

# TIFLIC BOOK SCANNER v2.1 - PARTS LIST

## TILT • FLIP • CLICK

INVENTED & DESIGNED BY MOHIB EBRAHIM (TIFLIC [a] SENT.COM)



## WHAT THE TIFLIC BOOK SCANNER WAS DESIGNED FOR

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As with all products, book scanners come in all shapes and sizes, each design generally optimised for specific objectives and purposes. When used for these purposes, they will typically perform very well, but when used for other purposes they were not specifically designed for, they will still perform but not as well as others designed specifically for those purposes. The TIFLIC Book Scanner is no different, and understanding the objectives it was designed for will help you understand when it will perform well, and when it will perform not as well as others.

## OBJECTIVE AND DESIGN CRITERIA

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The TIFLIC Book Scanner's primary purpose was scanning typical hardback and paperback books, at high speed and at sufficient quality for easy reading and generating accurate, searchable OCR. Images and/or colour fidelity were not key objectives, and depending on your needs, TIFLIC's performance with such material may or may not be satisfactory for you.

TIFLIC's total cost is approximately \$120-\$170, depending on optional items also incorporated.

All of the following objectives and design criteria are demonstrated in the TIFLIC Book Scanner demonstration video: <http://po.st/tiflicbookscannervideo>

1. High throughput.  
Tests show the TIFLIC Book Scanner delivers a sustained, time averaged, net throughput (including interruptions) of ~900 pages/hour. Between various interruptions -- such as separating stuck pages, re-positioning the book/platen, re-pairing the blue tooth remote or small camera adjustments -- scanning proceeds at rates up to 1500 pages/hour (see video).
2. Scan paperbacks nearly as fast as hardbacks, at the same quality, without damaging or creasing the spine from forcing it wide open.  
Tests show that between interruptions, the TIFLIC Book Scanner scans paperbacks (without damage) at rates up to 1320 pages/hour (see video).
3. Flatten pages so the full page content (even text close to the spine) is imaged without text curvature for accurate OCR (see video).
4. Scan books up to 13" x 10"; i.e. all normal sized books and many oversized books (see video).  
Scan newspapers without the platen (an un-folded photo-copy is best so the source document is flat).
5. Minimal construction.  
The TIFLIC Book Scanner is mostly built with plumbing parts and various nuts and bolts, all available at local hardware stores, and supplemented with a few ready-made, inexpensive parts available on Amazon/eBay. It requires an absolute minimal amount of handiwork (just drilling 9 holes and 7 cuts with a hacksaw) with a few basic hand tools detailed below. (see video)

6. Use smart-phones and a blue-tooth remote shutter trigger (see video) or small point-and-shoot cameras that have wireless remotes. An earlier version of TIFLIC works with point-and-shoot cameras with mechanical triggers, but requires additional construction, customised for each camera.
7. Knock down, compact and portable enough to carry on a bus use unobtrusively in libraries, clamped to the end of a small table (see video).
8. Solid with no finicky parts needing constant attention, adjusting and fiddling during operation (see video).

On-going discussion about the scanner, including improvements and building tips, can be found here:

<http://po.st/tiflicbookscanner>

Discussions about the original version, designed for small cameras with simple mechanical shutter triggers, and also extensive lighting tests, can be found here:

<https://forum.diybookscanner.org/viewtopic.php?f=14&t=3007>

## SUITABILITY AND PERFORMANCE FOR VARIOUS SCANNING PURPOSES

SCANNING OBJECTIVE	TIFLIC SUITABILITY	NOTES
<b>High quality OCR of regular sized text typical of hardback and paperback books, magazines and other printed material</b>	Excellent performance with almost all smart-phones.	<p>Check your phone's resolution and divide by 300 to find maximum page size with normal type size.</p> <p>Search for smart-phone camera on these sites to check resolution here:  <a href="https://www.dpreview.com/">https://www.dpreview.com/</a></p> <p>And overall image quality here:  <a href="https://www.dxomark.com/">https://www.dxomark.com/</a></p> <ul style="list-style-type: none"> <li>• iPhone 4s, iPhone 5 and iPhone 6: 8MB 3264 x 2448 Suitable for regular sized text up to 8.5"x11"</li> <li>• iPhone 6s: 12MB 4608 x 2592 Suitable for regular sized text up to 15.5"x8.6"</li> <li>• iPhone 7: 12mb 4032x3024 Suitable for regular sized text up to 13.5"x10"</li> </ul>
<b>High quality OCR of small type size on regular sized pages or regular sized text on large pages</b>	<p>Excellent performance with an appropriate camera that will image at 300dpi and has a good quality lens.</p> <p>Smart-phones may be suitable depending on their resolution, otherwise a small point-and-shoot camera will be needed.</p> <p>If OCR is not needed, slightly lower resolution and lens quality will be satisfactory.</p>	<p>Check your smart-phone camera's resolution achieves 300dpi for the page size as explained above.</p> <p>Check your camera's lens quality:</p> <ul style="list-style-type: none"> <li>• Photograph a scene with a lot of small detail, such a tree with small leaves. Examine the image at full size and check sharpness at the image's edge.</li> </ul> <p>The camera software should feature a "Fine" mode that performs minimal compression and also manual ISO control.</p>

<b>Images and pictures</b>	<p>Medium performance.</p> <p>Suitability depends on the quality and scanning objective (see tests at link in notes).</p>	<p>Assuming the smart-phone or camera has accurate colour fidelity performance is compromised by reflections and illumination.</p> <p>Without illumination, the reflections in the platen (such as of the camera or smart-phone) mar images. TIFLIC's single lamp illumination removes the reflection, but due to a single lamp, page illumination is not fully even if not supplemented with daylight.</p> <p>Various tests using TIFLIC with a small point-and-shoot camera can be found here: <a href="https://forum.diybookscanner.org/viewtopic.php?f=14&amp;t=3007&amp;start=20#p17727">https://forum.diybookscanner.org/viewtopic.php?f=14&amp;t=3007&amp;start=20#p17727</a></p> <p>Note, the lamp's reflection in the platen has been resolved.</p> <p>Tests with dual lamps have not yet been done.</p>
<b>Paperbacks or books with delicate bindings that should not be widely spread</b>	<p>Excellent performance.</p> <p>Since TIFLIC scans one page at a time, it does not require books to be opened more than is required for reading.</p>	<p>For extremely delicate books, TIFLIC advanced methods for scanning delicate books outlined here: <a href="https://forum.diybookscanner.org/viewtopic.php?f=14&amp;t=3411">https://forum.diybookscanner.org/viewtopic.php?f=14&amp;t=3411</a></p>

## MAIN COMPONENTS



1. The platen (transparent plastic sheet).
2. The platen handle (white).
3. The support post and camera arm (black); breaks down into 2 parts.

