

# Cat Cage Modifications: Making Double Compartment Cat Cages using a PVC Portal

Making and installing cat portals is a great way to bring expensive existing cages up to shelter standards in an economical way. That said, we now offer prefabricated portals that are affordable and will save you valuable time that you can instead use to focus on your facility's life saving mission.

**Why Portals? Check out the [Portals: Opening the Door to Lifesaving page](#). Also [see The Portal Project website](#).**

**[New prefabricated portals](#) are available if making them is not something you want to tackle. Otherwise if you want to make some portals that are relatively inexpensive on materials cost but a bit labor intense please read on:**

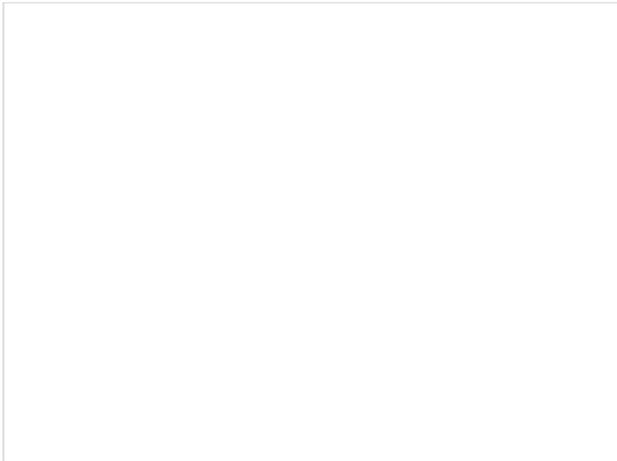
This is a very basic how-to-guide for making and installing PVC portals that will allow you to transform single stainless steel cages into double compartment housing units. There are many different ways to accomplish this feat - this is just one way to do it. Doing these modifications takes some knowledge and skill in using a variety of tools safely. Please seek additional guidance if needed. (Additionally, these portals will work in cages of other material type: fiberglass, laminates and plastic. Holes can be cut using a saw that is appropriate for the material.)

We have now made and installed hundreds of these portals - they can be done - and the cats - they love, love, love double compartment housing!!

If you have questions about doing this, please contact us at [sheltermedicine@ucdavis.edu](mailto:sheltermedicine@ucdavis.edu) and we will be in touch as soon as we can.

We now have a video that shows the basic processes of putting in portals.

And if you are into still pictures - check out our Flickr set on portals: <http://www.flickr.com/photos/sheltermedicine/sets/72157631622824999/>



## Needed Items for cutting stainless steel:

**Some method to cut stainless steel.** It has been several years since we have started remodeling cages. We have shared a lot of information and learned a lot too. Stainless steel can be cut in a variety of ways- from using a tin snips to a metal nibbler to a plasma saw. The plasma saw is the quickest and easiest way we have found, but do not let it hold you back if you do not have one - try one of the other tools.

1. Plasma cutter: most smaller units will cut the gauge of stainless steel used in animal caging.

There are two units I am familiar with:

A. Hypertherm 30, runs on 110 power with 15 amps - which provides more than enough power to cut all of the stainless steel cage material I have encountered. [Hypertherm](#)

With this plasma cutter you will need:

- Air compressor: 3.5 scfm @ 65 psi (99.1 l/min @ 4.5 bar) or compressed air from [Airgas](#) or comparable compressed air supplier.
- Consistent 110 power or generator (5000 watt or greater).

**Note #1:** I recommend using different sources/locations of power (different outlets or large enough generator) for each, as air compressor and plasma cutter need to run simultaneously.

**Note #2:** If you are cutting more than a few holes, you can use a metal hole template, which makes cutting a bunch of cages a whole lot easier - see the bottom of the page.

**Note #3:** I like having a fire extinguisher handy when I am cutting. Keeps me from having a heart attack when a flame emerges from between two cages- the remains of an ancient towel or cat toy.

B. [Hobart 250i](#) : 110 power and 20 amp outlet.

With this plasma cutter you will need very little - an electrical outlet with 20 amp breaker - as it has a built in compressor. Plug it in and cut.

