

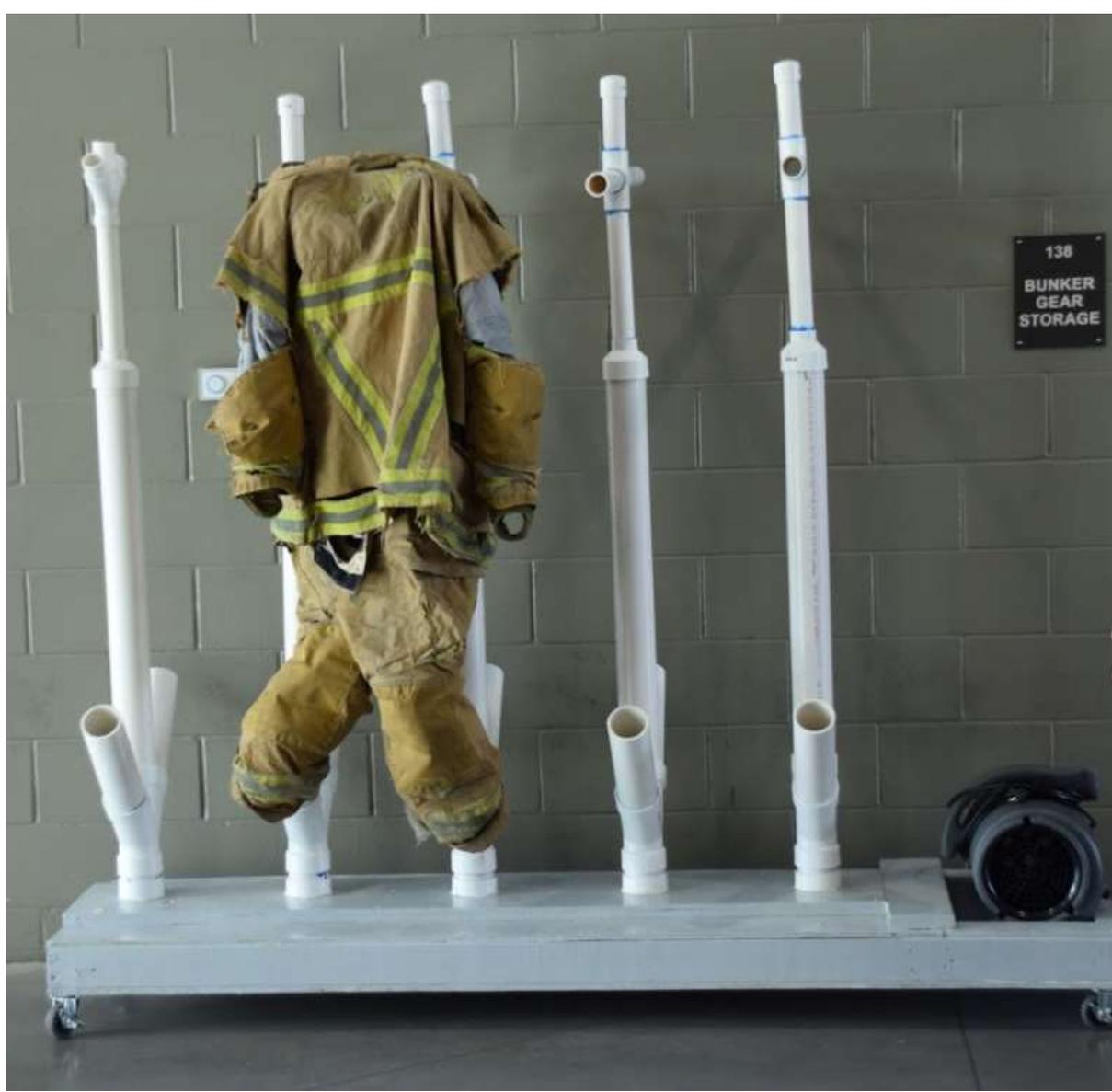
Bunker Gear Dryer 2

Project plans by: Linda Mentz

Beneficiary: Gainesville Fire Rescue

Contents

Introduction	2
Parts Needed.....	3
Tools Needed	4
Stands.....	5
Base.....	7
Bottom and Top	8
Blower Box	11
Putting it all together	13



Introduction

“Bunker gear is the protective clothing that firefighters wear into Immediate Dangerous to Life and Health (IDLH) environments such as fires, hazardous materials incidents, and vehicle extractions. After use in an IDLH environment, the gear must be immediately cleaned to remove carcinogens before it may be used again. The need for these dryers was identified as part of GFR’s cancer prevention program.”

