

How to make a

# Bicycle-Wheeled Farm Cart

Based on the original design by Charles Sanders in Backwoods Home Magazine

Diagram and design adaptations by Clint Freund

Instructions written by Jennica Skoug



This cart is such a handy tool for any mid-sized farm or garden. It hauls crates of produce, tools, mulch, compost, and just about anything else. The removable back door allows you to get a full load of compost with the door closed, and then open the door to evenly spread it over a bed, shovel-free. The wide handle allows two people to maneuver the cart at once, which is wonderful for heavy loads.

The original plans for this building project are located on Backwoods Home Magazine, and we need to give Charles Sanders plenty of credit for the design. (Original plans can be found here: <http://www.backwoodshome.com/articles/sanders45.html>) After building several carts, we're offering this how-to document as an extension of those plans, with some extra pictures, construction tips, and materials list for the less tinker-savvy – aka those who need more details before embarking on a building project.

Happy building!

# Materials List

Item	Place to Buy	Amt Needed	Cost each	Cost/one cart
1/4"x1/2" bolt	Hardwars store	14	0.06	0.84
1/4"x3/4" bolt	Hardwars store	4	0.07	0.28
1/4"x1 1/2" bolt	Hardware store	4	0.11	0.44
1/4" tee nuts	Hardware store	24	0.15	3.60
4' x 3/4" steel rod	Diversified Metal and Steel or similar factory	1	9	9
3/4" washer	Hardware store	4	0.5	2
3/4" end cap	Hardware store	2	1.5	3
10' x 3/4" EMT Conduit	Hardware store	2	3.2	6.40
Wheels - 26" Hydraulic	Northern Tool & Equipment			
4'x8' plywood, 1/2" thick	Lumberyard	1	26	26
1/2" wood screws	Hardware store	6	0.04	0.24
Bed Frame	Re-used	1	0	0
Paint	Hardware store	1/2 gal	10	10
TOTAL				\$132.08

# Tools List

Skilsaw with blades for wood and steel  
 Safety glasses and ear plugs  
 Drill with 1/8" and 1/4" bits  
 Conduit bender for 3/4" EMT conduit (90 degree angle capacity)  
 Wrenches for tightening bolts (socket wrenches are best)  
 Measuring tape & straight edge  
 Pain brush and/or roller  
 Sandpaper  
 Metal file  
 Hammer  
 Pipe cutter

# Step 1: Cut and paint plywood panels

## Tools

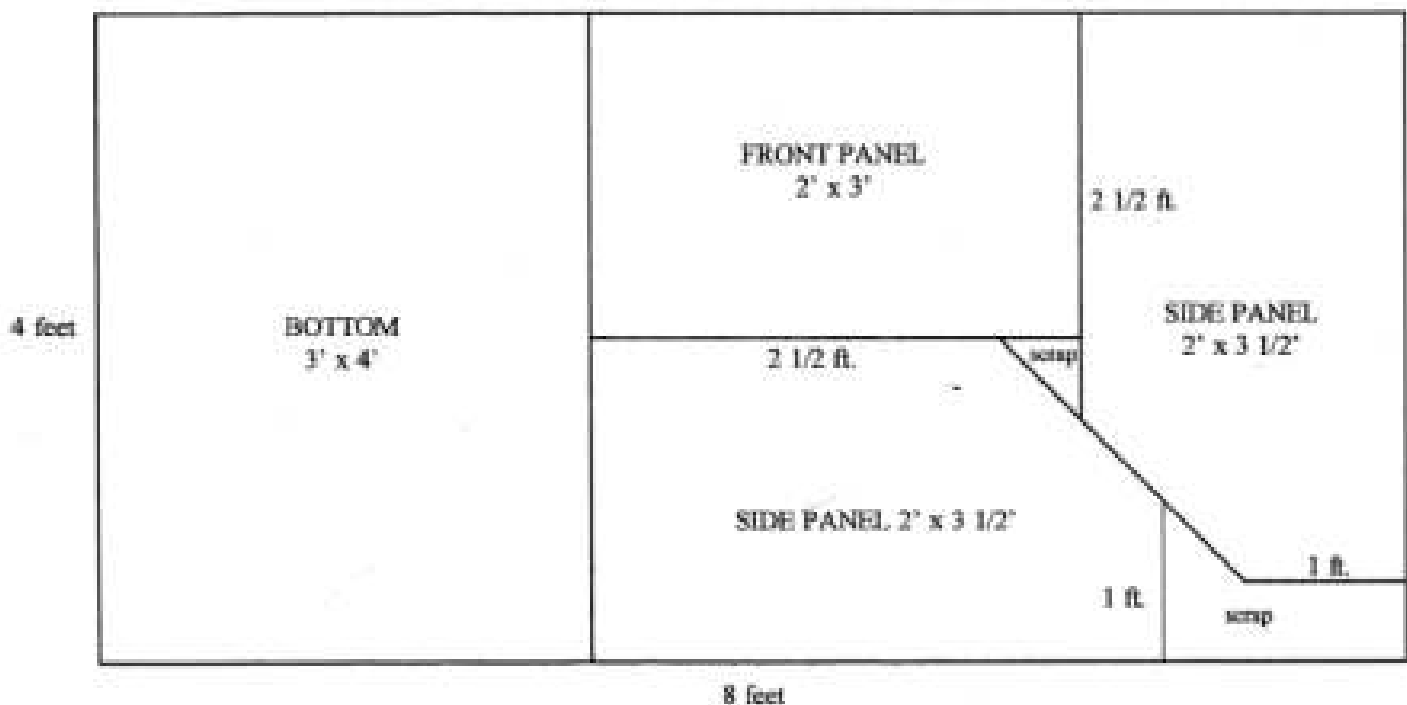
- Skillsaw
- Sandpaper
- Paint and brush
- Measuring tape
- Straight edge
- Safety goggles