The TIFLIC Book Scanner shown disassembled into 4 parts below:



## PARTS: PLATEN (COMPONENT 1)

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1. 3/8" x 11" x 15.25" standard Plexiglas sheet, cut to size by supplier (1/4" is quite thin and flexes easily under pressure, while 3/8" provides extra weight to keep the page flat with little pressure and doesn't flex).

Prices can vary widely from \$10 to \$25. Some have reported the more expensive non-glare Plexiglas results in blurrier images.

8mm or 9mm or 10mm glass may also be an option, but it has not been tested. It may be heavy and slow down scanning, however, it won't scratch and attract dust via static electricity (although dust is generally not a problem). Edges should be smoothed so they don't chip with the platen is lifted, however, rounded edges may not be helpful when scanning text that is close to the gutter as a square, straight edge helps push the facing page back and better expose the text on the page being scanned.

2. LEFT BELOW: non-slip shelf liner (to place under book so it doesn't slide and has a black background).

OR RIGHT BELOW: cover the entire scanning table top (or at least 24" square so that when the platen is tilted up, it's right edge "digs" into the rubber and doesn't slide on the table) with a black rubber floor mat like those used for Pilates exercises but or placed under exercise equipment.

The material should be:

- thin (i.e. 2-4mm),
- borderless,
- flat (i.e. not ribbed, gridded or dimpled),
- solid (i.e. not a mesh which lets light through),
- matt finished (i.e. not glossy or shiny),
- lightly textured (i.e. not smooth) so books are gripped),
- and washable (so dust and marks can be removed).

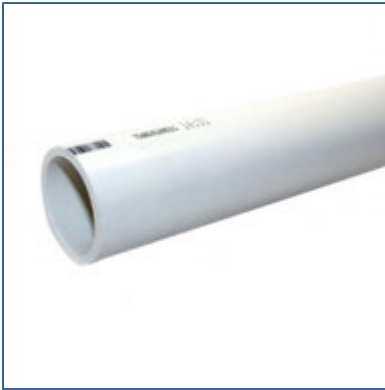


## PARTS: PLATEN HANDLE (COMPONENT 2)

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1. 48" x 1/2" Schedule 40 PVC pipe (usually comes in 10ft lengths)

1/2" pipe does not mean 1/2" outside or inside diameter. It's just the name given to this size of pipe. The actual outside diameter is 0.840"



2. 2 x 1/2" 90 degree PVC elbow joints.  
2 x 1/2" 45 degree PVC elbow joints.

1/2" pipe does not mean 1/2" outside or inside diameter. It's just the name given to this size of fitting to take the above 1/2" pipe



3. 5ft x 1/16" (~16 gauge) steel cable/wire rope (this is about the same thickness as bike brake cables).  
4 x matching aluminium cable ferrule/swage sleeves.





4. 2x Cross dowel nut: Length: 45mm ~1.75" or longer. Diameter: 10mm. Thread: M6 or 1/4 -20 thread. Hole position: Centre (see picture).  
2x Matching bolt: Length: 1.5".

Cross dowels are used in knock-down furniture but cross dowel nuts 45mm or longer, are almost impossible to find at hardware stores. Ikea has them. Other knock down furniture stores may also have them as spare parts.

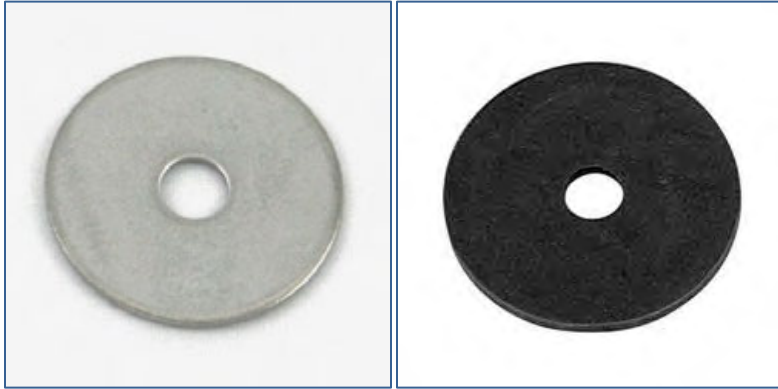
They are available from the UK at the links below. M6 x 45mm x 10mm centre holed, cross dowel nuts are available in 2 & 4 packs.

[http://www.missingscrew.co.uk/epages/es143616.sf/en\\_GB/?ObjectPath=/Shops/es143616/Products/10403](http://www.missingscrew.co.uk/epages/es143616.sf/en_GB/?ObjectPath=/Shops/es143616/Products/10403)

[http://www.ebay.co.uk/itm/Cross-Dowel-M6-45mm-length-x-10mm-diameter-M6-hole-centred-Pack-of-2-/181367167069?pt=UK\\_BOI\\_Building\\_Materials\\_Supplies\\_Carpentry\\_Woodwork\\_ET&hash=item2a3a53585d](http://www.ebay.co.uk/itm/Cross-Dowel-M6-45mm-length-x-10mm-diameter-M6-hole-centred-Pack-of-2-/181367167069?pt=UK_BOI_Building_Materials_Supplies_Carpentry_Woodwork_ET&hash=item2a3a53585d)



5. 2 x 1 1/4" diameter steel washers for M6 or 1/4-20 bolt.  
2 x 1 1/4" diameter rubber (preferably black) washers for M6 or 1/4-20 bolt.



## PARTS: MAIN SUPPORT POST AND CAMERA ARM (COMPONENT 3)

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1. 1 x Manfrotto 2909 SuperClamp with 2907 Short Stud.  
Some SuperClamps have no studs or other studs primarily for lighting.

The 2907 Short Stud (which has the standard 1/4" and 3/8" camera threads (male)) lets you use the Super Clamp as a tripod replacement when not using it for the scanner.

This is the item on Amazon: <http://www.amazon.com/Manfrotto-2909-Super-Clamp-Short/dp/B00009R6BO>



2. 1 x Vastar Universal Smartphone Tripod Adapter.

Note many such adapters are available, however this model doesn't use springs to hold the phone, but instead has a solid thumbscrew/clamp to hold the smart phone. The extra support is not used.

This item on Amazon: <https://www.amazon.com/Vastar-Universal-Smartphone-Horizontal-Adjustable/dp/B01L3B5PBI/>



3. 1 x CamKix Bluetooth Camera Shutter Remote Control with Wrist Strap for Smartphones (works with iPhone and Android; check your model).