**I really like both of these plasma cutting units but the Hobart with the built in air compressor makes cutting cages just a little less complicated.**

2. Angle type grinder

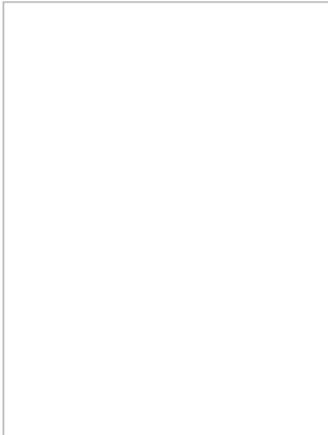


3. 8" or 6" schedule 40 PVC pipe (8" 125 pipe works ok too but 6" 125 pipe is too thin).

4. A band saw for cutting pipe is recommended but we have cut pipe with a 12" miter saw and a table saw (although both work much better with a safe system to hold the pipe).

5. PVC pipe cement- extra heavy body that is able to fill gaps is best.

- Weld On 719 PVC Pipe cement, but it is getting harder to find



- Another good option is [Spears PVC-19](#) which looks to be similar.
  - These glues are low VOC, slow cure and will fill gaps. It is recommended for all the PVC connections.
  - It takes about 24 hours to cure fully. (It sets pretty fast though - I have been able to grind glued connections in ~4 hours.)
- Standard PVC glue works too, however it does not fill gaps and if it is colored you will see it

6. 100% Silicone sealant to seal portal to cage wall.

## **The Process of Making PVC Portals**



**Left:** PVC portal with retainer ring attached, **Middle:** stabilizer piece, **Right:** loose retainer ring

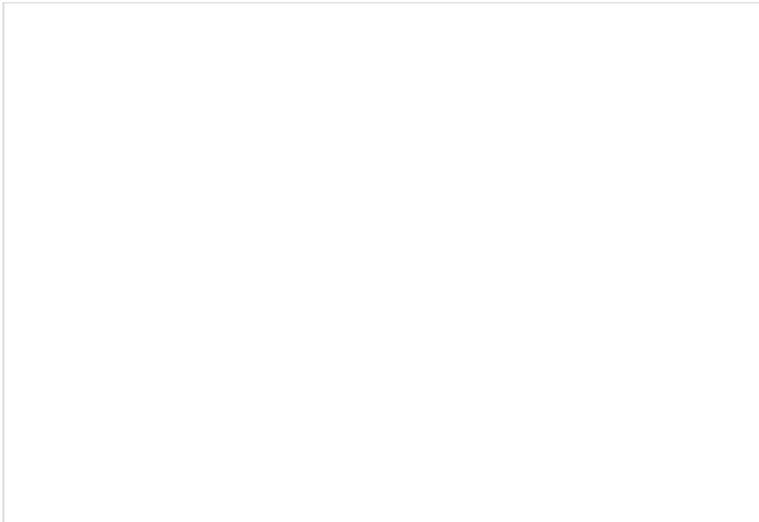
### 1. The portal pipe piece

- Measure the distance between the two adjoining cages, add the thickness of the steel wall and the amount you want the portal to extend into the interior of each cage ( $\frac{1}{2}$ " works really well)
- Add up these measurements and cut your PVC pipe to this length
- Bevel the inner edge of the PVC pipe with an angle grinder

Note: Many cages are approximately standardized in their distance between the cages and in these cages a  $3\frac{1}{4}$ " -  $3\frac{1}{2}$ " length of pipe works well to make a portal with  $\frac{1}{2}$ " extending into the interior of the cage on both sides

