Bend PVC Pipe

by **Thinkenstein** on January 14, 2010

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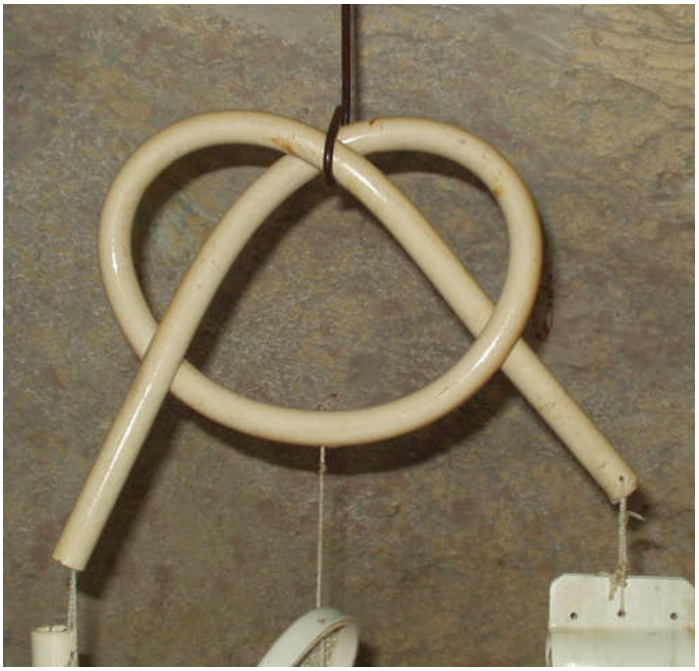
Intro: Bend PVC Pipe

PVC pipe is a great material for making things. If you ever need to bend the pipe, here's how to do it.

The trick is to fill it with sand before heating the plastic and bending it. Normally, the pipe would pinch closed in areas where it is bent, but the sand prevents that. When the heat forming is finished, you just drain out the sand.



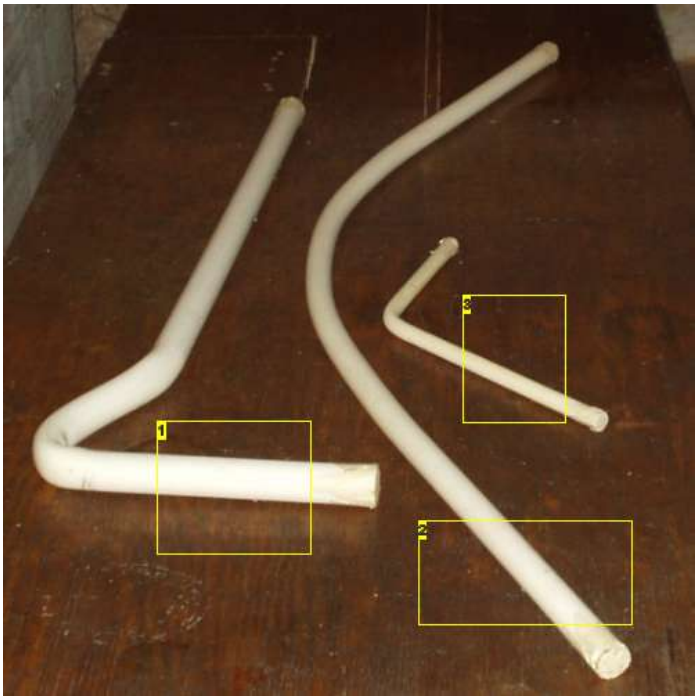


Image Notes
1. walking cane
2. massage stick
3. musical instrument

step 1: Safety while heating PVC

We love plastics for what they do for us, but plastic manufacture and decay tend to pollute the environment and negatively affect our health.

Vinyl Chloride, one of the components of PVC, is carcinogenic. When it is locked up in the polymer, however, it is much safer to be around. In my years of experience working with PVC, I have not noticed any adverse effects on my health from being around it.

Always work in areas with good ventilation. If you do get caught in a cloud of smoke, hold your breath and move to clean air.

When heating PVC with a gas stove or propane torch, try not to let it burn. Smoke from burning PVC is bad. With experience one burns it less and less. Don't panic the first time you do burn some. It scorches, but doesn't immediately burst into flame. Move the material away from the flame and try again. Don't breathe the smoke. Smoke avoidance comes naturally for most people.