## Tips

- Use straight edge to make sure lines and cuts are exact - measure twice, cut once.
- Wear safety goggles while operating circular saw.
- It's nice to have some place to prop up the panels so you can paint both sides at once.

## What to do

- Measure and mark plywood according to diagram below
- Cut plywood with circular saw.
- Sand edges of plywood with sandpaper to remove burrs.
- Paint plywood on both sides and lay out to dry.



This diagram is straight from the original plans: <http://www.backwoodshome.com/articles/sanders45.html>

## Step 2: Cut bed frame

### Tools

- Skillsaw with metal-cutting blade
- File
- Measuring tape
- Safety goggles

### Tips

- Cutting through angle iron will create a LOT of sparks. Make sure there are no flammable items or liquids in the vicinity. Wear safety goggles.
- Plan out your angle iron cuts - especially if using bed frame - to minimize wasted iron and make sure you don't end up with weird left over pieces you could have used.
- Each piece of angle iron should be a tiny bit shorter than the edge of plywood it will be attached to. (To avoid it sticking

- **Measure and mark your cuts:** You will need four pieces of angle iron - measure them by using the bottom and back of each of your side panels. Line up the bed frame pieces with the edges of the plywood they will be attached to and mark with sharpie.
- **Cut angle iron:** Use metal cutting blade in skillsaw to cut angle iron. Use a sawhorse, work table or overturned crate to stabilize the angle iron. Apply a normal amount of pressure to the saw, but not an extreme amount of pressure. It is slower than cutting wood, so be patient.
- **File ends of angle iron pieces to remove burrs.**



Metal cutting blade



Cutting through metal - sparky!



Finished cut - on overturned crate



## Step 3: Drill holes in angle iron

### Tools

- Drill with 1/8" bit
- Drill with 1/4" bit
- Measuring tape
- Safety goggles
- Sharpie

