bottom

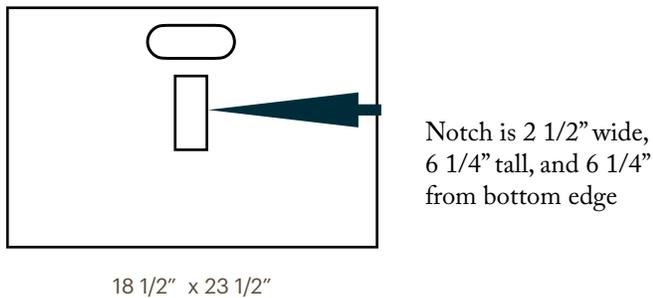
20" x 37 1/2" to make a nominal 39" tall bench.  
Sides for shorter carvers are 20 x 32 1/2" to make a nominal 34" tall bench. Vary this to match carver's height.

**Top**



1/8" grooves by 1/4" deep for four 1" high roll guards by 11" long from 1/8" plywood

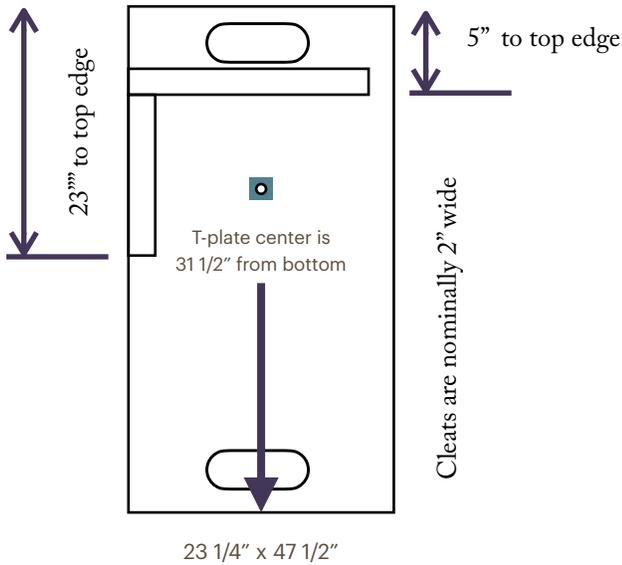
**Sub-Top**



The assembled Core

**Portable Carving Bench**

**Bottom**



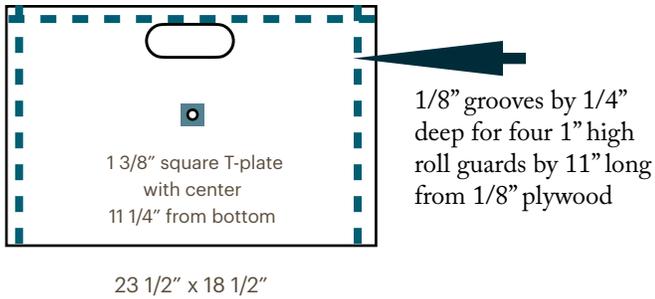
**Bottom - upper surface**



**Bottom - reverse**



**Top**



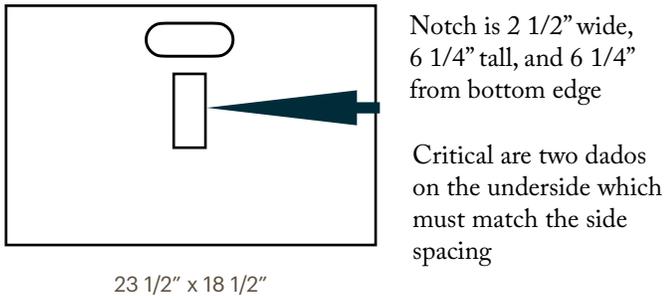
**Top - upper surface**



**Top - reverse surface**



**Sub-Top**



**Sub-Top - upper surface**



**Sub-Top - reverse surface**

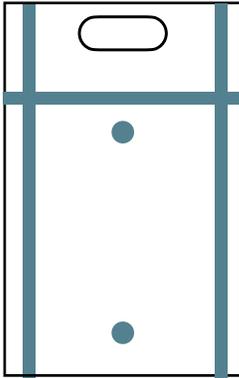


The extra holes on right and left were an experiment to bolt the halves together, but were not needed

Notice the two critical dados that engage the top of the sides for strength

## Portable Carving Bench

### Sides (2)

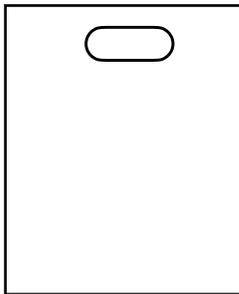


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20" x 37 1/2" to make a nominal 39" tall bench.  
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Vary this to match carver's height.

### Front & Back



18 1/2" x 23 1/2"  
Height is all that critical but width will determine the spacing of the dados on the sub-top underside

### Sides - inside and out



Note the dados on the inside for the front, back and shelf

### Front and Back



Identical pieces, no dados, height is shorter to allow access to the ratchet strap and eye bolts



The Back, Bottom Spacer and Top Shelf in position

## Portable Carving Bench



No spacers between Top and Sub-Top, results in "normal" 39" high bench. Note roll strips in place with the sun casting dark shadows on left and right.



Top and Sub-top separated by spacer blocks



Sub-Top rotated 180 degree with the Top overhanging so C-clamp handles have clearance

## Portable Carving Bench

### THE BITS AND PIECES

#### Ratchet Strap



This one from Home Depot but any will work as long as they have hooks that engage the eye bolts

#### Spacers



**Top Shelf** - to store supplies 8" x 18 3/8"

**Bottom Spacer** - keeps the core from being crushed by the threaded rods as they are tightened 5 1/2" x 17 3/4"

**Two top spacers** - just examples; slipped between the TOP and SUB-TOP to adjust working heights for different carvers (shown are 1 1/2" Cedar, 5" x 20")

#### Hardware



**Threaded Rods** (2) - 1/2" with washers and lock washers, and nuts, which could be standard, neoprene, or "box rod handle nuts"

**Wrench** (1 or 2) - ratchet style most convenient

**Eye Bolts** - to match the T-plates, short one for bottom but possibly a longer one needed at the top for tall benches

**T-Plates** (2) - matched to the threaded rod. The board shown is a router template to speed work when we made eight benches

#### Miscellaneous



**Shims** (top) - because floors are uneven

**Roll Guards** - one one each side, two for the top; helps keep tools from rolling off when pounding with a mallet

#### Handle Holes



Handle holes are for ease of moving individual pieces and assembly.

If the bench is mostly fixed, handle holes might not be necessary.

Mine are 5" wide, made using a 1 1/2" Forstner bit and jig saw. The top of the handle hole is 1" from nearest edge, centered on the board.