While heating PVC over a gas flame, keep the plastic an appropriate distance from the flame to avoid scorching the surface before the inside can warm up. It takes time for heat to travel to the center of the material being heated.

Keep the plastic moving, and keep an eye on the state of the plastic. When heated, the PVC material is flexible, like leather. Beyond this stage, you risk scorching it.

A word from James, the plastic engineer -- "Just a word of warning, PVC can handle some high heats but if it catches fire, you wont be able to put it out, it does not need oxygen to burn so don't do this inside".

I do work inside, but my house is made of cement and has good ventilation. MAKE SURE THAT YOU HAVE GOOD VENTILATION. PLAY WITH FIRE -- CAREFULLY.

step 2: Fill the pipe with sand

Cover one end of the pipe with masking tape to hold the sand in. Fill the pipe with sand, tapping the taped end of the pipe on the ground to compact the sand inside. When the pipe is full of compacted sand, tape over the top end. You are ready to heat and bend.

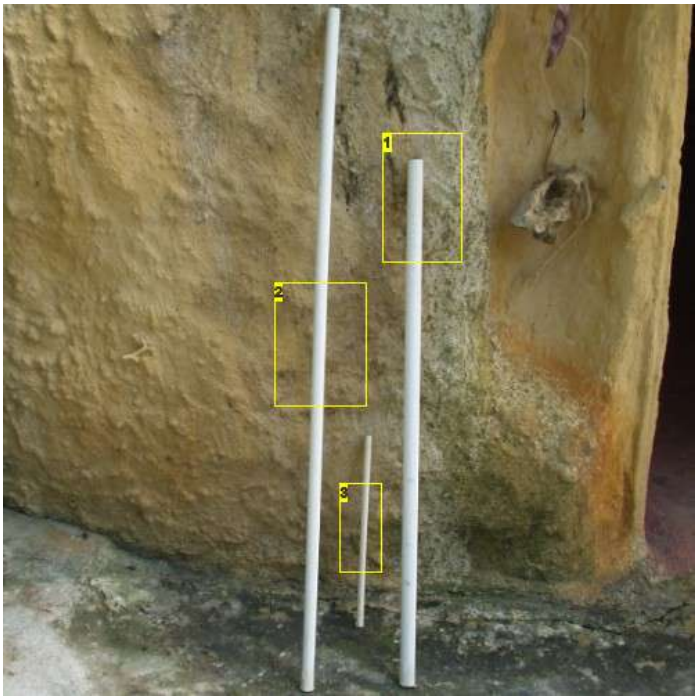


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Image Notes
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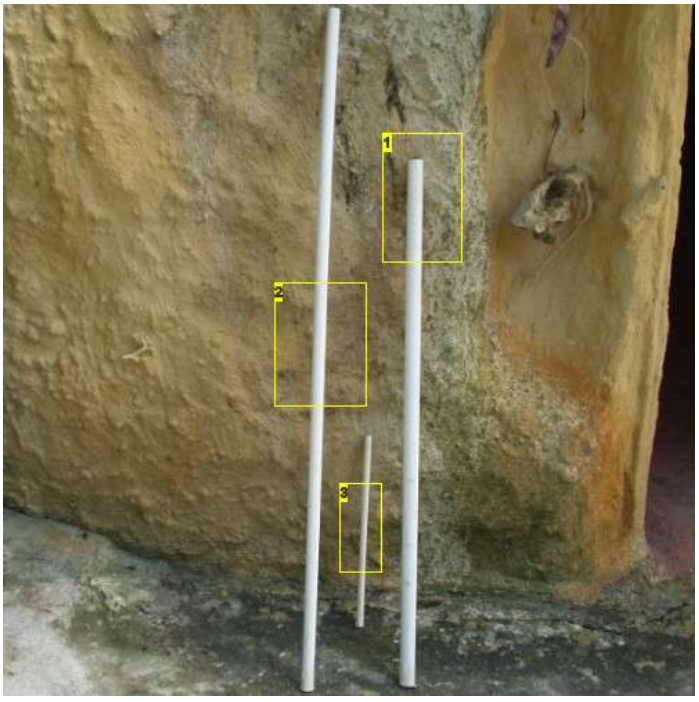

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step 3: Heating and bending

I use a gas stove for heating and bending sections of pipe.

Hold the pipe from both ends. Keep the pipe moving back and forth over the flame, rotating the pipe all the while so that the area to be bent is evenly heated.