This item on Amazon: <https://www.amazon.com/dp/B00PJSIIES>



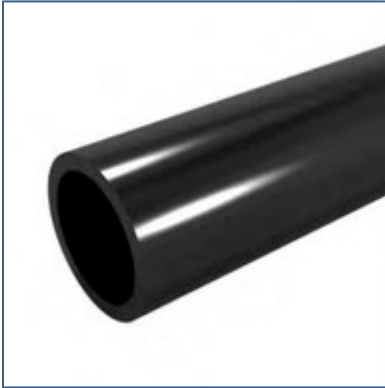
4. 1 x light weight, well-made tripod ball head for easy and accurate levelling of the camera.

These parts can found at local camera shops or on amazon.com at the following link: <https://goo.gl/a7qKwW>



5. 36" x 1 1/2" schedule 40 ABS pipe.

1 1/2" pipe does not mean 1 1/2" outside or inside diameter. It's just the name given to this size of pipe. The actual outside diameter is 1.900". ABS is much stiffer than PVC and so the best choice for these parts.



6. 1 x 1 1/2" ABS double sanitary T-joint. Sanitary T-joints have curved connections so the T is better supported and stiffer than a standard T-joint.  
2 x 1 1/2" ABS pipe drain-cap (flat, not rounded, cap surface).



7. 2 x Innovative Components AN4C-5S221 1.38" Star knob thru hole 1/4-20 steel zinc insert black  
[https://www.amazon.com/Innovative-Components-AN4C-5S221-steel-insert/dp/B00GORWKB0/ref=sr\\_1\\_3](https://www.amazon.com/Innovative-Components-AN4C-5S221-steel-insert/dp/B00GORWKB0/ref=sr_1_3)  
Others may be available at hardware stores. Be sure knob's outer dimensions does not exceed 1.5" diameter and cannot push through the large washer's hole. Also, as shown in the picture, below at left, the end must not be capped so the bolt it's threaded on to can push through.

2 x 1 7/8" large washer with 5/8"-3/4" hole to fit into sanitary T and press against star knob  
<https://www.fastenal.com/products/details/78026>

2 x 1" washer with 1/4" hole  
2 x lock washers for 1/4" bolts.  
4 x 1/4"-20 buts  
36" x 1/4"-20 threaded rod  
1 x M5x20 (20mm length) metric hex head hold + 1 x matching washer 1 + lock nut



## OPTIONAL COMPONENT: PEDCO ULTRAMOUNT BALL AND SOCKET HEAD

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The ball head (listed earlier) allows for easy and accurate levelling of the camera, but when used with the Pedco, camera placement is more flexible and essential to orient the smart-phone correctly if you wish to use the scanner attached to the back of a table, rather than on a side edge.

The Pedco by itself does not allow accurate levelling (as it shifts when tightened) and so should be used with a ball head.



The Pedco UltraMount Ball and Socket Head can be found here:  
<http://www.amazon.com/Pedco-UltraMount-Ball-Socket-Head/dp/B000KNNRHA>

## OPTIONAL COMPONENT: MACRO FOCUS RAIL (HIGHLY RECOMMENDED)

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The 6" macro focus rail can be used to move the camera phone vertically to accurately fill the frame.



The macro focus rail is highly recommended for many reasons as explained in the scanning operations later in this document.

This part can be found by searching e-bay.com for "macro focus rail" or on amazon.com at the following link: <https://goo.gl/5b8b8o>

The part shown is here:

<http://www.ebay.com/itm/2-way-Macro-Shot-Focusing-Focus-Rail-Slider-for-CANON-NIKON-SONY-Camera-D-SLR-/330912760547>

<https://www.amazon.com/DSLRLKIT-Focusing-Slider-Updated-Version/dp/B007L41QZG>



## OPTIONAL COMPONENT: LAMP (RECOMMENDED)

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1. 1 x 10W Waterproof Outdoor Security LED Floodlight; 50W Halogen Equivalent.  
[https://www.amazon.com/LEDMO-Waterproof-Daylight-Equivalent-Floodlight/dp/B01FS6ZFGO/ref=pd\\_sim\\_468\\_6](https://www.amazon.com/LEDMO-Waterproof-Daylight-Equivalent-Floodlight/dp/B01FS6ZFGO/ref=pd_sim_468_6)
2. 1 x in-line lamp switch.  
15' x 3 pin extension cord.  
1 x 18" (upstretched) bungee cord.  
3" x 1 1/2" schedule 40 ABS pipe (same as the vertical and horizontal supports)  
1 x 1 1/2" schedule 40 ABS pipe Hub x Hub Coupling  
1 x 1/4"-20 coupling nut  
3" x 1/4"-20 threaded rod (cut from remainder of 36" support threaded rod)

A discussion, with sample results under different conditions, on using the lamp with an earlier version of the TIFLIC Book Scanner can be found here:  
<http://www.diybookscanner.org/forum/viewtopic.php?f=14&t=3007&start=20#p17723>



## SOFTWARE: "CAMERA+ FREE" AND "5-IN-1 SUPERBUNDLE" (IPHONE)

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"Camera+ Free" and "5-in-1 Superbundle" (\$2.99) by tap tap tap available in the iPhone app store here:  
<https://itunes.apple.com/us/app/camera-free/id934516489?mt=8>

WARNING: Do not purchase "Camera +" also by tap tap tap (and also \$2.99) in the app store here:  
<https://itunes.apple.com/us/app/camera/id329670577?mt=8>

Be sure to get "Camera+ Free" not "Camera+"

Other iPhone apps may also be suitable. "Camera+ Free" is not available for Android so a similar camera will be needed.