**-Interim Fire Chief JoAnne Rice,
Gainesville Fire and Rescue
Gainesville, FL**

- Building a bunker gear dryer is a great project to help the first responders in our communities. It is a fun Eagle project that can be accomplished in a month or so.
- If you are a scout looking to recruit help to work on this, please keep in mind some Scouts BSA safety guidelines:
 - You must be at least 14 to use an electric screwdriver
 - You must be 18 or older to use a jig saw, circular saw, or chop saw
- Part of an Eagle project is making sure you have the right safety equipment and tools to do a project safely. All 1-1/2” pieces of PVC can be cut by younger scouts with handsaws and miter boxes, but 3” pipe cuts will need to be made by adults with chop saws. Circular saws to cut straight lines, while not necessary, do make cutting wood faster. A skilled jig saw user is necessary to complete this project.
- The airflow that comes out of the 3” pipes at the bottom averages 6 m/s of air flow. The air flow on the top 1- 1/2” pipes averages 5 m/s.
- The cost of materials to build such a unit is about \$600 (I calculated spending \$621.83 on the materials). This does not include the cost of tools (saws, drills, sandpaper, etc).
- This dryer incorporates the 1/2 horsepower B-Air Mover Model #BA-VP-50-GY which is sold at Home Depot. Alternative blowers can be substituted with minor adjustment to design.
- The bunker gear dryer described below is based on pictures of similar dryers from the Toledo Oh. Fire Department and the Woodlands Tx. Fire Department.

Parts Needed

Stands

Part Number

1-1/2" PVC cross	4
3" – 1- 1/2" PVC Reducing Coupling	5
3" PVC double wye	5
3" toilet flange	5
1 1/2" PVC cap	4
1 1/2" Double Wye	1
3" x 10' PVC pipe	3
1 1/2" x 10' PVC pipe	3
PVC glue	8 oz

The **stands** part list contains the pieces for the coats/pants and extra gear rack. Use the flanges purchased to fit the bolts and screws included at the bottom of the **base** list.

Base

Part Number

2 x 4 lumber	7
15/32" x 4' x 8' pine plywood	1
Lag Screws (5/16th x 1- 1/2)	16
3" castor wheels	4
3" deck screws	5 lbs
Wood glue	18 oz
Paint	1 gallon
Polyurethane	1 pint
3/8" galvanized washer	20
5/16"- 2- 1/4" bolt	10
5/16th lock nut	10
2" deck screws	30

For the **base**, make sure your lag screws fit into the castors. It is unlikely that 5 lbs of screws will be used, it's just a standard measurement to buy deck screws in.

Make sure all your screws and bolts fit into the flanges, the bolts will go in the slots on the side.

Extra Materials

1' x 7' plywood	1
-----------------	---

This **extra** portion is shown in the first picture, but not the final one. The section of plywood covers up the top of flanges, looking nicer and keeping the grooves in the flanges clean.

Tools Needed

To cut:

- jig saw
- Circular Saw
- Hand saw and miter box

To drill:

- set of drills
- electric screwdriver
- T25 drill bit
- Socket Wrench set (for lag screws)

Safety Gear:

- Earmuffs
- Safety glasses
- Clamps

To paint:

- paintbrushes
- smocks
- rag on a stick (to spread polyurethane)
- painter's tape

Other:

- 2 sawhorses
- sander and sandpaper
- hammer, rubber mallet
- pencil
- measuring tape
- level

Stands

Connectors needed:

Name	Size	Number
Cross	1 ½" x 1 ½"	4
Reducing Coupling	3" x 1 ½"	5
Double Wye	3" x 3"	5
Flange	3" Flange	5
cap	1 ½"	5
Double Wye	1 ½" x 1 ½"	1

