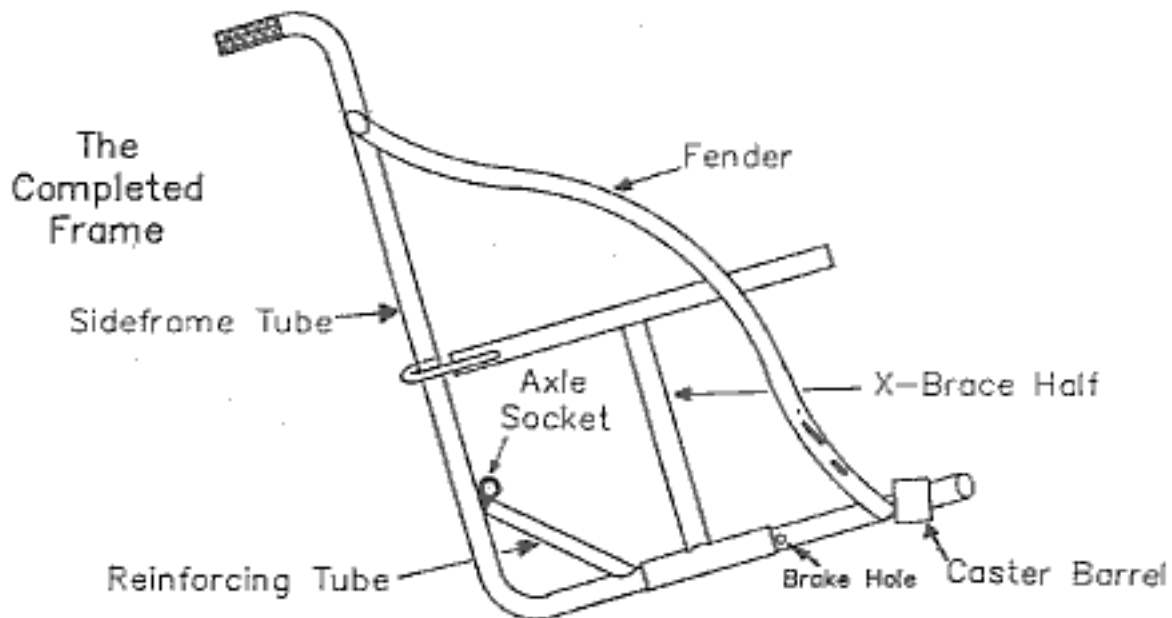


Center for International Rehabilitation

Chapter 10 Making the Frame

This chapter describes how to finish making the frame parts and how to assemble the frame. The assembly is a three-step process: attaching the x-brace halves, making the final bends in the sideframe tubes, and brazing the parts of the frame onto the sideframe tubes in the correct positions. It is important to do these steps in the order given. After the frame is complete, it can be sanded smooth, primed, and painted.

Each half of the chair's frame includes one sideframe piece, one x-brace half, one fender, one axle socket reinforcing tube, a rear wheel axle socket, and a caster barrel. (The caster barrel holds the front caster fork and wheel to the frame.) By following the instructions in the previous chapters, you have already made all of the parts of the frame except the rear axle sockets, the caster barrels, and the rear axle socket reinforcing tubes.



MATERIALS

ITEM	QUANTITY & SIZE	PART OF CHAIR
5/8" I.D. tubing with thick walls*	2 pieces, 1-1/2" (3.8 cm) long	rear axle
1-1/2" O.D. tubing with 1/16" wall thickness	2 pieces, 1-3/4" (4.4 cm) long	caster barrel
3/4" thinwall tubing	2 pieces, 8" (20.3 cm) long (these will be cut to fit)	axle socket reinforcing tube

sideframe (bent in Chapter 7)	2	sideframe
fender bar (made in Chapter 8)	2	fender
x-brace half (made in Chapter 9)	2	x-brace
fine thread 3/8" bolt	1 bolt, 3" (8 cm) long	x-brace bolt
3/8" (10 mm) I.D. washer	4	x-brace spacer
3/8" (10 mm) I.D. lock nut	2	x-brace bolt

* The most common type of thick wall tubing with a 5/8" inside diameter is called 1/2" waterpipe. Its actual outside diameter is about 7/8". The axle sockets must be cut exactly square on each end so that the bearings are not worn unevenly.