Required camera software features:

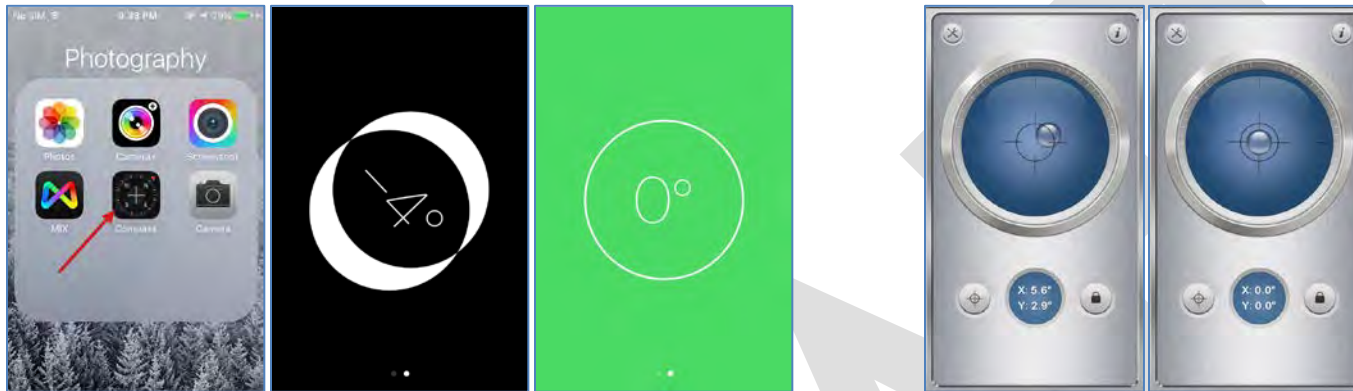
- a. High resolution files (hi-quality -- i.e. low compression -- JPG is sufficient) because without this option, the image quality will be poor for good OCR.
- b. Separate focus and exposure settings.
- c. Full manual controls:
  - white balance,
  - shutter speed,
  - focus lock and, optionally, focus
  - ISO setting.  
Manual ISO setting is important and should be set low (50) to reduce grain and keep image quality up.
- d. Efficient and fast to change the above manual controls (i.e. not a lot of opening and shutting down panels)
- e. Step zoom in increments (1.1x, 1.2x, etc.), not continuous zoom (for easy resetting).
- f. Click sound when shutter is tripped.
- g. Works with Bluetooth triggers.  
Apparently not all iPhone camera software does -- the key to ensuring Bluetooth works, seems to be ensuring the volume controls can be used a shutter release. If you decide on something other than Camera+ Free for an iPhone double check it works with Bluetooth triggers.
- h. Useful but not necessary is an on screen grid.
- i. Ideally software should keep settings.

## SOFTWARE: SMARTPHONE LEVELLING APP (FREE)

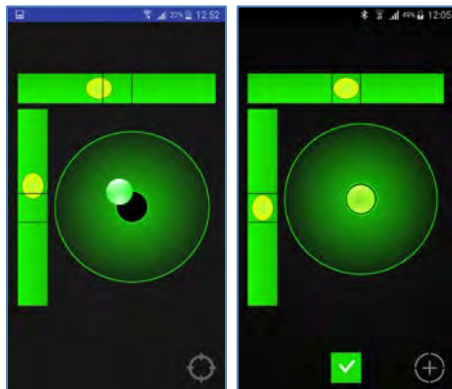
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Note the iPhone has a free levelling tool in the compass app (3 left screen shots).

If you find the default levelling tool confusing try "Surface Level - Angle and slope measure tool" (2 right screen shots) free the app store here:  
<https://itunes.apple.com/us/app/surface-level-angle-and-slope-measure-tool/id635314551?mt=8>



Levelling apps are also available for Android. "Bubble Level Galaxy" one is rated well and is free:  
<https://play.google.com/store/apps/details?id=pl.nenter.app.bubblelevel&hl=en>



## SOFTWARE: IMAGE PROCESSING (FREE) (WINDOWS)

### FILE NUMBERING

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Bulk Rename Utility available from here:  
[http://www.bulkrenameutility.co.uk/Main\\_Intro.php](http://www.bulkrenameutility.co.uk/Main_Intro.php)

### PAGE PRE-PROCESSING

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Obtain the latest AutoHotKey image normalization script from this thread. The purpose of the normalization script and how to use it, is also explained in the thread

<https://forum.diybookscanner.org/viewtopic.php?f=14&t=3401>

AutoHotKey:  
<https://www.autohotkey.com/download/>

AutoHotKey debugger (if you wish to edit the AutoHotKey script)  
<http://fincs.ahk4.net/scite4ahk/>

GraphicsMagick:  
<http://www.graphicsmagick.org/index.html>

### PAGE PROCESSING

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Scan Tailor available from here:  
<http://scantailor.org/>

## FULL PARTS LIST

COMPONENT	QTY	ITEM	UNIT COST (APPROX)	TOTAL COST (APPROX)	SOURCE
Platen	1	3/8" x 11" x 15" Plexiglas sheet	\$10.00-\$25.00	\$10.00-\$25.00	Local plastic shops
Platen	1	12" x 24" non-slip shelf liner OR exercise equipment rubber floor mat	\$5.00-\$10.00	\$5.00-\$10.00	Wal-Mart, Home Depot, dollar stores, exercise equipment stores, etc.
Platen handle	4ft	1/2" Schedule 40 PVC pipe (usually comes in 10ft lengths)	\$7.00	\$7.00	Hardware/plumbing stores: Home Depot, etc.
Platen handle	2	1/2" 90 degree PVC elbow joints	\$0.65	\$1.30	Hardware/plumbing stores: Home Depot, etc.
Platen handle	2	1/2" 45 degree PVC elbow joints	\$0.25	\$0.50	Hardware/plumbing stores: Home Depot, etc.
Platen handle	5ft	1/16" (~16 gauge) steel cable/wire rope	\$0.25	\$2.25	Hardware stores: Home Depot, etc.
Platen handle Support post	4+4	Aluminium cable ferrule/swage sleeves for 1/16" steel cable/wire rope (8 pack)	\$2.00	\$2.00	Hardware stores: Home Depot, etc.
Platen handle	2	Cross dowel nuts Length: 45mm ~1.75" or longer. Diameter: 10mm. Thread: M6 or 1/4 -20 thread. Hole position: Centre	\$1.00-\$4.00	\$2.00-\$8.00	Knock down furniture stores: Ikea, etc.
Platen handle	2	Matching bolt for cross dowel nuts Length: 1.5"	\$0.25	\$0.50	Knock down furniture stores: Ikea, etc. Hardware stores: Home Depot, etc.
Platen handle	2	1 1/4" dia. steel washers for M6 or 1/4-20 bolt.	\$0.25	\$0.50	Hardware stores: Home Depot, etc.
Platen handle	2	1 1/4" dia. rubber (preferably black) washers for M6 or 1/4-20 bolt	\$0.25	\$0.50	Hardware stores: Home Depot, etc.
Support post	36"	1 1/2" schedule 40 ABS pipe	\$1.50	\$4.50	Hardware/plumbing stores: Home Depot, etc.
Support post	1	1 1/2" ABS double <u>sanitary</u> T-joint	\$5.00	\$5.00	Hardware/plumbing stores: Home Depot, etc.
Support post	2	1 1/2" ABS pipe drain-cap	\$3.00	\$6.00	Hardware/plumbing stores: Home Depot, etc.