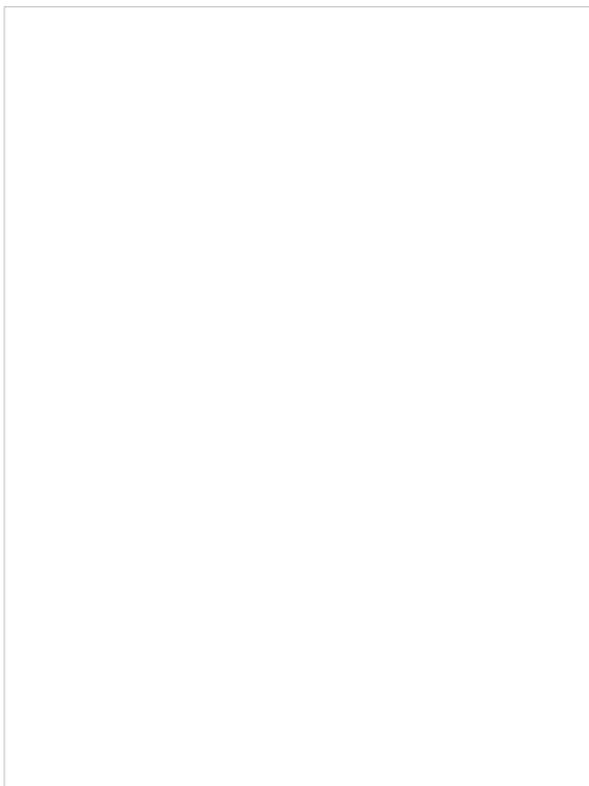
### 2. Stabilizer piece

- This PVC piece is "C" shaped and wraps around the outside of the portal between the two cages to be joined and acts to stabilize the walls of the stainless steel cage where the portal is placed.
- To make this piece cut a section of PVC that is slightly less than the distance between the two cages ( $\frac{1}{16}$ " or so less) and then make a perpendicular cut through the ring so it can be opened in the shape of a "C".
- In many cages a  $2\frac{1}{4}$ " width of pipe works well for this - but it is best to measure.



**Left:** stabilizer piece placed over PVC portal, view from between the attached cages.

**Right:** view from inside cages, placement of PVC portal through stabilizer piece that is being stretched open (to accommodate portal) with small block of wood.

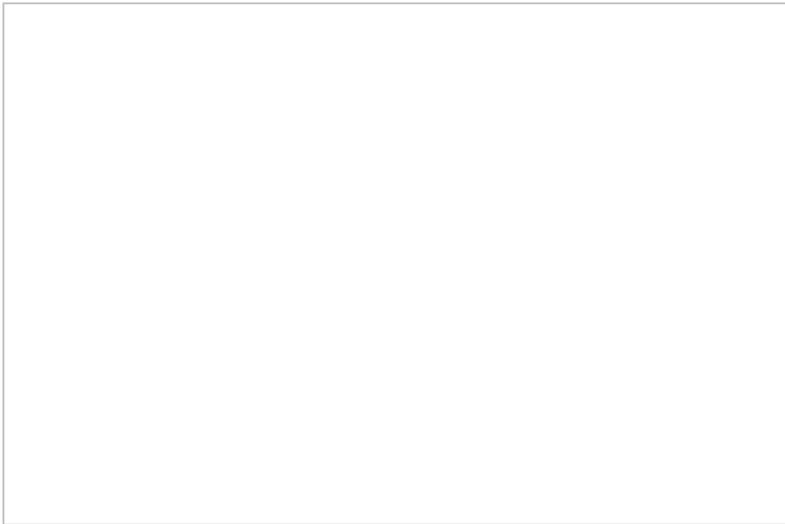


*Portal assembled without cage walls- notice stabilizer piece sandwiched between retainer rings.*

### **3. Retainer rings - to hold portal in place (attached to each edge of PVC portal)**

Cut two ½” pieces from the PVC pipe. These can be made a couple of ways:

- Cut the ring from a PVC coupler pipe- used for connecting two pipes together (this is by far the easiest method)- this ring will fit over the portal without the need for additional cutting. Bevel the outer edge of the retainer ring with an angle grinder.
- OR cut a ½” section of pipe from the same size pipe as the PVC portal. In order to attach this ring to the outside of the PVC portal it needs to be cut through so it can be opened to make a “C” as that allows it to be placed on the outer edge of the portal pipe. A gap will exist between the ends of the ring and a small piece of another ½” section of retainer ring will need to be cut and placed in the gap. Beveling the ends makes the connection between the ends much easier.