### Tips

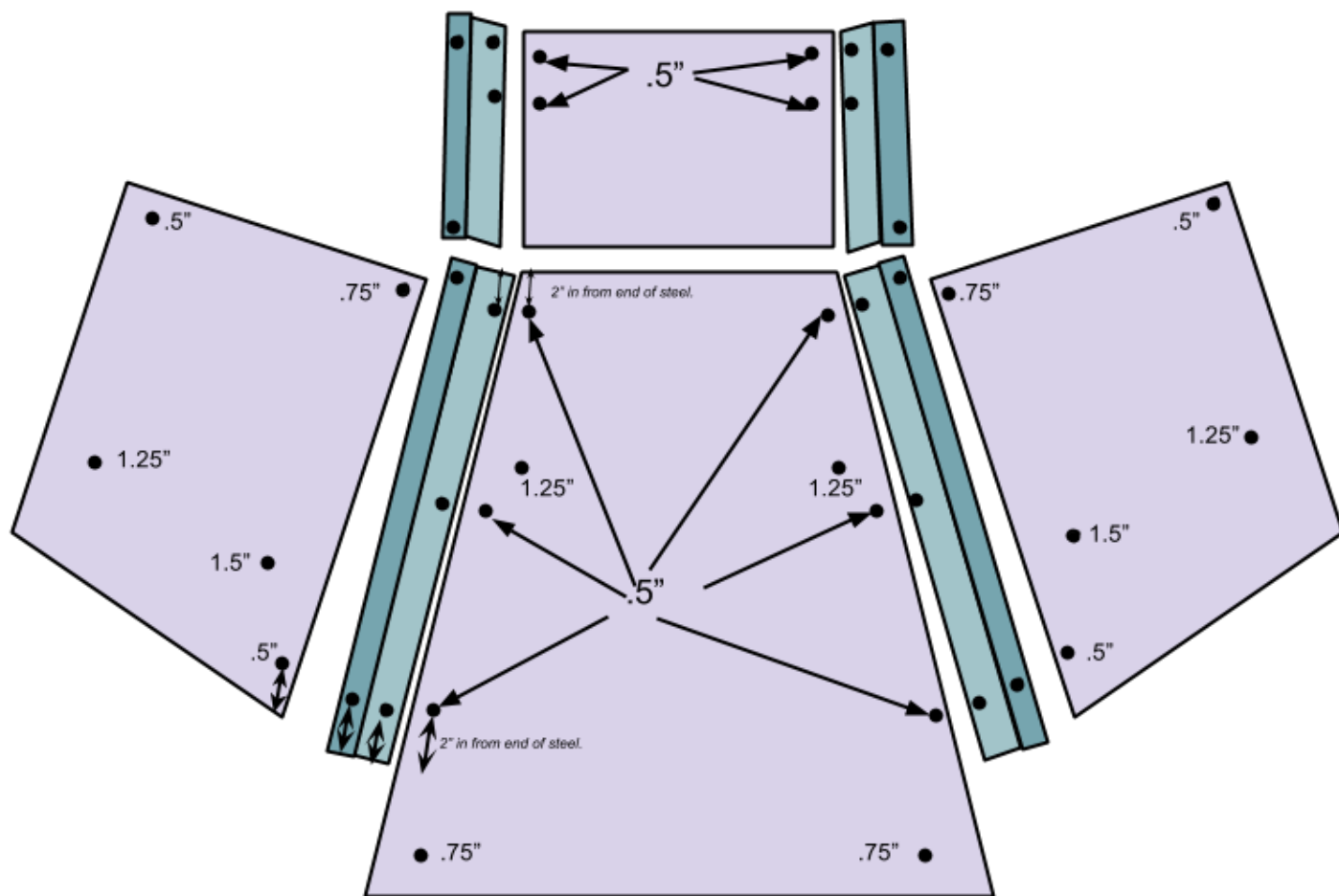
- Do not drill too fast. This can heat up the metal and make it harder to drill. Also add a bit of used motor oil to the end of the bit to help cool the metal.
- Rotate drill in small circles as you are drilling.
- We started with a generic brand drill bit and had problems, then switched to DeWalt brand later, and had much more success.
- Wear safety goggles – do you want metal in your eye? No.

- **Mark** the two longer angle iron pieces: Use diagram on next page. Exact placement is not necessary - just make sure there will be enough plywood so that the bolt has strong edges to hold it in place around all sides. Left and right sides of the cart are the same.
- **Drill holes in longer angle iron pieces: First drill 1/8" pilot holes**, then follow with the 1/4" bit on each hole. Hold angle iron stable with your non-drilling arm, or a table-mounted vice – if the drill catches a “burr” of metal (usually toward the end of drilling), it can spin the iron around somewhat dangerously unless you are holding it tight. Drill should pass easily through metal, with a bit of applied pressure.
- **Mark shorter angle iron pieces:** Use diagram on next page. Left and right sides are different in this case. Line up the longer pieces you just drilled with the shorter pieces where they will meet at each corner - they will share a bolt here, so they need to be lined up just right. See photo below. Reach the sharpie through the hole in the longer piece to mark the shorter piece. Then mark the other holes according to the diagram. Do this for each side of the cart – remember they will be opposite of each other!
- **Drill holes in shorter angle iron pieces.**  
Same as above.



