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DIY Dip Stand

Jeff Rice details a small construction project that will produce a dip station for about \$50.

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All photos courtesy of Jeff Rice

The dip is an important functional movement that's an integral part of the muscle-up. Between the muscle-up and ring dips, this movement comes up periodically as part of the WODs at most CrossFit gyms. Unfortunately, performing dips on the rings can be challenging to many beginning CrossFitters, so outfitting your gym with a stand to do bar dips—dips on rigid parallel bars—can be important for building the strength, coordination and confidence needed to master ring dips and to get that first muscle-up.

While many commercial pieces of gym equipment can be used to perform bar dips, all have their pros and cons, and in my experience evaluating dip stands for my own gym, the cons outweigh the pros by a wide margin. Most commercial dip stands are heavy or bulky, making them less attractive for the home gym, where space (or the ability to easily move equipment out of the way) is typically at a premium. Dip stands that are more appropriate for commercial applications, such as real gymnastic parallel bars, are very expensive. For people looking to outfit a CrossFit box, deciding between a large capital outlay on commercial parallel bars and spending similar money on plates, bars or other equipment that plays a more common role in WODs is not a hard decision: spend your money on the equipment that gets used the most.

Making dip stands from scratch is another solution. In my research for homemade dip stands on the Web, I came across an abundance of ideas. Many involved using steel pipe and fittings. These were often attached to walls to provide stability, or they were welded together to form makeshift parallel bars. While all these solutions have their merits, I was looking for something lightweight and something that could easily be moved around the gym. And, of course, I didn't want to spend a lot of money on the project.

PVC—Strong and Light

Drawing inspiration from Coach Glassman's 2003 article [Really Cool Homemade Parallettes](#) and from a design I spotted in a [YouTube video](#) by Matt Wichlinski, I decided to make a dip stand from PVC pipe. Using PVC pipe as the material for the dip stand has the advantage of needing no specialized tools for construction. In fact, the only tools really needed for this project are a tape measure, sandpaper, a level and a fine-tooth saw for cutting the PVC pipe. And, frankly, you don't need a ton of skill.

Another advantage of PVC pipe as a construction material is that it is surprisingly strong in spite of its light weight. This dip stand is designed with 24-inch bars supporting the athlete's weight during the dip. At that length, the flexural strength of 1.5-inch PVC is enough to hold almost a ton. This is plenty strong enough to handle any CrossFitter—even one doing weighed dips.

I built two versions of this dip stand. My first prototype was based on the one in the aforementioned YouTube video (see Figure 1 as well). While it was easy to build and performed reasonably well for seasoned athletes, it lacked

stability. Unless you can perform dips pretty smoothly, the original design would tend to oscillate. This was somewhat "disconcerting" to inexperienced athletes.

A redesign of the prototype yielded much-improved stability (see Figure 2). The resulting dip stand is lightweight, inexpensive and, with the addition of the diagonal bracing on the side, solid enough for even novices to dip without feeling like they are working out during an earthquake. The materials for this final design will run you around \$50 US and should only take you a few hours to complete.



Figure 1: Original dip stand prototype.

Before you dive into this project, if you have never worked with PVC pipe before, I recommend you build a simpler project first. Perhaps try the parallettes I mentioned earlier. Working with PVC is not difficult, but a little experience will go a long way in giving you great results on this project.

It is also worth pointing out that the dimensions of this dip stand will not allow it to fit through standard-width doors. Give some thought to where you want to ultimately



Figure 2: Redesigned dip stand with bracing.

put it before you start gluing everything together. Don't assemble this in your driveway if you plan on using it in your basement gym.

Ready to go? Let's walk through the construction process.

Pieces and Parts

Table 1 shows the complete parts list for the project. I used 1.5-inch PVC pipe and fittings, but you could also use 2-inch pipe and fittings. I find the 1.5-inch pipes feel more comfortable than the 2-inch pipes when doing dips, and while the larger pipe would be slightly more rigid and less prone to oscillation, with the added braces in my final design, the flex in the 1.5-inch pipe is negligible.