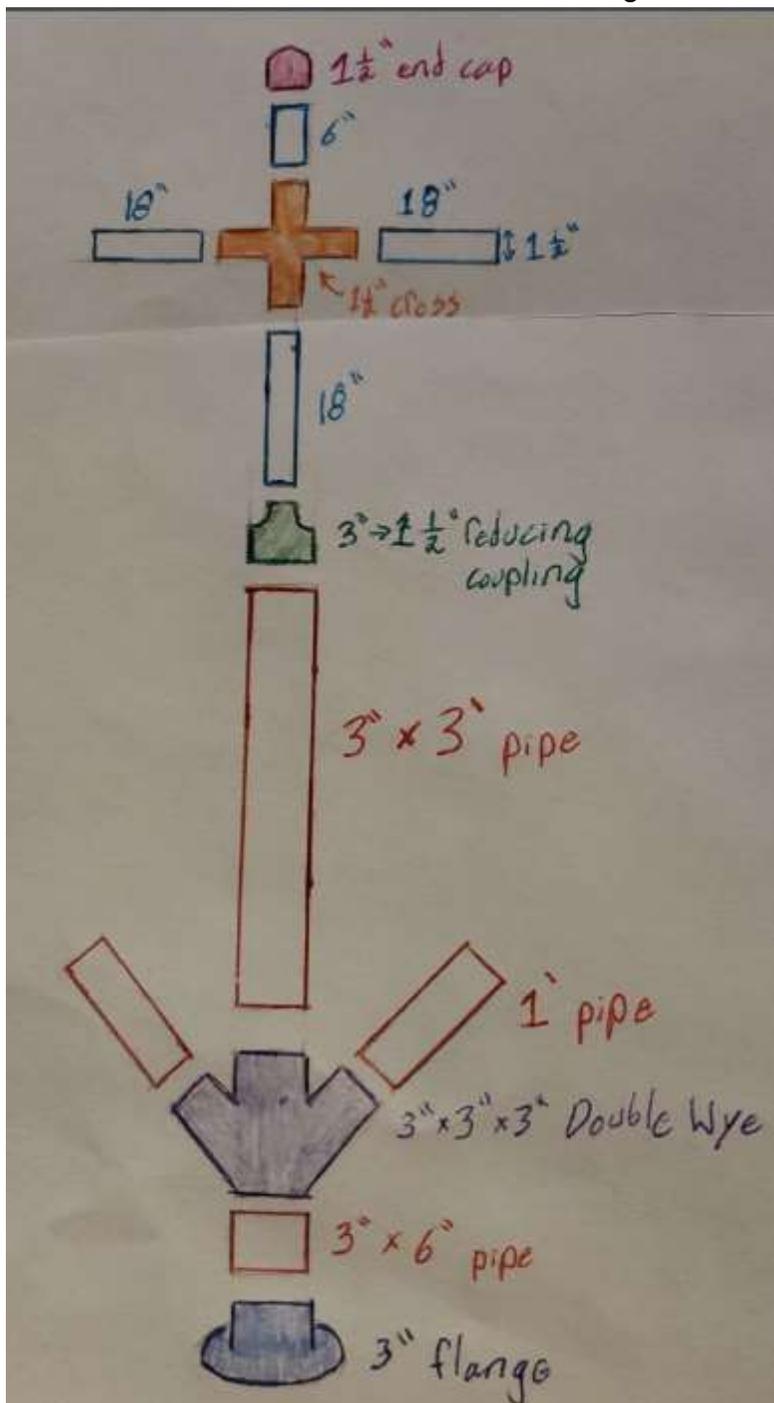
PVC needed

Length	Diameter	Number
18"	1 ½"	13
6"	1 ½"	4
3"	1 ½"	3
3'	3"	5
1'	3"	10
6"	3"	5

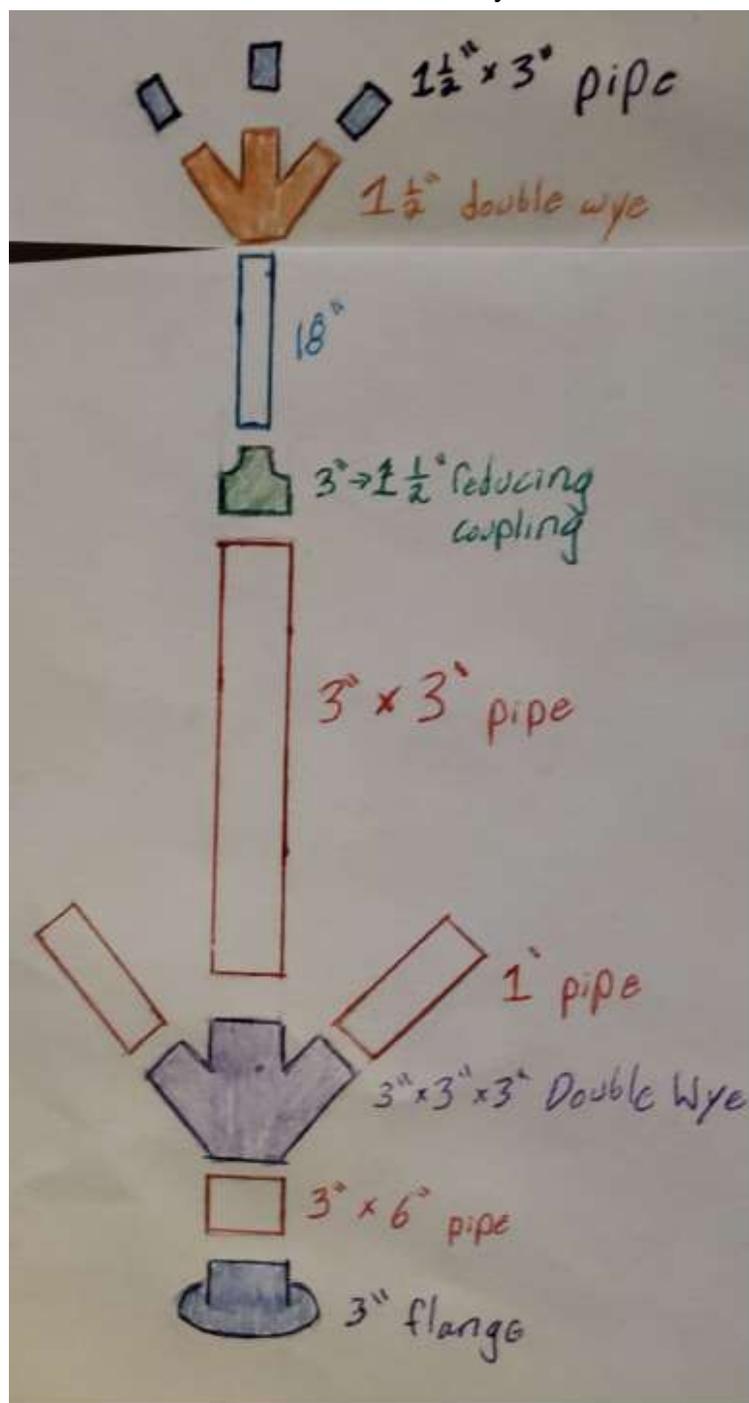
Instructions

1. Cut 3" pieces to the correct height using a chop saw, and the 1- ½" pieces to height using a chop saw or a hand saw and miter box. Sand the end of the pieces cut with hand saws.
2. Assemble the 1- ½" sections. Glue three 18" pipes to three openings in the 1- ½" cross. Glue a 6" piece to the top, and cap with a 1- ½" end cap. Four of these need to be built.
3. Put the last remaining 18" pipe into the bottom of the 1- ½" double wye. Glue the 3" long pieces of 1-1/2" pipe to the branches. Only one of these will be built.
4. Next, build the 3" portion of the stand. Glue 1' pipe to the sides of the 3" double wye. In the middle of the wye, glue the 3' pipe. Top with the reducing coupling. You will make 5 of these.
 - a. Notice that the flange and the 6" pipe above it aren't included in the description above. While attaching these can be useful for storage, as it

allows the stand to stand upright, you **cannot glue these portions** until the end of Putting It All Together! Gluing early will compromise the strength of the bottom, allowing the stand to rock back and forth after assembly!