Support post	2	Lock washers for 1/4" bolts	\$0.25	\$0.50	Hardware stores: Home Depot, etc.
Support post	2	1 7/8" washer for 1/4" threaded rod	\$1.00	\$1.00	Hardware stores: Home Depot, etc.
Support post	4	1/4"-20 nuts	\$0.10	\$0.40	Hardware stores: Home Depot, etc.
Support post	2	Innovative Components AN4C-5S221 1.38" Star knob thru hole 1/4-20 steel zinc insert black (10 pack)	\$8.00	\$8.00	Amazon or hardware stores: Home Depot, etc.
Support post	36"	1/4"-20 threaded rod	\$5.50	\$5.50	Hardware stores: Home Depot, etc.
For camera	1	7" Zip tie (20 pack)	\$2.50	\$2.50	Wal-Mart, Home Depot, dollar stores, etc.
Support post	1	Manfrotto 2909 SuperClamp with 2907 Short Stud	\$30.00	\$30.00	Amazon
For camera	1	Vastar Universal Smartphone Tripod Adapter	\$8.00	\$8.00	Amazon
For camera	1	CamKix Bluetooth Camera Shutter Remote Control with Wrist Strap for Smartphones	\$7.00	\$7.00	Amazon
For camera	1	Light weight, well-made tripod ball head	\$8.00	\$8.00	Amazon
For camera	1	Camera+ Free Super Bundle (iPhone)	\$3.00	\$3.00	Apple App Store
			~\$120.00- TOTAL		
			\$142.00		

## OPTIONAL PARTS LIST

COMPONENT	QTY	ITEM	UNIT COST (APPROX)	TOTAL COST (APPROX)	SOURCE
<b>FOR CAMERA</b>					
For camera	1	Pedco UltraMount Ball and Socket Head	\$13.00	\$13.00	Amazon/eBay
For camera	1	6" macro focus rail	\$10.00	\$10.00	Amazon/eBay
<b>LIGHTING</b>					
Illumination	1	10W LED light.	\$8.00	\$8.00	Amazon/eBay
Illumination	1	In-line lamp switch	\$4.00	\$4.00	Hardware stores: Home Depot, etc.
Illumination	15ft	3 pin extension cord	\$10.00	\$10.00	Hardware stores: Home Depot, etc.
Illumination	1	18" (upstretched) bungee cord	\$1.50	\$1.50	Wal-Mart, Home Depot, dollar stores, etc.
Illumination	1	1 1/2" schedule 40 ABS pipe Hub x Hub Coupling	\$0.80	\$0.80	Hardware stores: Home Depot, etc.
Illumination	1	1/4"-20 coupling nut	\$1.25	\$1.25	
				<b>~\$53.00</b>	<b>TOTAL OPTIONAL ITEMS</b>



## TOOLS REQUIRED

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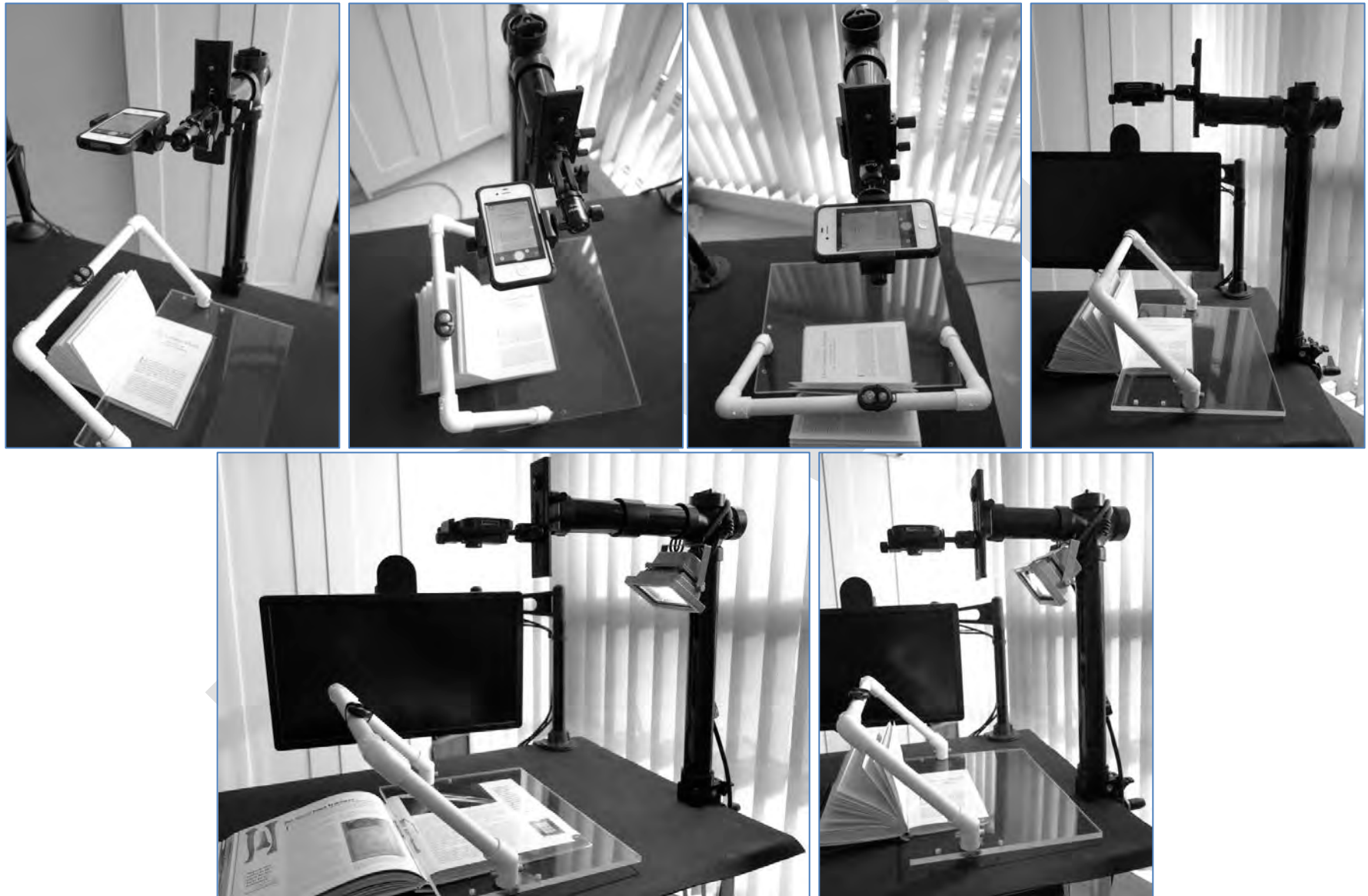


