

## PVC Whole Body Dog Wheel-chair

### Introduction

Our family in Thailand adopts one handicapped dog, 'Messi'. He was contracted with some kind of virus since he was around 1-2 years old (when we adopted him) and caused his rear legs to be paralyzed. Though his front 2 legs are still functioning, but they do not have enough strength to support his whole weight. So we've got him a fully supported dog wheel-chair for his use.



This dog wheel-chair, made by veterinarian hospital in Thailand, cost Bht 5000 (~USD 155). This is considered very expensive in Thai currency.

I've done some search for the fully supported dog wheel-chair cost in the US, and it ranges from ~ \$350 - \$800+ (for medium size dog).

For this winter break, we are visiting our family in Thailand, so I've got a plan (or a goal) to design a DIY low-cost dog wheel-chair for Messi, that could also benefits other handicapped dogs.

### Design Concept

The design is intended for a medium size dog but can be easily modified for smaller or larger dogs. I choose PVC piping system as the main material for its low cost, light weight, sufficient strength and easy to work with for DIY. For this design, I use the Schedule 40, 1/2" PVC piping system, easy to find at every hardware store and is strong enough to support a medium size dog.

**Bill-Of-Material (BOM)**

Item	Qty	Description	Est. \$	~Ext. \$	Resources
1	2	PVC Pipe Schedule 40, 1/2" x 10ft	1.81	3.62	Hardware Store
2	12	PVC Tee Schedule 40, 1/2"	0.72	8.64	Hardware Store
3	6	PVC 90 degree Elbow Schedule 40, 1/2"	0.55	3.30	Hardware Store
4	4	PVC 45 degree Elbow Schedule 40, 1/2"	0.60	2.40	Hardware Store
5	2	Swivel Caster, 4" wheel stem mount	6.00	12.00	Amazon
6	2	Plastic wheel, 8" x 1.5"	7.50	15.00	Amazon
7	2	Hex Steel Shoulder bolt, 1/2" dia. x 1.25"	2.80	5.60	Hardware Store
8	4	Steel washer, 1/2" x 7/16"	0.35	1.40	Hardware Store
9	2	Hex Lock-nut, 1/2"	1.10	2.20	Hardware Store
10	1	Wood Screw, #6 x 1/2", flat head phillips (box 100)	2.50	2.50	Hardware Store
11	1	Duct Tape			Hardware Store
12	1	PVC primer/glue			Hardware Store
			<b>Total</b>	<b>56.66</b>	

Per the BOM, the main cost items are the wheels. These are Amazon pricing for brand new items. However, you probably can find those items at a much lower cost from a junk yard, estates sales or flea market.

**Tools**

- PVC Pipe cutter, available at many hardware store (@Home depot ~ \$12)
- Hack saw can also be used, but PVC pipe cutter is a lot more quicker and easier to use.
- Electric drill. Note: for prototype build, I use Flat head phillips, Wood screw #6 to hold each PVC pipe joint together. You can use PVC primer/glue, once you've got all the dimension adjusted to fit your dog.
- Drill bit for #6 screws with countersink: 3/32" drill with 5/16" counterbore.
- Drill bit for 1/2" axel bolt: use 1/2" flat blade drill bit.
- Misc: Ruller, marking pencil/pen, knife