JIGS OR BENDERS

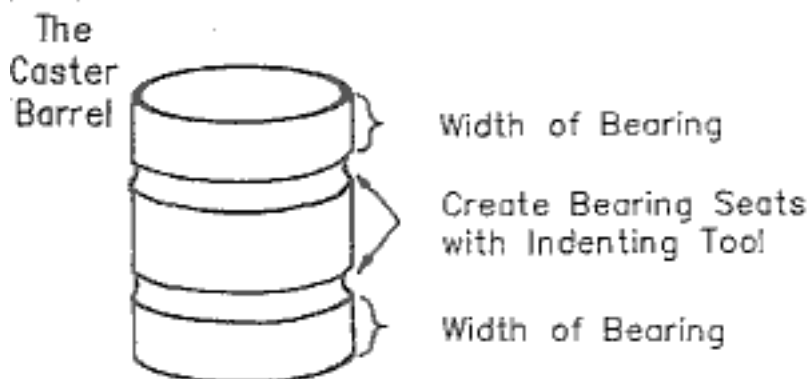
- Sideframe Brazing Jig

Instructions for making this jig are found in Appendix B. The jig can also be ordered as a part of the Basic Tool Kit.

DIRECTIONS FOR MAKING THE FRAME PARTS

Before assembling the frame, you will need to make two of the three remaining frame parts--the rear axle sockets and the caster barrels. The axle socket reinforcing tube will be cut to fit after the axle sockets and x-braces are welded in place.

1) To make the caster barrels, use the tubing cutter to cut two 1-3/4" (4.4 cm) lengths of 1-1/2" O.D. tubing that has a wall thickness of 1/16".

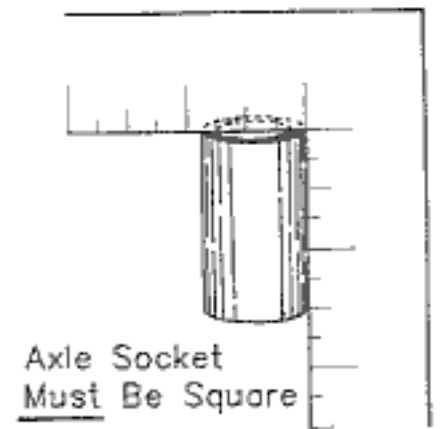


2) Use the tubing cutter with the indenting tool to make bearing seats in the caster barrels (see Chapter 6).

Bearing seats can also be made by welding a short piece of tubing or two rings of heavy steel wire inside the caster barrel. If tubing that fits inside the caster barrel is not available, slit a tube on one side and squeeze or expand it until it fits.

3) To make the axle sockets, use a hacksaw to cut two 1-1/2" (3.8 cm) lengths of 5/8" I.D. tubing with walls about 1/8" thick (1/2" waterpipe has these dimensions). It is very important that both ends of the axle socket are square.

4) After the axle socket pieces are cut, check them in two directions to see if they are square. Use a hand file to make them exactly square if necessary.



DIRECTIONS FOR ASSEMBLING THE FRAME

Once you have made the caster barrels and axle sockets, you can begin to assemble the frame. Assembling the frame is a three step process:

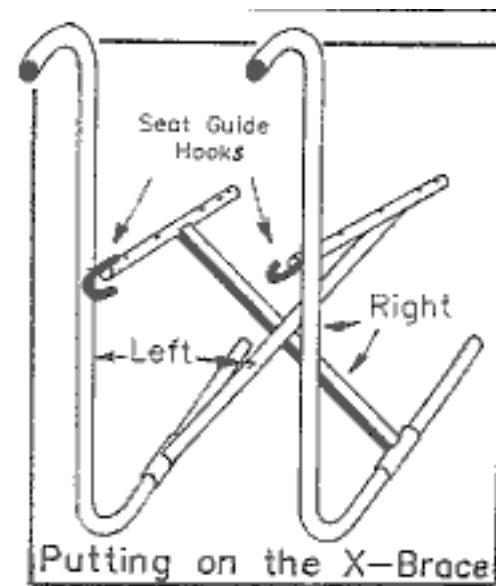
- 1) putting the x-brace halves on the sideframe,
- 2) making the third bend in the sideframe pieces,
- 3) brazing the frame components onto the sideframe tubing.