### TOOL NOTES:

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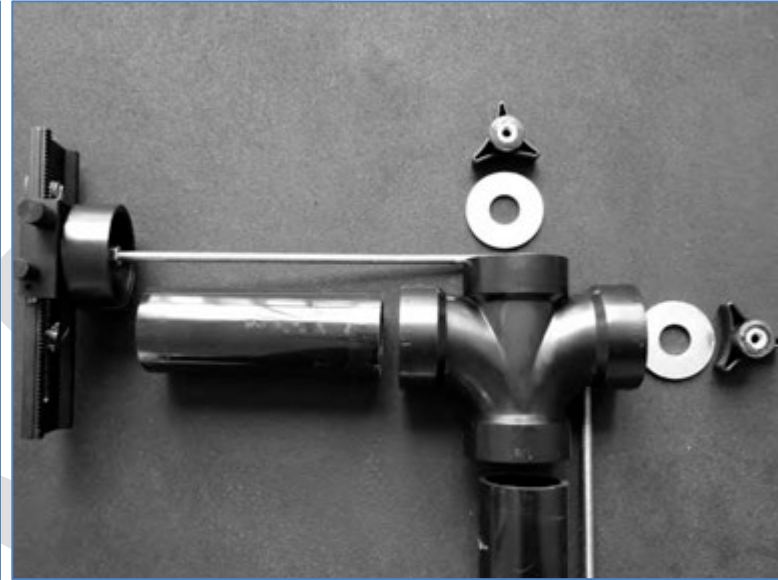
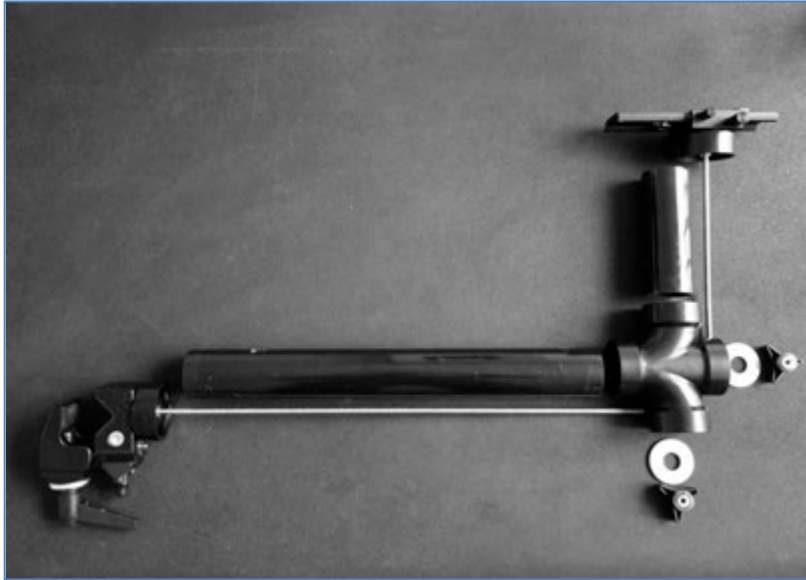
- ♦ Work will be easier with a vice, but a C-clamp (though clumsier) will suffice and is cheaper.
- ♦ Drill can be manual or electric. Manual drills are available here:  
<https://www.amazon.com/Schroeder-Hand-Drill-4-Inch-Capacity/dp/B000JRDLVY>
- ♦ Drill bits: 1/16", 3/32", 1/8", 3/16" 1/4"
- ♦ Extra drill bit: 10mm or other size to match cross-dowel diameter (with a 1/4" shank so it fits in a 1/4" drill chuck of standard drills).
- ♦ Metal file: flat (1/4" - 3/8" width), reasonably coarse and suitable for metal and plastic.
- ♦ Square should be at least 12" long on one side with 1/32 divisions on the scale (or use an accurate metal ruler).
- ♦ Wire cutters must be able to cut 1/16" (~16 gauge) steel cable/wire rope cleanly and easily without crimping the wire.
- ♦ About 10' of string for measuring (so it must not stretch - such as fishing line) is needed.
- ♦ Notepad paper must be lined and US Letter or European A4 size.
- ♦ Zip ties should be 7" long. Only 1 zip tie is need but keep a few for testing.