All the parts should be available at your local hardware store and are certainly readily available from the national hardware chains.

Table 1: Dip-Stand Parts List

Item	Count
1.5" diameter Schedule 40 PVC pipe	5 x 10'
1.5" PVC "T" fitting (socket/socket/socket)	18
1.5" 90-degree elbow fitting (socket/socket)	6
1.5" 90-degree elbow fitting (socket/spigot)	2
8 oz. PVC purple primer	1
8 oz. PVC cement	1

As mentioned earlier, you won't need many tools. Table 2 shows the complete list.

Table 2: Tools

Fine-tooth saw
Medium-grit sandpaper
Tape measure
Pencil or marker
Level

Measure Twice, Cut Once—and Repeat

The first step is to cut the five 10-foot PVC pipes into the appropriate pieces. As always, your mantra here is, "Measure twice, cut once!" You can use a fine-tooth handsaw to make the cuts. I used a power miter saw with a fine-tooth blade, mostly because with a miter saw you can make quick work of the many cuts, but also because I believe there is little purpose in undertaking a weekend building project unless some power tools are involved. Table 3 shows the cutting list. You can get all these cuts out of the five 10-foot pipes using the cutting diagram in Figure 3.

Table 3: Dip-Stand Cutting List

Length	Count
15.5"	2
6"	6
17"	2
24"	2
11"	10
7.5"	4
36"	4
36.5"	2
47"	1

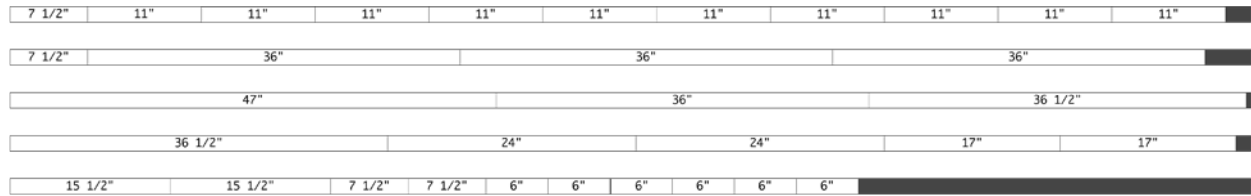


Figure 3: PVC cutting diagram.

Prime(r) Time

Once you have cut all the pipe pieces, you are basically done with the heavy lifting. What lies in front of you now (literally—see Figure 4 and Figure 5) are a bunch of PVC parts that need to be primed and glued together. Before you can start assembling things, make sure your pipes and fittings are clean and free of burrs and loose bits from the sawing process. You can use a bit of sandpaper to remove any burrs from the ends of the pipes.



Figure 4: The required lengths of PVC pipe all laid out, plus coffee (also required).



Figure 5: All the required fittings.

Please note: Assemble the stand in an area with good ventilation! The fumes from the primer and glue are pretty nasty and can be hazardous to your health. Read the labels on the glue and primer prior to using them, and follow all directions on the labels. You have been warned.

After cleaning the pipes, you will need to apply primer to both ends of all the pipes, and to the surfaces of all the connectors that will be in contact with the pipes. There is a bit of an art to applying the primer so that it doesn't run all over the pipes and fittings. The key is to get the excess off the applicator before you start swabbing the pipe ends.

Be sure to down newspapers or drop cloths on any surface you don't want stained purple. I prime the pipes in groups and let the primed ends hang over the end of the table so that the primer doesn't drip down the length of the pipe (Figure 6).



Figure 6: Pipes being primed. Hang them over the end of a table so the primer doesn't run.

Putting It Together

Figure 7 shows how all the pieces fit together. To assemble the stand, start at the bottom and work your way to the top. There are really only two tricky parts to the assembly, and I'll address each of them as they come up in the process.