Do not do these steps in a different order!! It is impossible to put the x-brace halves on after the third bend has been made; it is also impossible to make the third bend once the caster barrels have been welded to the frame!

1) Slide an x-brace half onto each main side frame tube. The guide hooks should be toward the back of the chair as shown in the diagram. Make sure the seat mounting holes are vertical when the frame is held as in the diagram. If not, interchange the two x-brace halves.

2) Once the x-brace halves are on the sideframes, you can put the third bend in the sideframe tubes.

DO NOT START THE NEXT BEND UNTIL AFTER YOU HAVE PUT ON THE X-BRACE HALVES. IT IS IMPOSSIBLE TO PUT ON THE X-BRACE AFTER YOU HAVE MADE THIS BEND!

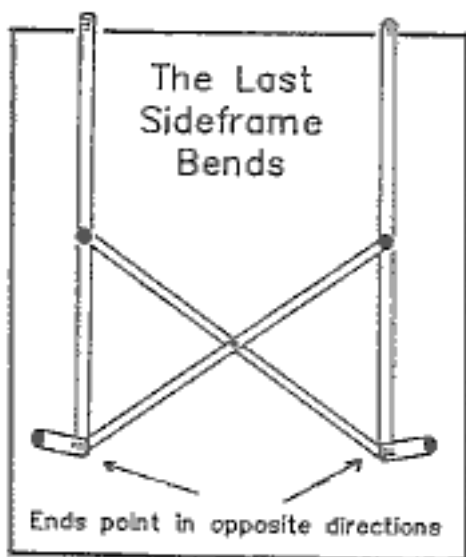
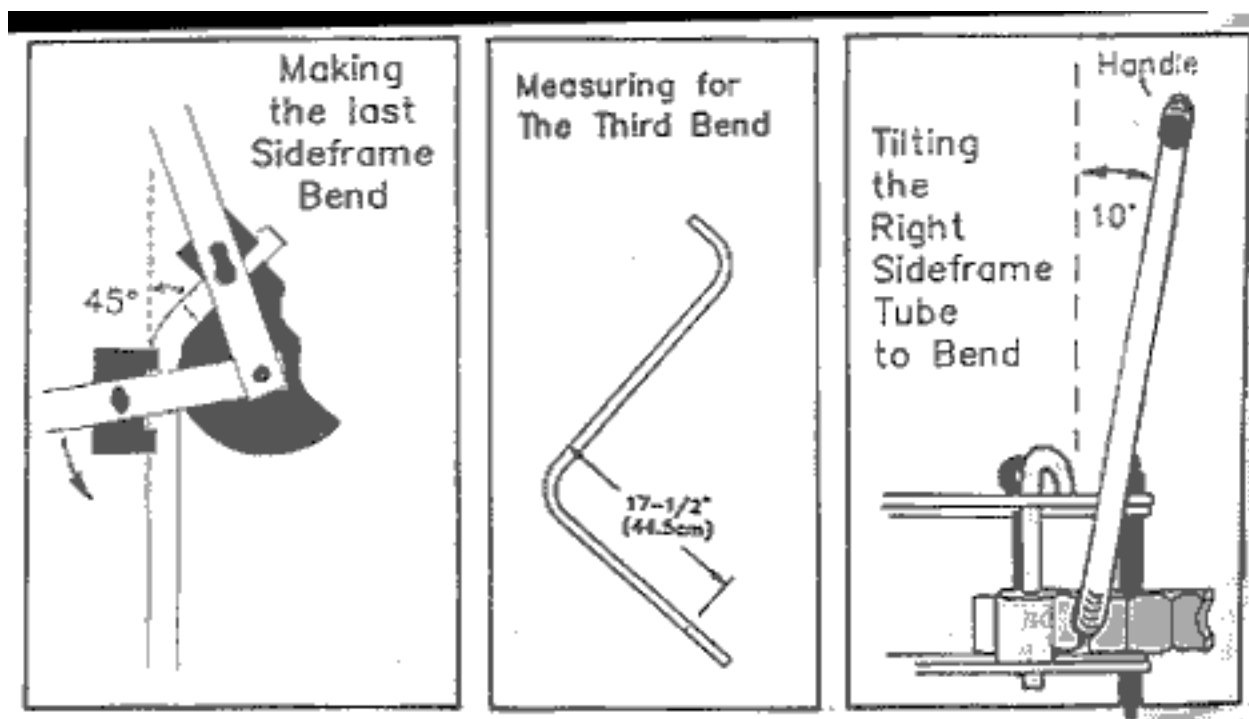