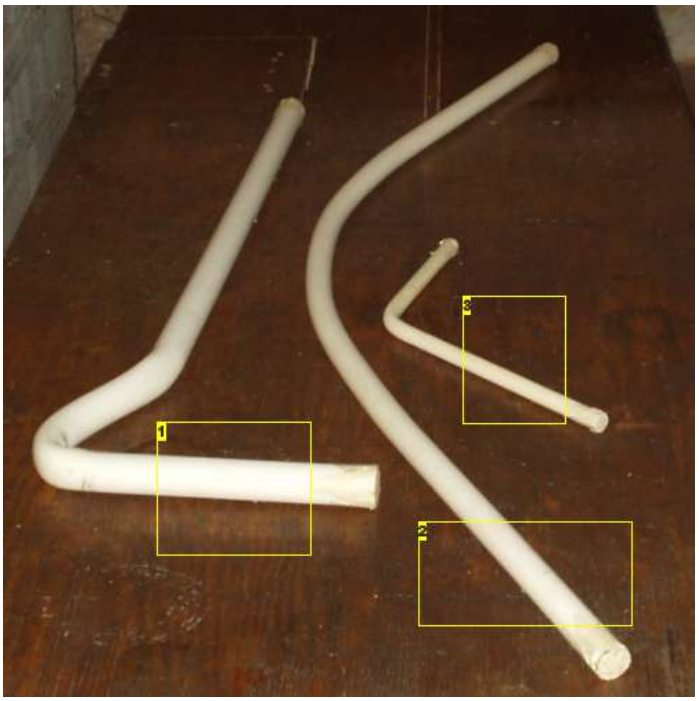
Keep the pipe at a reasonable distance from the flame to keep from burning it. Heat penetrates slowly through the plastic. Be patient. Haste can result in burnt plastic. Don't try to heat it too fast.

When the plastic softens up some, the pipe begins to sag from its own weight and the weight of the sand inside it. It gets leathery.

At this point, turn off the stove and bend the pipe into the shape you want. Do it on the floor, if you want to keep it all in one plane.

step 4: Some finished shapes

These are a few bent pieces of pipe. The ends of the pipe are still taped.



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Comments

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smokehill says: Feb 2, 2010. 7:41 PM **REPLY**

I have not personally tried it, but I've spoken to commercial plumbers that have bent PVC pipe with the exhaust from their work trucks. I'm not sure this would work for very tight curves without something on the inside (sand, springs, etc), and I think they were talking about 45-degree angle bends, or less, to make runs of pipe match up without fittings (especially if it was a strange angle for which fittings don't exist).

As I recall, the idea was to stick the PVC pipe up the exhaust pipe and gradually bend it, making the angle appear at the end of the exhaust pipe.

Thinkenstein says: Feb 3, 2010. 6:40 AM **REPLY**

Interesting idea. Thanks for sharing it.

Years ago, I read of some Boy Scout leader who built a little oven around the exhaust pipe. They put food in at the beginning of a trip and it was ready when they arrived. Seems like it would have to be gas tight to avoid contamination of the food. Anyway, it seems like a creative use for exhaust heat.

The Bottomless Paddling Pool says: Feb 27, 2010. 3:57 PM **REPLY**

That reminds me: When my father was in high school he would heat his lunches and drinks during winter on the school's transformer cases from it's own power plant. I've always liked that.

smokehill says: Feb 3, 2010. 8:18 AM **REPLY**

Interesting idea -- sort of a variation on the old Army trick of putting cans of food on the intake manifold of a Jeep or an old Deuce-and-a-half truck to cook it. I never personally tried it, but heard of the trick the whole time I was in the Army ('64 to '85). Generally I was lucky enough to be near one of those old gas-fired water heaters in a metal drum

It was common, when I was in the field, to put your laundry in a big metal ammo can, with soap & water, and then strap it to the intake manifold. As you drove around, it heated the soapy water & agitated it like crazy, so all you had to do when you got back was rinse the stuff. The process had a lot of cute names like "Military Maytag," etc.

No sense wasting heat ....

Thinkenstein says: Feb 3, 2010. 10:38 AM **REPLY**

My father said that in World War II, they used to put beers in wet socks and spin them around to cool the beers through evaporation. Another creative problem solution.

blazingpencilsdotcom says: Jan 21, 2010. 9:11 AM **REPLY**

Would you recommend this for making greenhouse hoops? Would the PVC hold up to UV radiation?
Thanks!