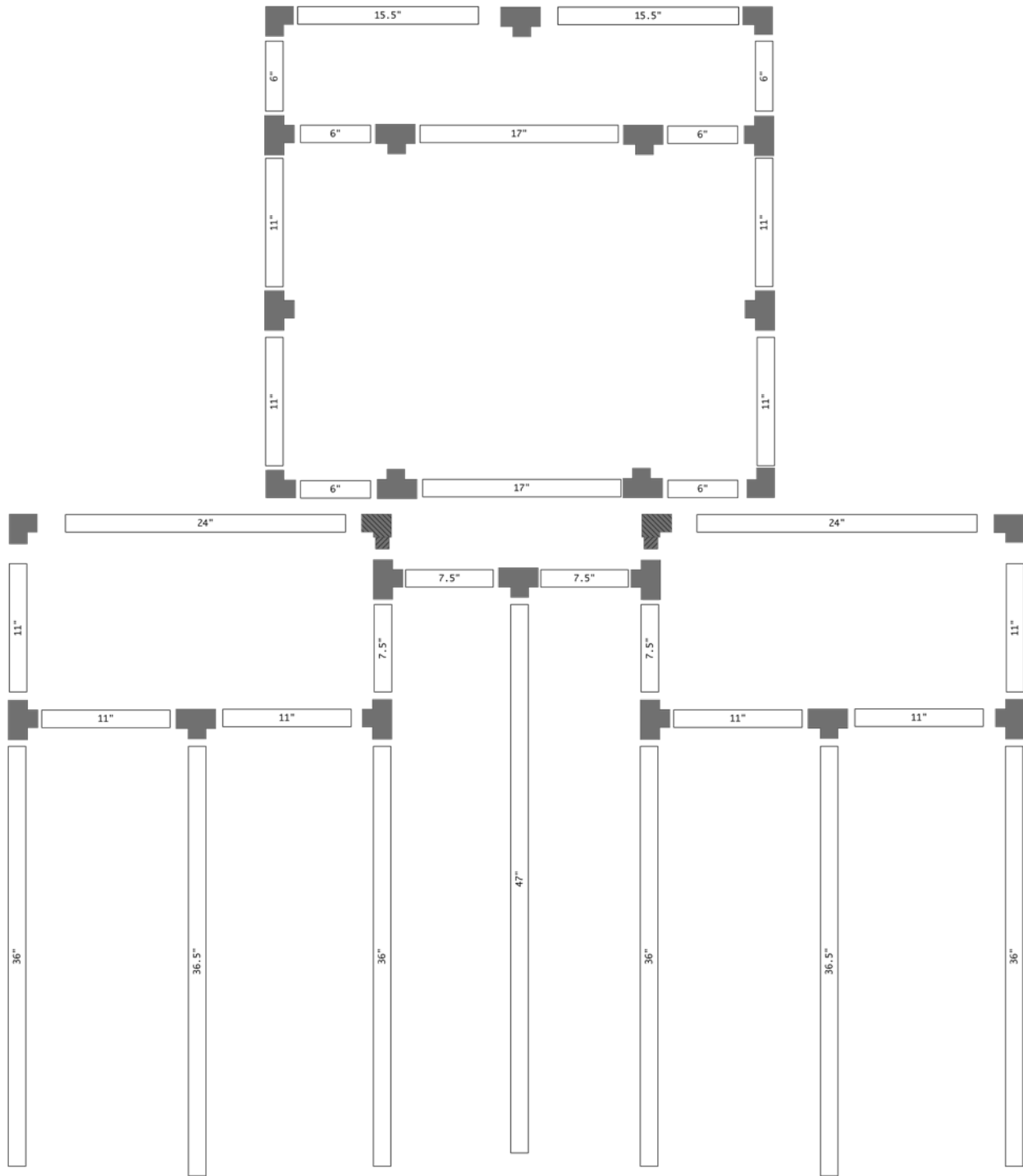


Figure 7: Exploded parts diagram.

Figure 8 shows the order in which the pieces will be assembled. There are 10 steps (labeled A-J). Let's take them in order.