3) Set up the Hossfeld type bender to bend tubing using the die set for 7/8" O.D. tubing with a 2" Center Line Radius.

4) Start with the right sideframe tube. Make a mark on the sideframe tube 17-1/2" (44.5cm) forward from the back of the sideframe. Line up this mark with the mark on the form die.

Position the sideframe tube in the bender with the handle end up and tilted 10° to the right as

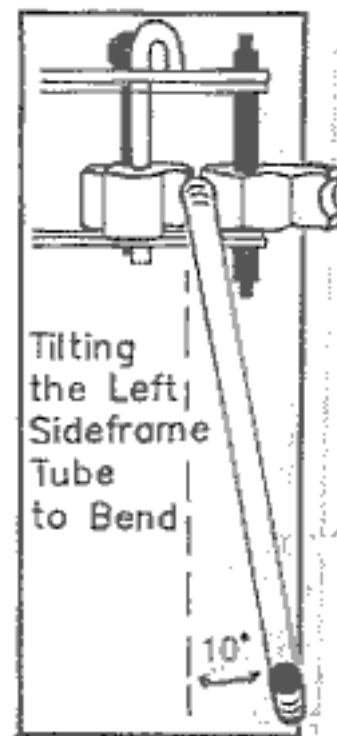
shown. Note: tilting the sideframe 10° is optional. A 10° tilt will result in footrests that fold closer to the wheelchair seat. Check the angle by sighting along a protractor placed on the form die. After clamping the vise-grips onto the tubing next to the back block, bend the end of the sideframe tube 45°.



5) Position the left sideframe tube in the bender with the handle end down and tilted to the right 10~ (tilting the sideframe is optional). After clamping the vise-grips onto the tubing next to the back block, bend the end of the sideframe tube 45~.

Note that the ends of the two sideframe tubes must point in opposite directions toward the outside of the chair.