## Step 3: Drill holes in angle iron - cont'd

### Hole Placement and Bolt Sizes for Holes



The above figure shows placement for holes drilled in angle iron and on wood panels. Numbers indicate the length of bolt needed for each hole(s), in inches.

## Step 4: Attach angle iron to plywood

### Tools

- Drill with 1/4 " bit
- 7/16" socket wrench
- Bolts...
- Tee-Nuts

### Tips

What to do if tee-nuts won't hammer into the wood: We had some problems with them bouncing out. An alternative way to get them to bite into the wood is to first insert a longer (1") bolt through both holes and attach a tee-nut on the other side, since the end of the bolt will stick out. As you tighten the bolt, it will pull the tee-nut teeth into the wood. Remove the 1" bolt - the nut will stay locked in - and replace it with the shorter bolt.

- **Attach longer angle iron pieces to bottom edge of the side panels:** Hold angle iron on edge of plywood where you want to attach it. Drill through the angle iron holes, into the wood. Remove angle iron. On the back side of the wood, hammer in tee-nuts. Put angle iron back in line with wood, and attach with a 1/2" bolt, using socket wrench to tighten. See photos below.
- **Attach shorter angle iron pieces to the back edges of the side panels:** Remember that the two pieces of iron will share a hole where they overlap. For this hole, swap out the 1/2" bolt for a 3/4" bolt.
- **Attach cart bottom board to the two side panels:** Using the same method of drilling and bolting, but this time, you will be using the angle iron that is already attached to the bottom of the side panels - you can begin to see the shape of the cart body. It is useful to have a second person for this step to hold things in place while the other person drills.
- **Attach the back board to the two side panels:** Same method.

Congratulations, you now have a funny-shaped box!





## Step 5: Bend conduit for cart legs and handle

### Tools

- Pipe cutter
- Pipe bender
- Measuring tape
- Vice

### Tips

- If your vice is not mounted, it is easiest to flip it upside down on the floor and then smash the pipe.
- If you have trouble turning the crank on the vice, extend the crank using a 1-2' section of pipe (simple machines, yeah!).

- **Cut two 5 ft pieces of conduit:** Put pipe cutter on metal and line up the blade with where you want to cut. Spin it around once to score the metal, then tighten gradually each time you go around until the conduit cuts in two. These will be the legs.
- **Mark the conduit:** On each 5 ft section, make a mark at 2", 9", and 17" from the end.
- **Bend at the 9" mark:** Place the pipe bender at the 9" mark - line the arrow up with the mark. Place the pipe and pipe bender, curve-side down, on a flat surface. Put one foot on the conduit to hold it steady, and one foot on the foot pedal of the pipe bender. Press down on the handle of the pipe bender until the pipe bends to a right angle – make sure to keep the curved edge of the pipe bender on the ground the entire time.
- **Bend at the 17" mark:** Remove the pipe, and place it in the pipe bender at the 17" mark. Bend the pipe again, this time until it reaches about 75 degrees. The exact angle is not too important, but the two legs should be the same. They should be a tilted "J" shape.
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## Step 5: Bend conduit for cart legs and handle - cont'd

- **Smash the ends of the legs so they will attach to the bottom of the cart:** Place the short end of one leg in the vice at the 2" mark (you want to smash the first 2" of pipe"). After you smash the end flat as a pancake, keep it in the vice and bend it at a 90 degree angle, toward the inside of the "J". See pictures at right.
- **Repeat bending and smashing process for the second leg.** Remember, they should look the same.
- **Mark the 10' piece of conduit for two more 90 degree bends** - this takes a little bit of guess work and lining up with your cart, but basically you will end up with a 3-sided rectangle with curved corners. (Or, a very flat-bottomed U shape). No smashing necessary. This will be the cart handle.