Hammerhead46 says: Jan 30, 2010. 2:22 PM **REPLY**

After you bend the PVC just "Paint" it.
I have been doing that with masts that I use for Radio Antennas for many years and with 2 coats of white paint I have only had one break in 5 years due to sun / wind damage.
The wind sandblasted the paint off about 15 feet up and I didn't see it.
Good luck on the greenhouse and post an instructable on it.

n0ukf says: Jan 22, 2010. 10:59 AM **REPLY**

Gray PVC conduit might resist the UV better than plumbing type. For the more gradual bend of 'greenhouse hoops' (quonset style buildings), you may not need to bother with filling and heating. But that depends on how large the bend radius is.

Thinkenstein says: Jan 21, 2010. 10:15 AM **REPLY**

I don't know what you mean by greenhouse hoops, but I think PVC holds up better to UV radiation than most plastics. It does eventually get brittle, though.

bulsatar says: Jan 17, 2010. 8:32 PM **REPLY**

Just a possible alternative, instead of heating the pipe, couldn't you heat the sand first, then pack it into the pipe? It wouldn't have to be hot, just warm. And after you pack it in, just leave and come back in say 10 minutes or so and then bend the pipe?
Also, do you think it would work on the thicker walled cpvc?

Thinkenstein says: Jan 18, 2010. 9:32 AM **REPLY**

I think the sand would be awkward to heat separately and work with hot. If the pipe didn't reach temperature, you would have to start over. Anyway, give it a try, and report back to us. The theory is nice.

CPVC does heat form, but it takes more heat than PVC.

cougarmandan says: Jan 23, 2010. 9:49 AM **REPLY**

I think heating the sand misses the point of how simple it is to do this simply with the stove.

Mr. Bricoleur says: Jan 21, 2010. 5:03 PM **REPLY**

My Boy Scout troop used a method some time ago, heating up sand in a pot with a stove until it's REALLY hot, then pouring it out into a trough. Then, the PVC section would be placed into the trough for about a minute, taken out, and bent to shape. If you need to heat more PVC but the sand's too cool, just pour the used sand into a bucket and pour some more of the pot of heated sand into the trough.mak It worked really well to make many pairs of PVC horseshoes. So, if that works, really hot sand inside the PVC might work as well, although the method in this 'ible is a lot easier than anything. :) Thanks.

bulsatar says: Jan 21, 2010. 8:37 PM **REPLY**

Yes, this method would be great for single bends. I was thinking a little more...roundly. I have previously made a custom shower head with cpvc and this 'ible gave me a REALLY great idea for custom nozzles. May be a couple of months (as I need to purchase a vehicle first) but I think I have a good start for an 'ible!
Hopefully, as long as I don't get to distracted by shiny objects ;)

bulsatar says: Jan 17, 2010. 8:32 PM **REPLY**

GREAT 'IBLE btw :)

eafindme says: Jan 21, 2010. 7:02 PM **REPLY**

Hi, since you used PVC pipes to make walking cane, can the PVC pipe be used to make seats? Is this possible?

Thinkenstein says: Jan 21, 2010. 10:10 PM **REPLY**

Years ago people were making very boxy furniture using straight pieces of pipe and standard connectors like Ts and elbows. Really crude and not very comfortable. I always thought of having a 10 ft. oven to heat whole pipes and then bend them into curvy furniture, like rocking chairs.

Anyway, yes, it is possible to make seats with PVC. Making comfortable and good looking ones is the trick.

lngchao says: Jan 23, 2010. 5:55 AM **REPLY**

WOW, a pvc rocking chair would be wicked cool! I worked for a company in the late 70's- early 80's assembling pvc furniture. They were pretty comfortable, too.
They used custom slings to hold the cushions at an angle instead of the chair backs being straight. We still have a table or 2 kicking around the yard!

Nice Instructable!
I wish I would have seen this before my hip surgery, I made my cane from straight pipe and some fittings. It's not as slick looking as yours, but it also has a hidden lightsaber :)

hjartland says: Jan 22, 2010. 12:25 AM **REPLY**

Hope this hasn't been asked yet ... How strong is it after bending? Does it retain the same "spring" like quality? Does it become brittle?

Thinkenstein says: Jan 22, 2010. 7:10 AM **REPLY**

Good questions.