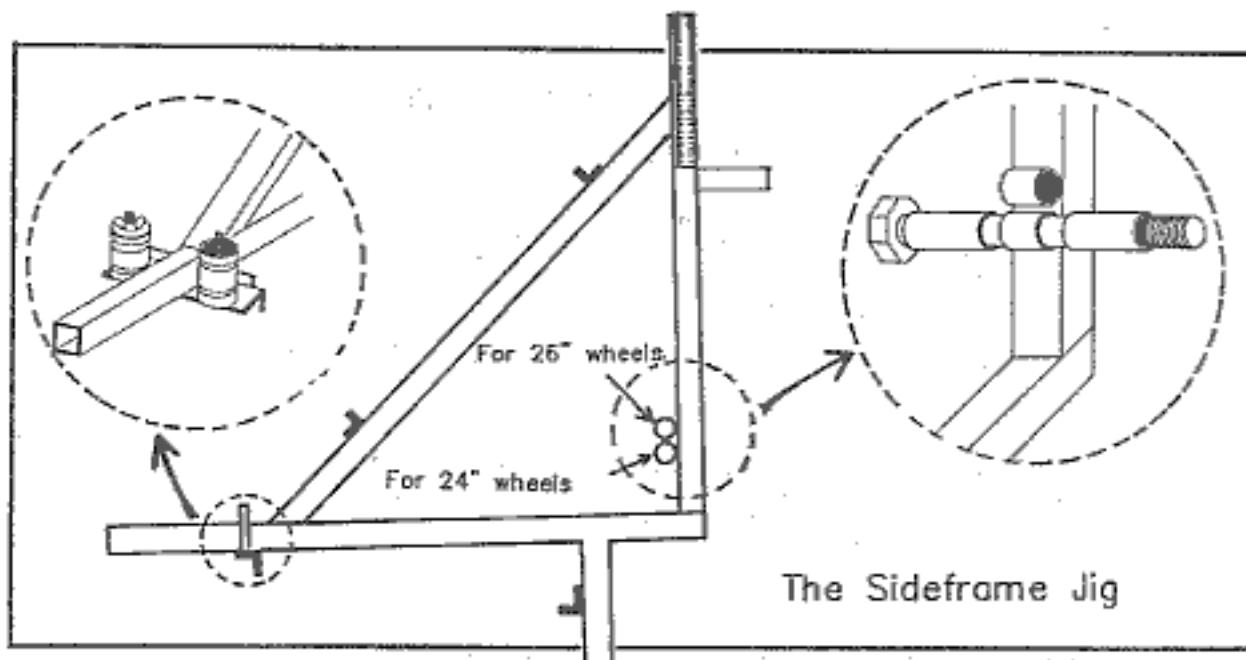
Do not cut off the excess tubing on the front of the sideframe pieces. After you make the footrests, you can cut it to the correct length.



6) The sideframe brazing jig can be used for wheelchairs with either 24" or 26" wheels. If your chair has 24" wheels, bolt the two axle sockets onto either side of the lower jig tube. If the chair you are building uses 26" wheels, use the higher tube on the jig.

7) Put the caster barrels (already indented) onto the front bolts of the jig, place the washers on

top and screw them on very loosely.



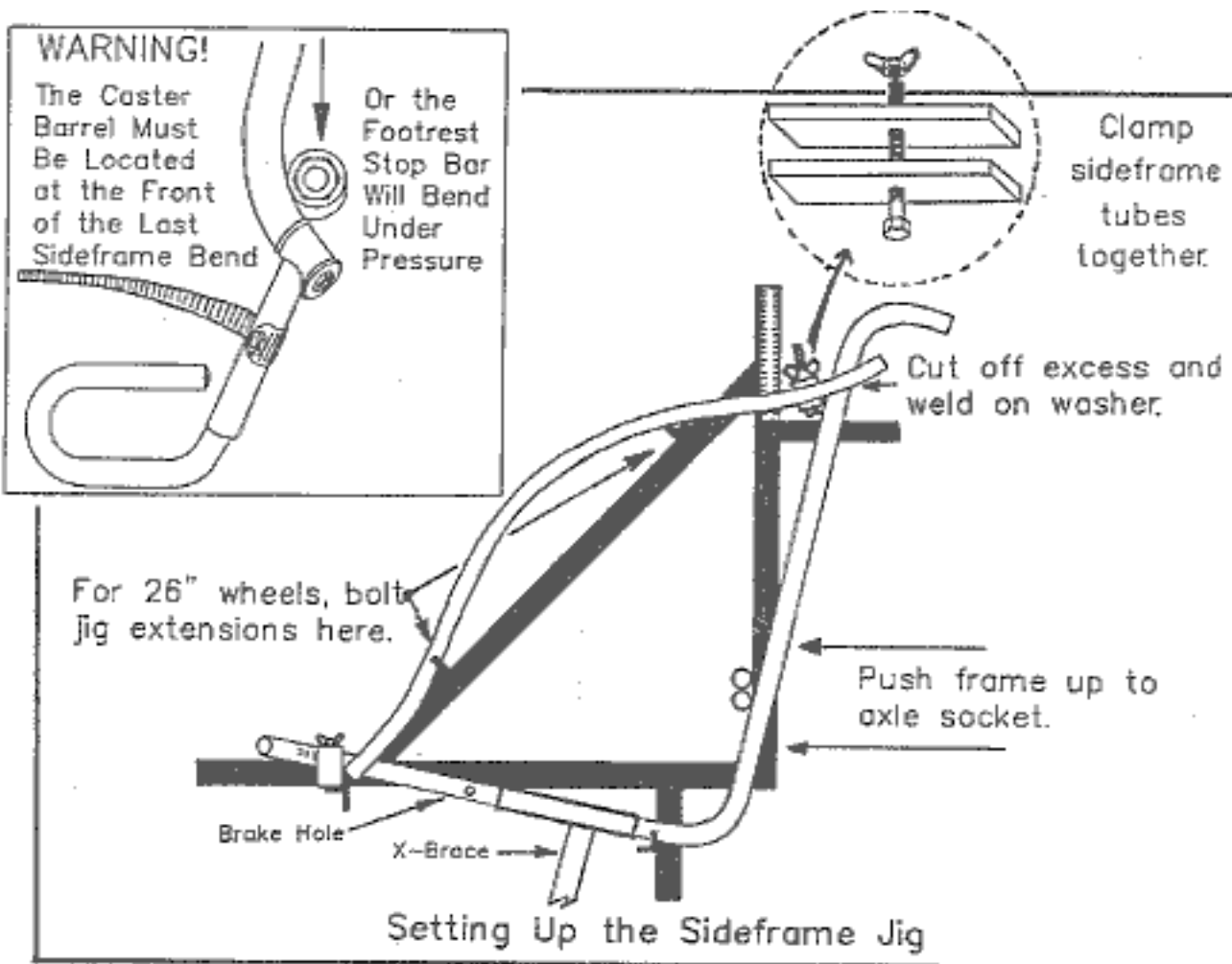
8) Put one sideframe on each side of the jig as shown. Push the frames up against the axle sockets. Press the caster barrels into the frame and against the jig. Clamp the caster barrels in place by tightening the wing nuts.