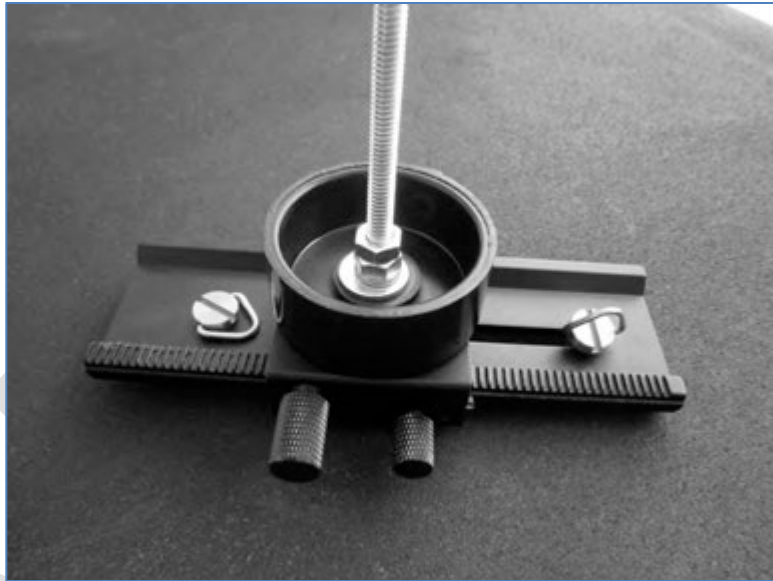
## OPERATIONAL VIEWS OF THE TIFLIC BOOK SCANNER



## EXPLODED VIEWS OF THE CAMERA SUPPORT

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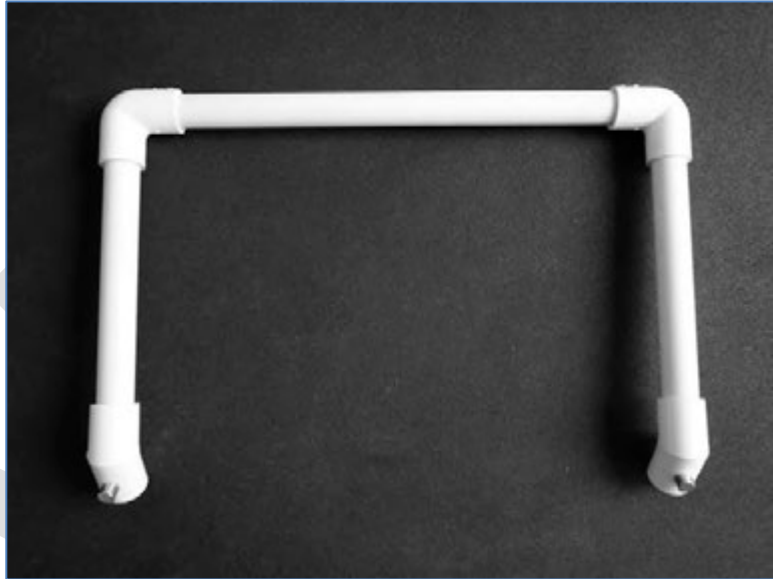
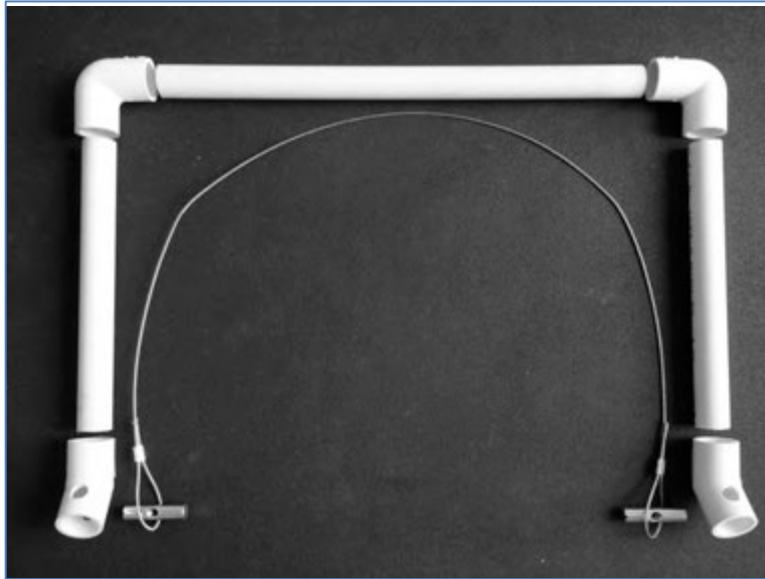


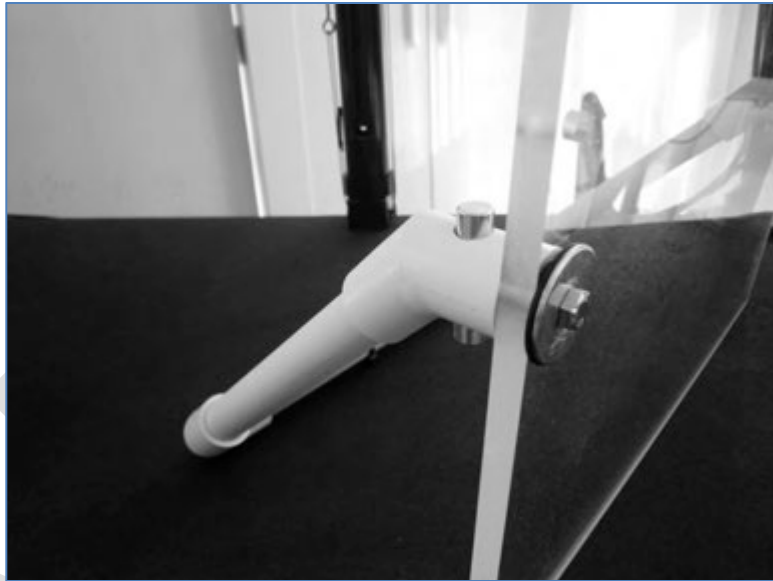
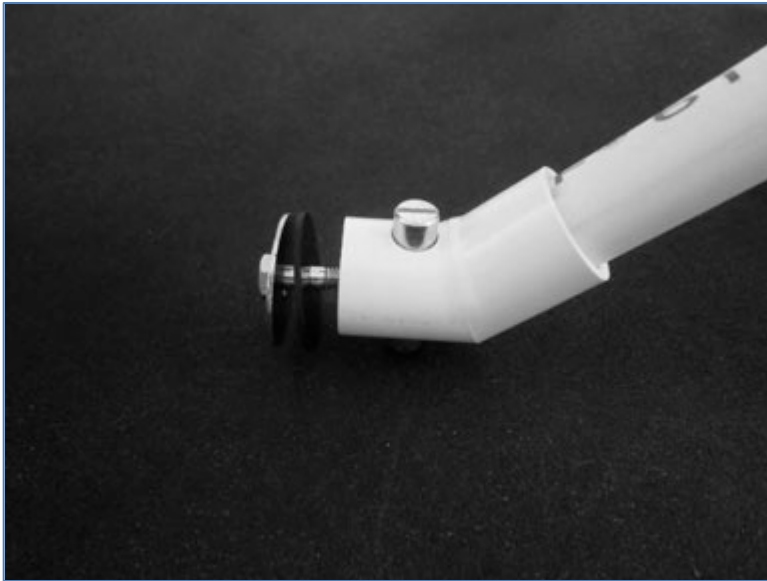
DRAFT