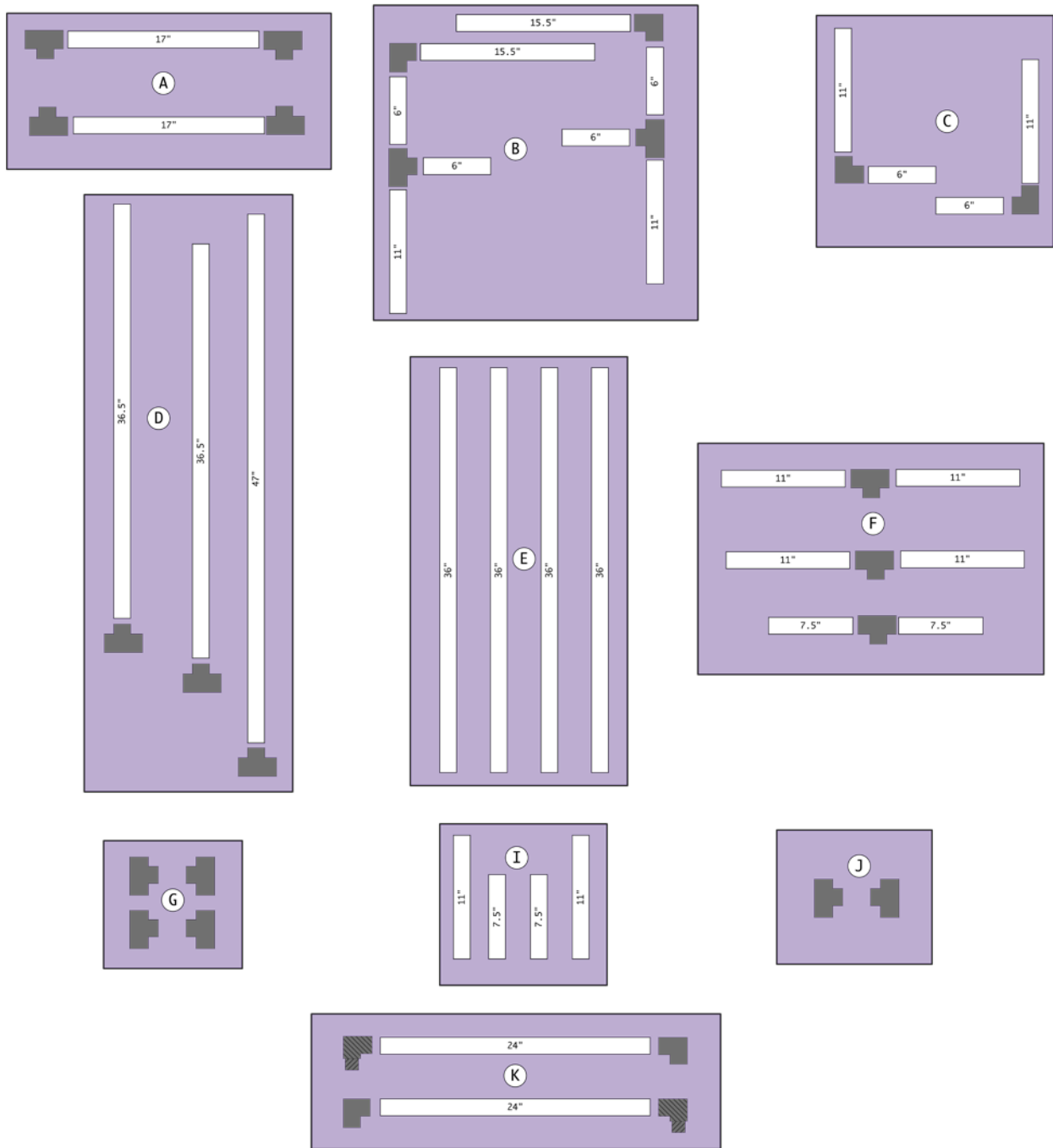


Figure 8: Parts organized by assembly steps.