9) Put one end of the fender up against the caster barrel. It should rest on the jig as shown. If it doesn't, take it off and bend it to the correct shape. For 26" wheels, bolt on the the two jig extensions before putting the fender in place.

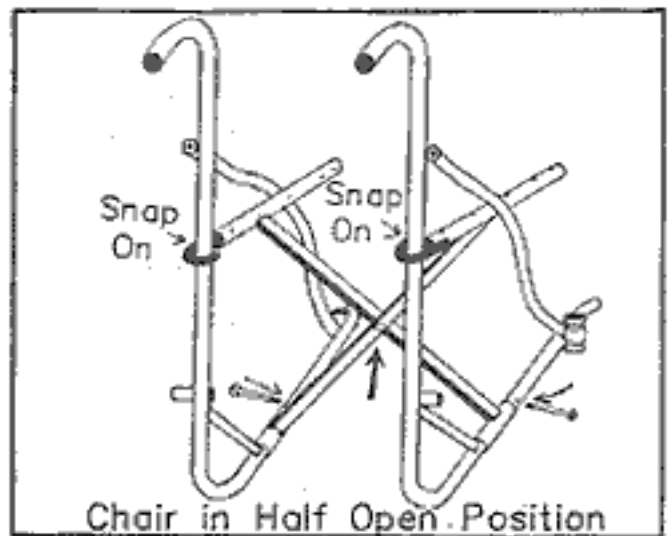
Once the bends are correct, the fender will probably stick out past the frame. Mark where it should be cut off, take it off the jig and cut it with a tubing cutter. Weld a conical washer (see Chapter 6) to the end of the fender to cover the sharp edges. Repeat the same procedure with the fender on the other side.

10) Put both fenders back on the jig, and clamp them in place near the top with two wooden blocks connected by a bolt.

11) Tack every joint securely. Remove each sideframe from the jig and finish brazing all the components onto the frame.