Coats/Pants stand. Four of these will be assembled. **DO NOT glue the flange or the 6" piece of PVC at the bottom.**



Extra gear stand. One of these will be assembled. **DO NOT glue the flange or the 6" piece of PVC at the bottom.**

Base

Wood Needed

Type	Length	Number
2 x 4	4"	4
2 x 4	8'	2
2 x 4	22"	2
2 x 4	Cut to size (described below)	2
2 x 4	6"	2
15/32" x 2' x 8' plywood	8'	1
15/32" x 2' x 76.5" plywood	About 76.5" (cut to size)	1

Part	Number
Castors (3" w/ swivel)	4
Lag Screws (5/16th x 1- 1/2)	16
Wood glue	18 oz
Primer	1 gallon
Deck Screws (3")	About 50
Paint	1 gallon
Polyurethane	1 qt
3/8" galvanized washer	20
5/16"- 2- 1/4" bolt	10
5/16th lock nut	10
1" deck screws	30

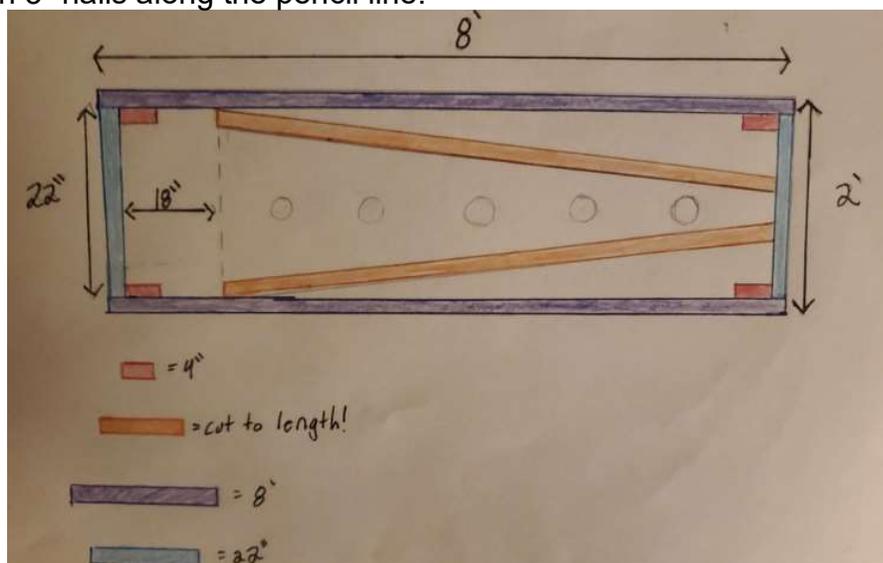


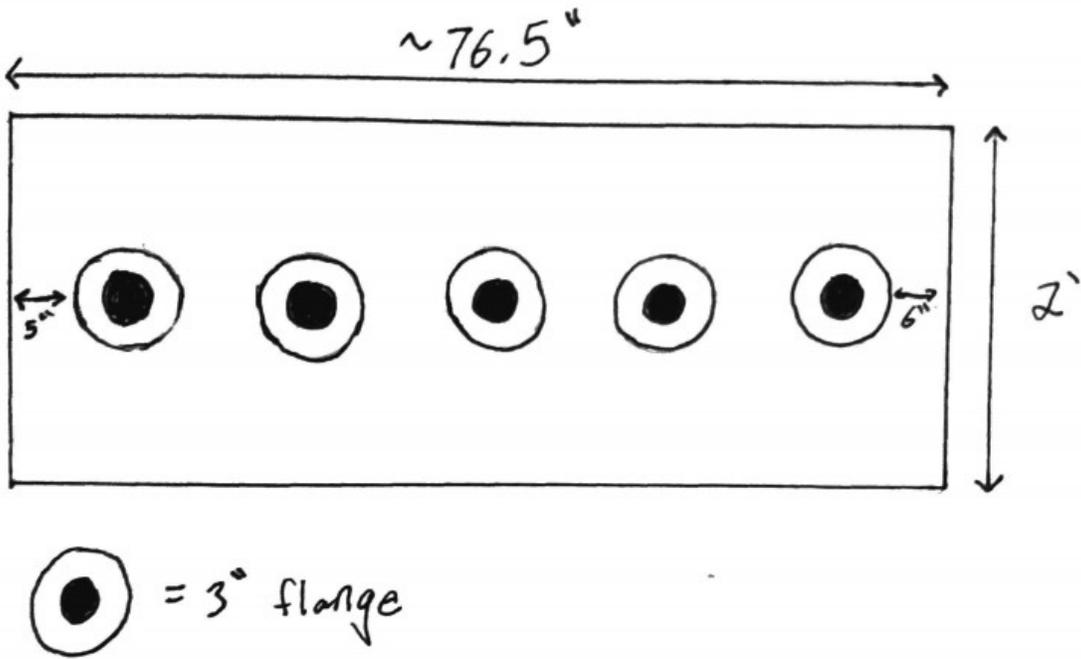
Bottom and Top

Instructions

1. Cut the 4' x 8' sheet of plywood in half. This can be done by drawing a line down the middle, placing half the plywood on the sawhorses, and having one adult cut down the center with a circular saw while a second person holds up the un-supported half of the board. Be sure to keep safety in mind.
2. Next, you are going to prime both pieces of wood. While it won't be visible, primer will prevent the wood from rotting quickly.
3. Once the primer has dried, you can begin building your box. Take one piece of the now 8' x 2' plywood and place it on the sawhorses. If bowing, the crown of the wood should be pointing towards the ground. Start by coating the long edges of the plywood and the long edges of the 8' 2x4s with wood glue. Wood glue can be mixed with water to spread easier. Place 2x4s, clamping them in place. If the 2x4s are bowing, point the curve in the wood out.
4. Carefully flip the whole thing over, so the 2x4s are on the sawhorses. Use the deck screws to screw down one side at a time. Try to force the 2x4s straight when screwing them in.
5. Flip back over. Make sure the 22" pieces of 2x4 fit the width. You may have to cut them down a little. Screw in the 22" pieces.
6. Cut the 4" pieces of 2x4, screwing them in from the sides. Flip the whole thing over again and install the wheels. Lay your castors onto the corners, and mark with a pencil where you want to drill. Remove castors and predrill the top holes. Bolt the castors down using a socket wrench.
7. Once your wheels are installed, flip the whole box over again. Place your blower to the rear of the box, where you would like it to be when your project is completed. This is approximated at 18" in the drawing below, it will probably be less. Draw a line down the width of the base where the end of the blower is.