As far as I can tell, it is just as strong after bending as before. Chemically, I don't think you break any of the polymer chains by softening the plastic, or bending it.

Yes, it seems to be just as springy.

It doesn't become brittle.

Interestingly, it does seem to have some "memory" of its original shape. If you heat it up again, it tends to return to the way it was.

I imagine the original shape was a liquid mass of goo, but the first time it is shaped is as pipe. If you just soften it to stretch it, heat it again and it unstretches.

Someone at the PVC factory told me once that they never have any 2nd quality pipe, because if it is defective, they just reprocess it. From that, I imagine that you can take solidified PVC and melt it again, probably in the absence of oxygen.

You can weld it somehow with a hot air gun and a special tip, but I never had any luck with that.

DrCoolSanta says: Jan 22, 2010. 8:04 PM **REPLY**

I don't know about anything else, but I remember the thing about the memory...
I don't know the science behind it too, but plastics tend to have a memory of the shape they were in before...
There was a video on youtube that showed someone heating a yoghurt cup in an oven and it returned to the disk like shape they melt to form the cups...

Aquilla says: Jan 22, 2010. 12:58 PM **REPLY**

I don't work in a PVC factory, but I'm fairly sure PVC is a thermoset, not a thermoplastic, so reprocessing defective polymer would require some rather specific solvents, as opposed to just heating it and resetting it.

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zappenfusen says: Jan 21, 2010. 7:42 PM **REPLY**

As an electrician we've been bending P.V.C. for years. They produce special heaters and plugs for the end of the conduit & the heated, expanded air prevents collapse. We bend 4" conduit using this method & high dollar heaters. I've made Christmas display candy canes stuffing 1-1/4" P.V.C. stuffed with rags. You can bend up to !" with a heat gun & patience.

Funk_D says: Jan 21, 2010. 10:45 AM **REPLY**

This is awesome! Just this morning I was trying to think of a way to bend some PCV I have to make a bike rack so I didn't have to go buy 90 degree joints! Thank you!

Also, do you think this method would work with copper piping? I need to bend some into a radiator shape but I can't figure out how.

Thinkenstein says: Jan 21, 2010. 5:01 PM **REPLY**

I think copper pipe has been bent cold with sand inside. Pack it tight and give it a try.

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crashrandall says: Jan 21, 2010. 1:30 PM **REPLY**

If you get ductile copper tubing, it is bendable without heat. The straight stuff is not so bendy though, and is prone to cracking and creasing instead of bending clean.

AlleluiaPTL says: Jan 21, 2010. 11:29 AM **REPLY**

I may not have made myself clear on my previous blog.

Is it possible to bend 32 or 40 mm pipe using this idea.
Thanks

Tim Temple says: Jan 21, 2010. 6:57 AM **REPLY**

Would the Viper springs work for heated bamboo? I know we can bend bamboo with sand.

CoolKoon says: Jan 21, 2010. 7:14 AM **REPLY**

I'm not sure what are you referring to by the "Viper springs" regarding bamboo, but bamboo is a natural material. This means it has to be bent by other ways. AFAIK you can do it by soaking it in water for a while (or more ideally in hot steam) which will soften any wood or wood-like material which will be flexible enough to be bent at will. You'll have to fix it in its new position though until the time it dries I think.

Tim Temple says: Jan 21, 2010. 11:12 AM **REPLY**

I was taught to fill bamboo with sand, heat bamboo on the inside of the curve and pull it on over. When it cools, it is set.
See: http://www.youtube.com/watch?v=iV-CE3hW4ss

spylock says: Jan 21, 2010. 10:30 AM **REPLY**

Good one,I will have to keep some sand in a coffee canister on my work truck,will also show my fathers employees how to do this method.

firefighter1333 says: Jan 21, 2010. 9:17 AM **REPLY**

this will propably make a great gun-stock :D ty

ivyplant says: Jan 21, 2010. 9:11 AM **REPLY**

Using sand to maintain the id of the pipe is excellent! We used to wrap the pipe with aluminum foil and use a butane torch to heat it up. The foil helped distribute the heat evenly over the bend and kept the pipe from getting too hot in one place and catching fire. The Pipe Viper is awesome, but it's always nice to know techniques that work without specialty tools. Thanks for the post and the excellent idea!

AlleluiaPTL says: Jan 21, 2010. 5:11 AM **REPLY**

Exellent, was pumbing in a dishwasher recently and had to fiddle with 90 degree joints... this will save time and money...