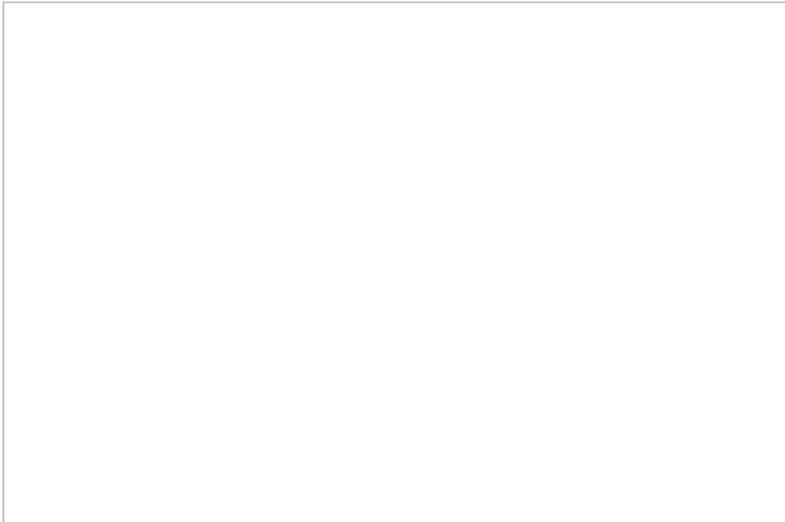


**Left:** Retainer ring made from coupler PVC. **Right:** Ring made from portal size pipe with ring gap filled with 2nd ring piece- notice beveled edges- (additional grinding with result in a ring that is flush with the portal edge).

#### 4. Cutting the holes in the cage walls

- Measure and cut holes in cage sidewalls. Make sure to measure and mark the holes to cut in the same place on both sides of the cage. (For templates you can use a circle-cutting guide, the PVC pipe or a precut steel template (preferred if cutting more than a few holes - see addendum at end of document).
- Do not make holes too close to the cage floor, as it will be more difficult to make the cut and place the portal. We placed the portals about 3” above the cage floor.
  - Depth into the cage depends on where you would like to place it
  - Placement of the hole slightly towards the front is easier to cut and clean when in use
  - Placement of the portal farther back is a bit more difficult to cut (small cages are hard to work inside) but when in use may ease movement of the cat from one side to the other with little to no handling - especially for more fearful cats.
  - In two by two cages, placing the portal 5” from the front edge allows enough room for a raised cat bed to be placed in the back of the cage. [See Information sheet on making raised cat beds](#)

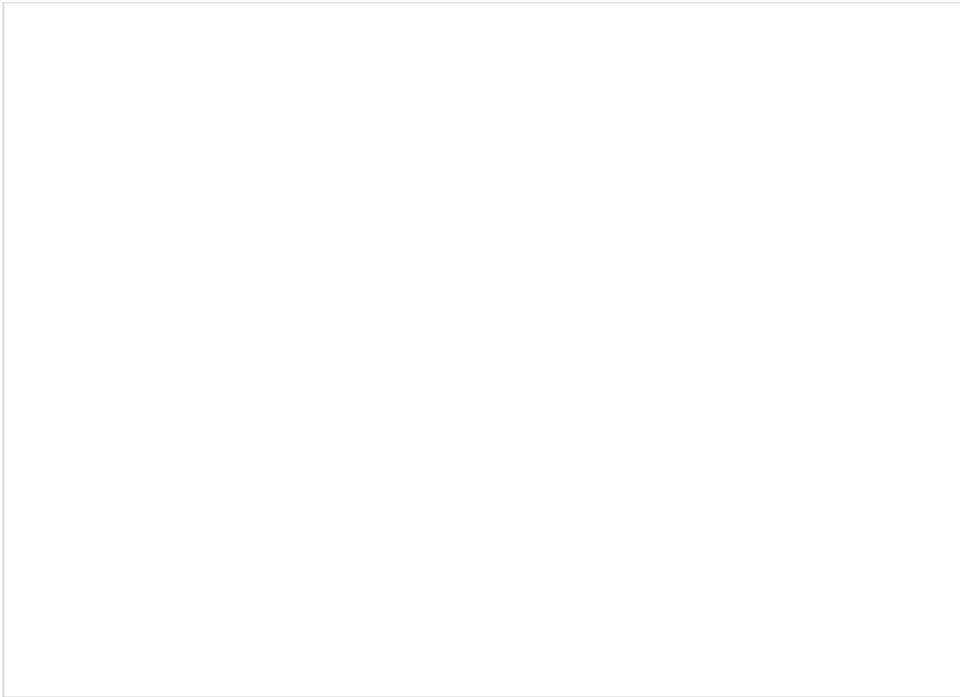
*Note:* When possible do plasma cutting outside or in excellent ventilation. Cages that are in built in can be cut with good ventilation in the room and lots of checking to insure nothing flammable is between the cages. Take the time to inspect between cages prior to cutting for any flammable items- e.g. towels, toys etc.- they will burn and make a mess of things (from experience). Alternatively holes can be cut using a [nibbler](#).