8. Use the line you just drew to find the length of the top board, the other 2x8 sheet of primed plywood. The is estimated to be 76.5" in the drawing but may be a bit longer. Cut the top board to that length, saving the scrap piece for use later.
9. Position the flanges equidistant in a line down the center of the plywood. The flange closest to the blower should be at least 4" from the edge, while the flange furthest from the blower should be at least 6" from the edge.
 - a. If you are including the extra piece of plywood to cover the bottoms of the flanges, make two of these (steps 8-11). The extra one can be one foot instead of two feet across.
10. Flip the flanges over and using the top of the flange, trace a ring onto the wood. Make sure your spacing stays correct while doing this.
11. Cut the holes you just traced out with a jig saw. These holes are how the air gets from the base to the pipes in the stands.

12. Flip over the flanges again and bolt them to the plywood. The bolts should go on the two slots on opposite sides of the flange. Include two flat washers, one on top of the flange and one under the plywood. Include the 5/16ths lock nut. Tighten with a socket wrench. Add screws to the rest of the holes.
13. Put the bottom back onto the sawhorses. Add the top (the plywood with the flanges). When lined up, use a pencil to trace the holes onto the bottom sheet of plywood (at least for the furthest hole, the rest aren't really necessary).
14. Using the hole you just traced and your knowledge about the distance of the bolts from the hole, position your last two 2x4s to form diagonals. Place the shorter plywood sheet on top so you know exactly where your diagonal boards won't interfere with the flange bolts. It won't be a perfect triangle, but the goal is to get it as close as possible. The goal of the channel being created is to get all the stands to have a similar air output, by reducing the space for the air to move forward after each flange.
15. Mark the ends of the diagonal 2x4s and cut to length.
16. Coat sides of 2x4 and the place you want to stick them with wood glue. To screw these in, add the top of the base. Put a clamp on each end of the diagonal boards. Draw a pencil line from one clamp to the other. Screw in with 3" nails along the pencil line.