Plumbers should use this method... they could keep a supply of curve pipes for future tasks.

charlessenf-gm says: Jan 21, 2010. 8:25 AM **REPLY**

Better solution for plumbing is the flexible pipe and no-solder fittings available at Lowes and HD. It comes in short lengths as well as 100' coils.

But, this idea for bending PVC is a good instructable and, the resulting stable shapes are likely to be most useful for other projects where the rigid result is desired "after the bending."

dangeross says: Jan 16, 2010. 10:24 AM **REPLY**

GREAT! Now I dont have to go to lowes to buy that 90

Dries von weidtz says: Jan 15, 2010. 10:44 PM **REPLY**

Happy new year ya all

Nice tip Thinkenstein
One question though . If youre married and making something for the home the lady of the house obviuosly wants it more refined .
Any tips on that.? For example smooth edges maybe some colour staighter edges etc
Thanks

Thinkenstein says: Jan 15, 2010. 11:34 PM **REPLY**

Tip: make the edges smoother, the edges straighter, and use some paint.

Alternative solution: help women to evolve to appreciate less refined things. Preferably, teach them to make the things themselves. Leave the edges and color up to them.

MichelMoermans says: Jan 15, 2010. 6:23 AM **REPLY**

Your 'ible made me think. In highschool we never used heat to bend pvc pipes, for our installations we used something that you could just stick into the pipe and then bend it using your own force. Then when you were done you'd simply pull it out and the pipe would remain undamaged but bent in a nice curve. I think I have one of those things lieing in my garage. I'll check tonight and see if my memory isn't betraying me...

If it works like I remember I'll post a picture and maybe make an 'ible of my own about it.

Thinkenstein says: Jan 15, 2010. 7:57 AM **REPLY**

I imagine you are thinking of another material. If you bend PVC cold, it tends to spring back into its original shape.

Anyway, whatever you remember seems new to me, and I'd like to know what it is.

godofal says: Jan 15, 2010. 10:42 AM **REPLY**

no, i know what hes talking about, and hes right.
its like a long spring, one of those pull versions, it fits really nice inside, and it doesnt require alot of force!

MichelMoermans says: Jan 15, 2010. 11:58 AM **REPLY**

Yep, that's right. It's some sort of a spring.

I asked my dad about it and he says that it works with all "normal" PVC pipe of normal diameter.

Just stick the spring in there and bend using your hands. I can't find the spring in the garage right now but if I can't find it in the morning I'll search for a picture on google :)

MichelMoermans says: Jan 15, 2010. 12:03 PM **REPLY**

http://www.youtube.com/watch?v=PFB2-8gWzl0

There ya go, it was quickly found. This is what we used in school. A spring that bends the pvc pipe cold without compromising the integrity or durability of the pvc pipe also the spring is the same diameter as the innerhole so while bending the hole won't get smaller.

This video explains how it works and how less time consuming it is.

Shadow Ops says: Jan 15, 2010. 5:36 PM **REPLY**

The Pipe Viper is a pretty amazing concept!

Thinkenstein says: Jan 15, 2010. 2:37 PM **REPLY**

I never would have believed it possible, but I saw the video. Pipe Viper. I'm going to have to send for one of those. Thanks.

MichelMoermans says: Jan 16, 2010. 12:44 AM **REPLY**

You're welcome :)

According to me it has been around for atleast 4-5 years since I came in to contact with it when I was 14.

That's why it suprised me nobody here seemed to realize you could bend pvc cold. Well this is were instructables is for gaining knowledge and using it to fit your needs :D

backyardmunitionist says: Jan 23, 2010. 4:39 AM **REPLY**

looks alot like a weakened version of a garage door spring

alex-sharetskiy says: Jan 17, 2010. 10:17 PM **REPLY**

how does it work?

MichelMoermans says: Jan 18, 2010. 4:31 AM **REPLY**

www.youtube.com/watch

This video should give you a pretty clear picture.

But it's just sticking the spring in. Look were you want to bend your pipe. And bend it with your hands until you have the shape you want. Then you just pull the spring out and your done :D It does require the use of some force but if a 14 year old can handle it I'm pretty sure everyone here can too.

alex-sharetskiy says: Jan 18, 2010. 6:03 PM **REPLY**

I mean, what are the mechanics of it?

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