**Left:** Cage hole made with plasma cutter and circle guide. **Right:** hole is completed after second cut.

##### 5. Placing the PVC stabilizer piece and PVC portal.

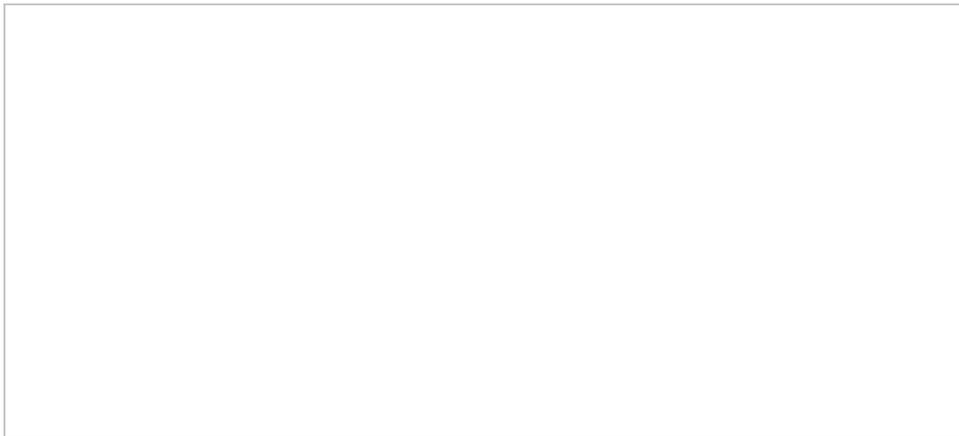
- Place the stabilizer piece in between the two cage walls (**wear gloves!**) - this may take a little shimmying on the part of the stabilizer piece but with a little effort this should slide in between the walls.
- Open the stabilizer piece and place block of wood in between ends. Bring opened stabilizer down into the cut opening so it is nearly flush with the edges and slide portal PVC into the opened retainer ring- once the portal pipe is inside the stabilizer remove the block and continue to slide the portal through the stabilizer. (I don't glue the stabilizer as I often need to move things around a bit for best fit.)



**Top left:** Placing the stabilizer piece and wooden block to open. **Top right:** stabilizer in place and portal being slid into stabilizer. **Bottom:** portal in place.

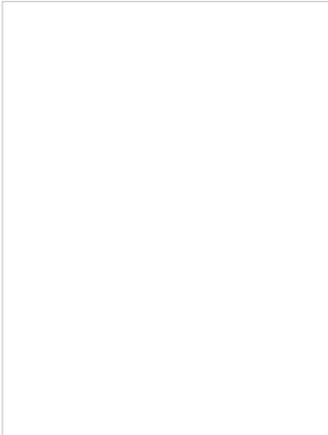
#### 6. Place a retainer on each side of the portal

- Make adjustments as needed for best fit.
- Alternately, one retainer piece can be glued onto the PVC portal before placement reducing the amount of gluing done in the final assembly of the portal.



**Left:** portal with retainer ring ready for placement. **Right:** pre-attachment of one retainer ring to the portal (using hose clamps to keep ring tight to portal).

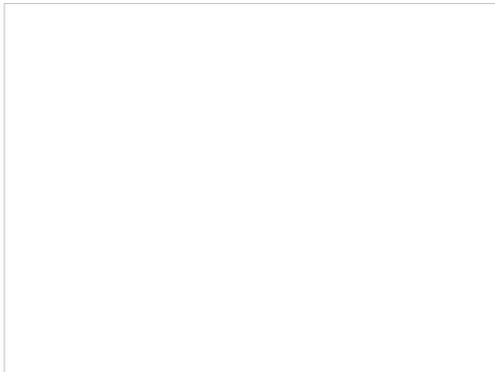
#### 7. Glue retainers onto portal using Weld On 719 PVC pipe cement.



**Note:** *Recommend sealing the portal (actually back edge of retainer piece) to the metal cage wall with silicone. Always clean the metal before applying silicone. I do this at the same time that I attach the retainer.*

**8. Allow glue and silicone sealant to dry (24 hours).**

**9. Do any final grinding for smoothing out retainer and portal edges and to remove any residual glue - being careful not to hit the cage sidewalls.**





*Cage bank with 12 portals completed. Install time about 12 hours. Preparation time about 20 hours (making the portals).*

**Addendum:**

**TEMPLATE:**

The template is used to cut holes in cages from one side to the other in the same location easily and efficiently. The tip of the plasma cutter should be held on the inside edge of the template cut out and run along that edge to make the cut. Templates can be ordered from Shor-Line – call 1.800.444.1579; allow 2-4 weeks for delivery – or can be made by handy folks at your local metal shops for about \$40 - \$100.