Step A

Assemble the two braces that will eventually support the uprights. Do this by gluing one of the T's to one end of a 17-inch pipe. Follow the gluing directions on the glue container with regards to how much to apply. Be sure to measure each of the pipes before you glue it to anything. There are lots of pieces, and many of them look about the same length. Don't trust your eyeballs. Measure first. Once these babies are glued together, they are not coming apart.

Now, here is the first tricky part. When you glue the second T to the 17-inch pipe, you need to make sure it is lined up with the first T so that both of the openings are pointed in the same direction with as little variance as possible. I do this by applying the glue, putting the second T on, and then laying the assembly on a table or other flat surface, applying pressure to the T's so that they line up. The T's will want to lie flat on the table, so push down on them until they both are lying flat on the surface (see Figure 9.) You need to move quickly: the glue will set up in about 3 seconds.

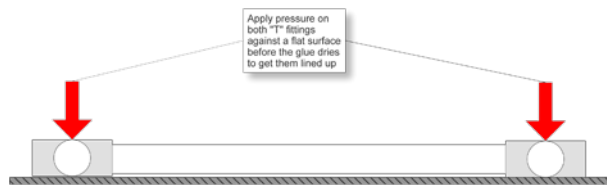


Figure 9: Place the assembly on the table and press down to align the T's before the glue sets.

Step B

Assemble the two corners of the base using the pipes and fittings indicated. Again, measure everything first. And it is a good idea to lay the pieces out as shown in Figure 8(B) to make sure you have everything ready to go. Start by gluing all the pieces that attach to the T, then glue the 15.5-inch pipe to the elbow fitting. Finally, glue the elbow fitting assembly to the T assembly, pressing the two fittings against a flat surface to line them up as you did in the last step.

Step C

Assemble the other two corners of the base with the parts shown in Figure 8(C).

Step D

Assemble the diagonal braces by gluing T's to the two 36.5-inch pipes and the one 47-inch pipe. Again, measure those pipes first. The 36.5-inch pipes look a lot like the 36-inch ones.

Step E

Glue the four 36-inch pipes into the two assemblies you made in Step A.

Putting the Base Together

Now that you've gotten Steps A-E done, you are ready to put the base together. Begin by taking one of the two F-shaped assemblies completed in Step B and gluing it to one of U-shaped assemblies you made in Step E. When you do this, the 36-inch upright needs to be pointing perpendicular to the plane of the F (Figure 10). The best way to do this is to put the F on a flat, level surface, gluing the pipe and the socket end of the T on the upright assembly. Quickly insert the pipe into the socket and adjust the upright assembly using a level until it is vertical. This does not need to be absolutely perfect, but you should get it as close to vertical as possible.

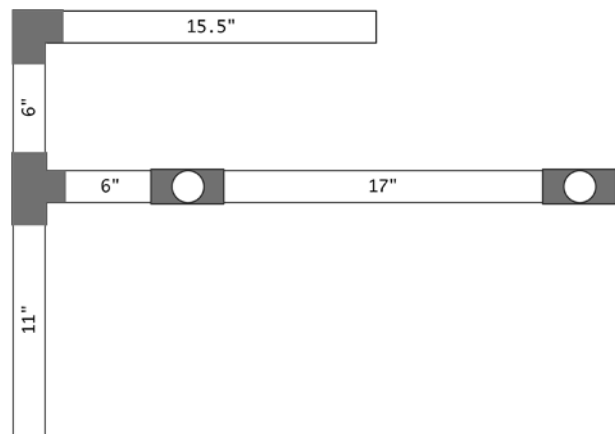


Figure 10: Partial assembly of the base.

Another Tricky Bit

The next piece to attach to the base is one of the 36.5-inch diagonal braces. These provide rigidity to the stand and have to be installed at approximately an 80-degree angle. The easiest way to get the angle correct is to loosely fit the T on the 36.5-inch brace to the base assembly. Once it is loosely attached, adjust the angle of the brace so that it lines up with the tops of the 36-inch uprights (Figure 11). Once the brace is lined up, make two marks on the assembly: one on the pipe that the brace is connecting to, and one on the T. These marks should make a straight line when the brace is at the 80-degree angle (Figure 12).