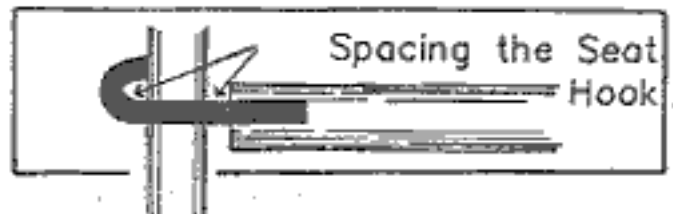


12) With the chair in a half open position, snap the seat guide hooks onto the back of the frame. Only when the chair is in the half open position are the seat guide hooks at right angles to the frame, making it possible to snap them on.



13) Bolt the two halves of the x-brace together using:

- one 3/8" (10 mm) fine thread bolt that is 3" (7.6 cm) long.
- enough 3/8" (10 mm) washers to separate the x-brace halves by about 1/2" (13 mm).
- two locknuts.

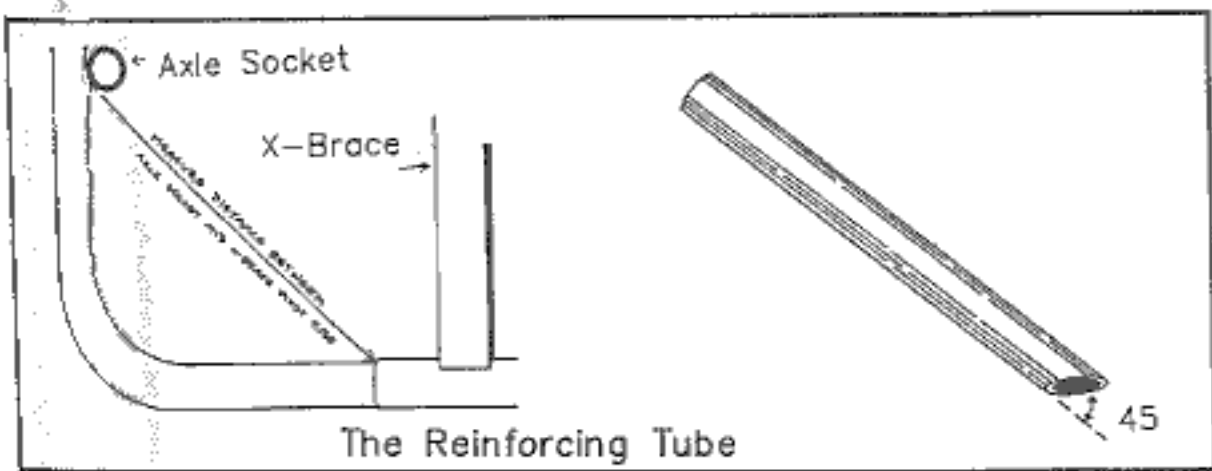


14) Slip 5/16" (8mm) rods or bolts into the brake mounting holes. Slide the x-braces forward until they touch these bolts. In this position, the seat back tubes should be roughly centered in the seat guide hooks (see diagram). If they are not centered, the x-brace or the sideframes may need to be bent back into alignment.

the seat guide hooks (see diagram). If they are not centered, the x-brace or the sideframes may need to be bent back into alignment.

15) Once the x-brace is positioned properly, use vise grips to clamp the bottom tubes to the sideframe tubes.

16) Measure the distance between the back of the bottom tube of the x-brace and the underside of the axle socket. Cut a piece of 3/4" tubing to fit. The top end of the tubing can be cut square, the bottom end should be cut at a 45~ angle as shown. This will become the axle socket reinforcing tube.



17) Use a vise to crimp the top end of the reinforcing tube. Jam the crimped end into the space between the axle socket and the frame.

18) Partially braze behind the bottom end to hold it in place. Be careful not to weld the x-brace to the frame!

19) Braze the top end to the frame, filling in any gaps with brass.

20) Take the vise grips off the x-brace, and remove the bolts in the brake mounting holes. Tap the x-brace forward as far as it will go. This will get the x-brace out of the way before brazing the bottom of the reinforcing tube. Once the x-brace is moved, finish brazing all the way around the bottom of the tube. File or melt off any brass that accidentally got ahead of the reinforcing tube so that the x-brace can slide back all the way.

21) Repeat this procedure for the other side of the chair.

22) Tap the x-brace back into position. Hold it in place by replacing the bolts in the brake mounting holes.