- The template for 8" PVC pipe schedule 40 or 125 using plasma cutting tip sized 3/16" from center to edge (this is important for making the right size cut out – if plasma tip is drastically different- plan accordingly for hole size) should be:
  - 14 and 1/4" high, 11" wide and the footplate is 7 and 1/4" from front to back
  - The template hole is 8 and 15/16" to 9" in diameter, just slightly less than 9" seems to work well, giving just enough wiggle room for uneven cages and yet cut edge gets covered when portal is completed. (The 8" PVC pipe, schedule 40 or 125, is 8 and 5/8" in OD)
  - The measurement from the bottom of the footplate to the bottom of the cut out in the template is 3 and 1/8" (this can be variable but closer than about 3" to the floor makes placement and working on the portal more difficult)
  - The distance from the cut out to the edge of the template on the sides is 1" just to make it easy when measuring placement of the portal in the cage

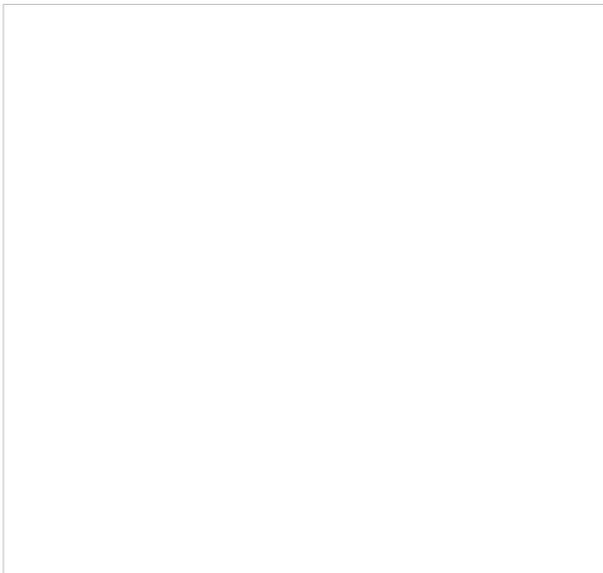
If the desired depth of the portal into the cage is 5" then measure 4" to the edge of the template, hold the foot of the template with the free hand to keep it from moving too much and start cutting. Cage holes can be cut with less than a few minutes of prep for each cut - greatly reducing time spent measuring.

**Note:** Sand the inner edge of the template to make it as smooth as possible- helps when moving plasma tip along inside edge.

**Note:** If using the schedule 125 pipe it will not be as thick as schedule 40 so template should be just slightly smaller to insure good coverage of cut hole in cage wall by portal retainer ring.



## **Making Doors for the Portals:**



We have made a simple door that works well for these cage portals. It pivots on a single bolt and has a catch on the opposite side to hold the door in a closed position. This door is intended for use only during cleaning. It will help keep a curious cat on the other side of the cage to allow tidying without cat interventions. Do not use it to return the double sided cage to two singles as it is not intended for that and there is a danger of getting a foot caught if the door is left closed and unattended.

We used 1/4" high density polyethylene plastic. This can be purchased from a plastics distributor - here on the West Coast we purchased from TAP plastics:

<http://www.tapplastics.com>

1. Trace the portal onto the plastic and add a 1" tab to the circle
2. Cut plastic with a jig saw (blade that has 10 teeth per inch seems to work well)
3. Once the portal is in (glue and sealants have cured), drill into portal edge, twist a hanger bolt in - a double threaded bolt (use 2 nuts attached to the end to twist in bolt)
4. Drill hole in door
5. Place stainless steel washer, door, another washer and stainless locknut to hold door in place.
6. Place stainless catch hardware - I have been using a 1" stainless screw. I predrill the portal and screw it to catch the door. I also have been notching the door at that point to allow the door to sit in a normal closed position.

The tab on the door works well to allow opening and closing the door when an unfriendly cat is housed within. Use a stick with metal hook at the end to catch the door and open or close as needed from outside the cage.