PVC Pipe Cutter

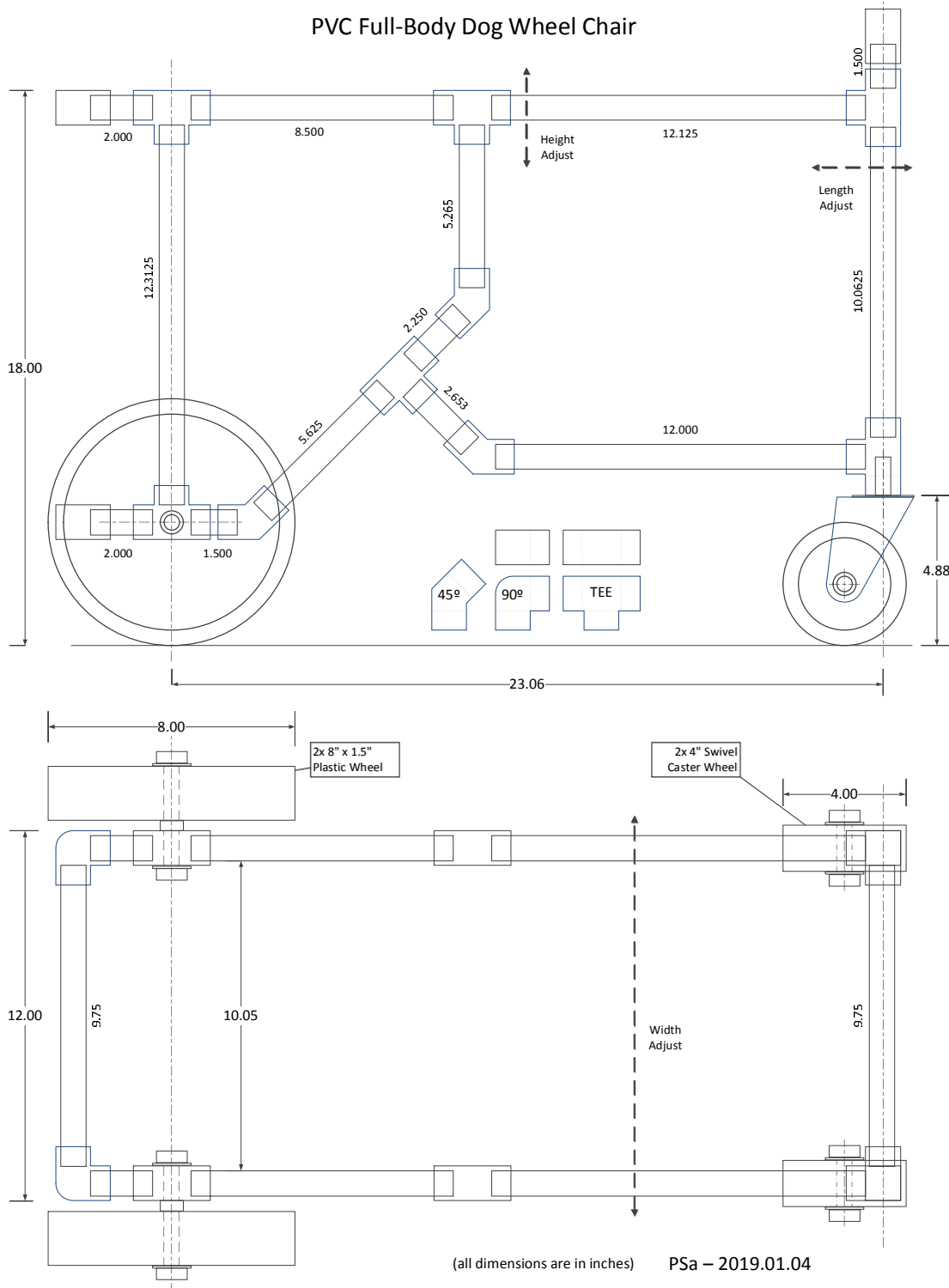


Drill bit: #6 with countersink

**Detail Design**

A single 2D drawing is provided and is simple enough for self explanatory. All dimensions are in inches. Dimensions shown in the drawing are good start for general medium size dog (Messi weights ~ 19 kg).

Height, Length and Width can be adjusted to custom fit your dog as shown.



**Construction Steps**

1. Cut ½” PVC to length as shown in the table below. Length can be rounded up to the nearest 100<sup>th</sup> of an inch (2 decimals). A tolerance of ± .02” would be sufficient.

Qty	Length (in)
4	1.500
4	2.000
2	2.653
2	2.250
2	5.265
2	5.625
2	8.500
3	9.750
2	10.063
2	12.000
2	12.125
2	12.313

2. Drill ½” hole into 2x TEE coupling as shown. The hole is for the ½” axle bolt for the rear wheel.



3. Assemble all the pieces together per the drawing. Can start with just hand press-fit, the friction is high enough to hold all the pieces together.





4. For this prototype, I use #6 wood screws to hold all the joint together as shown. Only one screw per joint. Use the #6 drill with countersink at approximately  $\frac{1}{2}$ " from the edge of each joint piece.



5. For the front Caster wheel, cut a short piece of PVC pipe approximately  $\frac{3}{4}$ " long. Use Duct tape to wrap around the stem of the caster till the diameter can be snugly fit inside the  $\frac{1}{2}$ " PVC pipe as shown. Then insert the caster with duct tape and PVC pipe into the front TEE piece as shown.



6. Assemble the Rear wheel into the  $\frac{1}{2}$ " hole of the TEE piece using the axle bolt, washer and locknut as shown.



7. Body support: Note: this instruction does not include the detail of the body support. The rear body support was transferred from the old wheel chair. As shown in the picture, one can be constructed using steel rod, plastic hook, foam tube, ... items that can be acquired from general hardware store. For the front body, luggage strap was used. soft fabric can be added for more comfort. Pictures shown as examples:



8. Size adjustment: with Messi strap into the wheel chair, I have to reduce the length by about 2.5" so that the front wheel casters will approximately line up with his front legs.

Improvement: Rear leg support can be added with hanging strap attach to the rear cross bar similar to the original wheel chair.



### Conclusion

Messi front legs are still function but not strong enough to support his overweight body, so all 4 wheels are needed. The same design can be easily modified for using only the two rear wheels

Messi does not walk that much anymore. So it is hard to evaluate how good the design is. We hope that he will do more exercise, as much as he can. I also hope that the PVC PET Wheel chair design can be beneficial to many more handicap dogs around the world.