Figure 11: Line the diagonal pipe up with the tops of the uprights.

Now take the brace off, apply glue and put it together, making sure the marks line up (Figure 13). Once the glue sets, your brace should be at just the right angle. As with the uprights, if it is off by just a bit, don't panic. There will be enough flex in the pipes to move it into position when you attach the upper assemblies.



Figure 13: Line the marks up before the glue sets.

Repeat this procedure with the 47-inch brace, attaching it to the top of the F. The top of this brace will need to line up with a line projected out of the top of the braces (Figure 14).



Figure 12: Make marks on the pipe and T when the angle is correct.

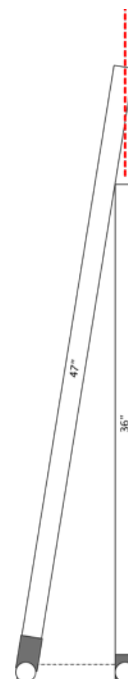


Figure 14: Line the long diagonal pipe up with the plane of the uprights.

Finish the base by attaching the other F assembly, followed by the other 36.5-inch diagonal brace. Attach the two corner pieces from Step C to the U assembly from Step E. Finally, attach that assembly to the other half of the brace (Figure 15).



Figure 15: The completed base.

Step F

At this point, you should be getting the hang of gluing PVC together. The remaining steps should go pretty quickly. Glue together the braces shown in Figure 8(F). Attach the two braces made from the 11-inch pipes to the top of the 36.5-inch diagonal braces (Figure 16). Before the glue sets, adjust the angle so they line up with the ends of the uprights.



Figure 16: Braces attached to the two side diagonals.

Step G

Glue a T to the top of each of the four 36-inch uprights. Make sure the openings in the T are pointing as is shown in Figure 17.



Figure 17: The T's attached to the uprights.

Now glue the diagonal braces into the T's on the uprights as shown in Figure 18. You will have to glue both sides of the brace assembly at the same time, so apply the glue, insert the ends and *very quickly* push the uprights together to fully insert the brace pieces.



Figure 18: Diagonal braces locked into place.

Step H

Glue the two 11-inch pipes into the T's furthest away from the 47-inch diagonal brace, and glue the two 7.5-inch pipes into the T's closest to that long diagonal brace.

Step I

Take the short brace made in Step F and glue it to the top of the long diagonal brace. Before the glue sets, make sure its angle is set so that the brace lines up with the two uprights.

Now attach two T's to the 7.5-inch upright pipes, making sure their openings are pointed directly toward each other. Finally, glue the top of the diagonal brace assembly into the two T's. You will have to glue both ends in at the same time, so move quickly before the glue sets.

Step J

Assemble the top bars from the parts shown in Figure 8(J). Use one of the socket/socket elbows and one of the socket/spigot elbows on each assembly. Once more, you will need to make certain the ends of the two elbows are pointing in the same direction, so use the technique of setting the angle on a flat surface again as was described in Step A.

Once the glue sets, attach the two assemblies to the top of the uprights. The socket/spigot elbows fit right into the T's at the end with the long diagonal. This may end up being a tight fit, so you may have to use a bit of force to get it in place. This is also another assembly where you will have to glue both ends at the same time, so you will need to move quickly. Once you insert both glued ends into the uprights, pull the assembly down fast and hard to seat it all the way.

Wrapping it Up

The dip stand will be ready to use almost immediately, though you may want to let the glue fully harden for a few hours before you put the stand through any really rigorous WODs.



About the Author

Jeff Rice is the owner and founder of Flower City CrossFit in Rochester, N.Y. In addition to being a CrossFit affiliate owner, he is an avid triathlete and dad, and these days he's getting to be pretty handy with PVC pipe.