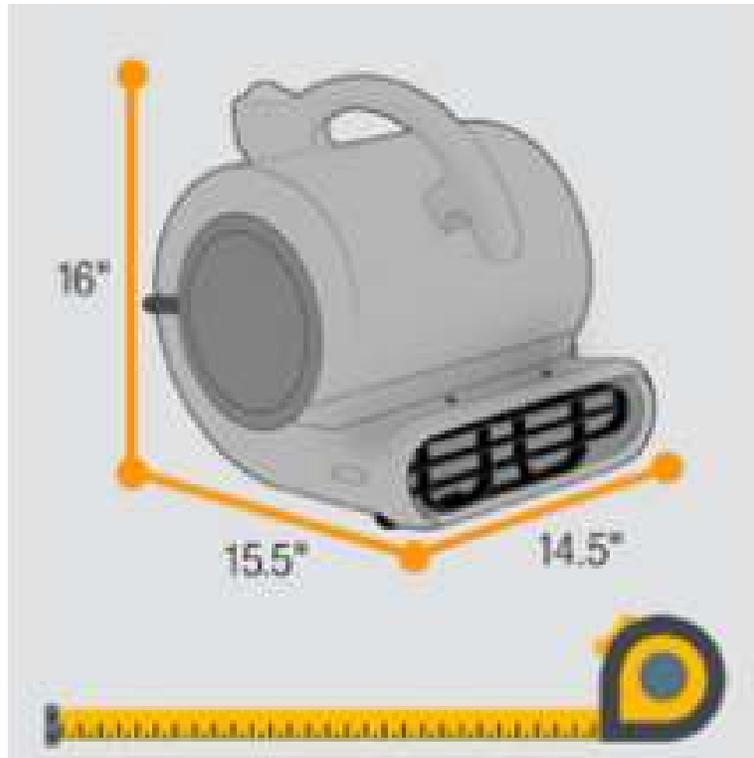




Blower Box *Instructions*

1. Cut two small pieces of wood (about 6") and place them on the pencil line. Push them all the way back so they touch the ends of the diagonal boards.
2. Place the blower in the box, scooting it forward until it touches both pieces of wood. Using a pencil, trace the side curvature of the blower onto the two pieces of wood. Take the blower and pieces of wood out of the box.
3. Cut the curves you just drew out with a jig saw. Place the pieces back into the box and screw them in from the sides using 3" screws.
4. In the picture, you see pieces of scrap plywood screwed to the insides of the box. This is for aesthetics, and you may choose to omit them if you don't have the available wood.
5. Get the piece of plywood saved from the top portion (step 8 of the previous instructions).
6. With a jig saw cut the plywood into a 3-sided square. It may have side widths of 1-1/2" and 3", or more if you chose to add wood. Screw the plywood into the 2x4s.
7. Place the blower in the box, making sure it fits. The blower may still have air leaking out the top.
8. Screw in a 2' long 2x4 into the edge of the long top plywood (shown in the right picture). This should reduce the air that escapes the box, but won't make it airtight.
9. Once you have verified everything is how you want it, prime and paint the box.





1/2 horsepower B-Air Mover
Model #BA-VP-50-GY

Other blowers can be substituted, with similar oval outputs rather than round ones.

Putting it all together

Instructions

1. Retrieve the 6" pieces at the bottom of the stands (the pieces you should not have glued). Stand the pipes on top of the flange rims, making a pencil mark on the pipe where the top of the flange is. You can also just mark 2- 1/2" on each 6" pipe.
2. This step requires speed. You don't want the PVC glue to dry before the pipe is where you want it (glue can usually be scraped or sanded off if necessary). Once you put the glue in the pipe, set it in the flange. Using a piece of scrap 2x4 and a hammer, hammer the pipe into the flange until the pencil mark lines up with the top of the flange. If it's not fully set, that's okay. It only needs to be nearly impossible to get out.
3. Once completed, glue in the stands. This is done merely by coating the inside of the 3" double wyes with glue, and putting them on the 6" pipes now attached to the flanges.
4. The blower can be set in the box and removed with ease.





If you have any questions, you can email: pvcgeardryers@gmail.com