It is a good idea to line up your cart legs before smashing the end to make sure they are the right shape to fit the cart.

## Step 6: Attach cart legs and handle

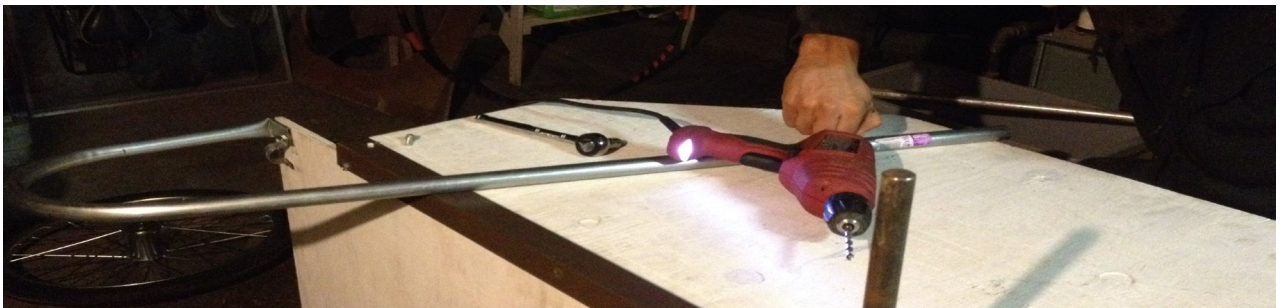
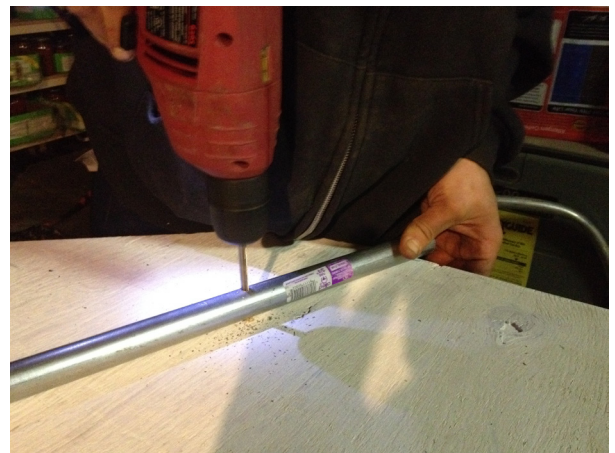
### Tools

- Drill
- Measuring tape
- Sharpie

### Tips

- Line everything up before you drill!
- Be careful when drilling through the pipe strap. This is easy to bend out of shape, because they tend to be flimsy. Try holding it down to a work bench with a strong clamp before drilling. Drill slowly so the strap doesn't catch a burr and try to spin along with the drill bit.
- If building your cart inside, make sure it will fit through the door before attaching the legs, handle and wheels!

- **Legs:** First drill a hole to bolt in the the smashed part of each leg on the two front corners of the cart. Also drill a hole through one side of a u-shaped pipe strap (will be used to hold the handle in place later). Bolt through all three. Leave the other side of the pipe strap loose. Then line up the long part of the leg with the side of the cart and secure with two bolts and t-nuts to the wood. See photo at right.
- **Handle:** Insert the handle through the two pipe straps you just attached. Adjust to desired length by slidling back and forth, then screw down pipe straps with 1/2" wood screws. Bolt the ends of the handle to the bottom of the cart to hold it firmly in place.
- Photo below shows finished leg. Handle not pictured.





## Step 7: Attach axel and wheels

### Tools

- Drill
- Hammer

### Tips

- Make sure wheels spin correctly before putting on end caps  
- these do not come off easily!

- **Attach two pipe straps to bottom of cart** - these will be for holding the axel. Place the pipe straps far enough back on the cart so that when the wheel is mounted, it will stick out just slightly beyond the back of the cart - this will give you the ability to easily store your cart vertically - aka sitting upright on it's back side - when not in use.
- **Put axel through pipe strap.** Should be a little loose so axel can rotate freely.
- **Put washers and wheels** onto ends of axel (washer-wheel-washer on each side).
- Use **hammer** to gently pound end caps on ends of axel so wheels don't fall off.

## Celebrate!