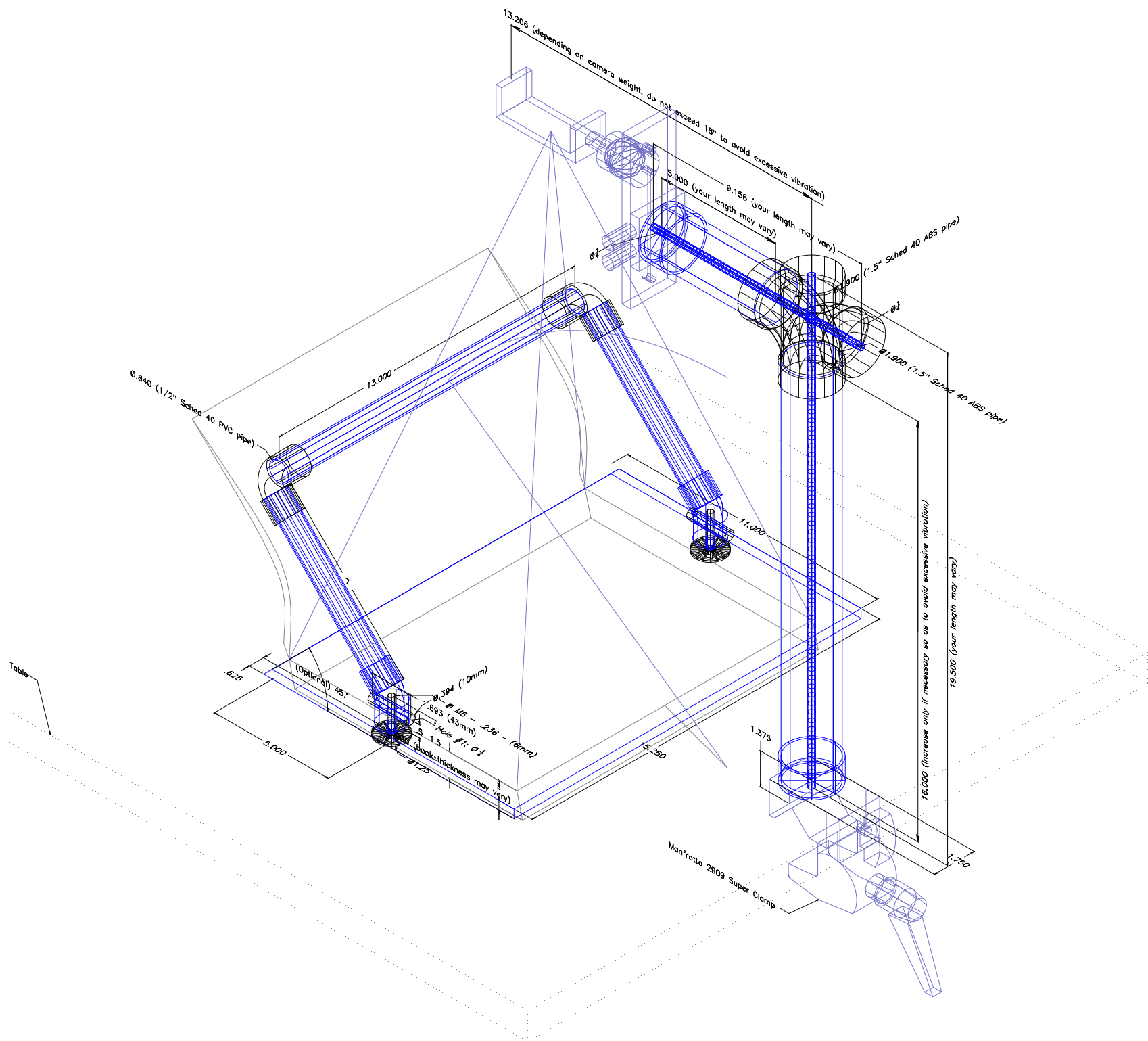


## EXPLODED VIEWS OF THE PLATEN HANDLE

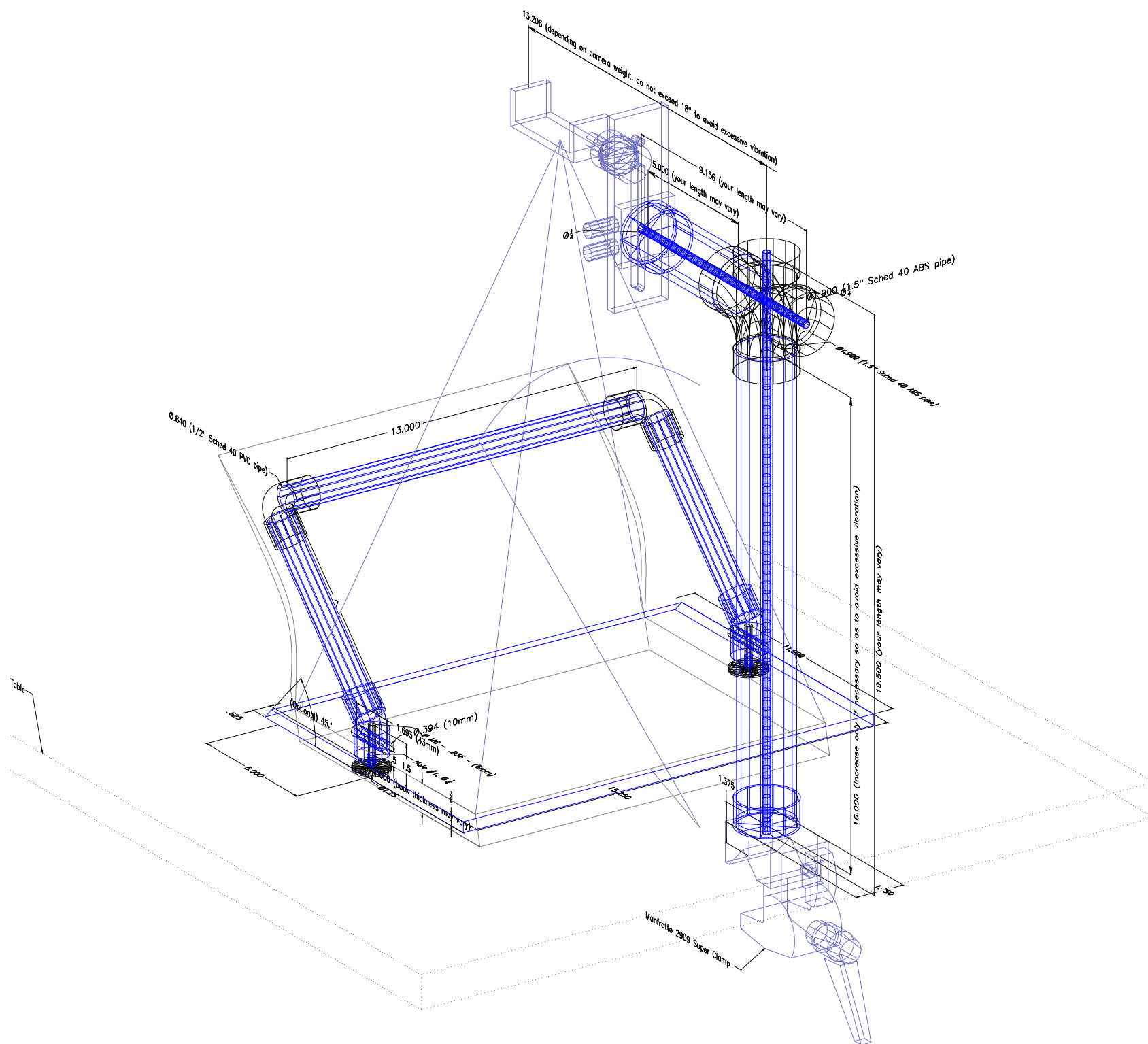
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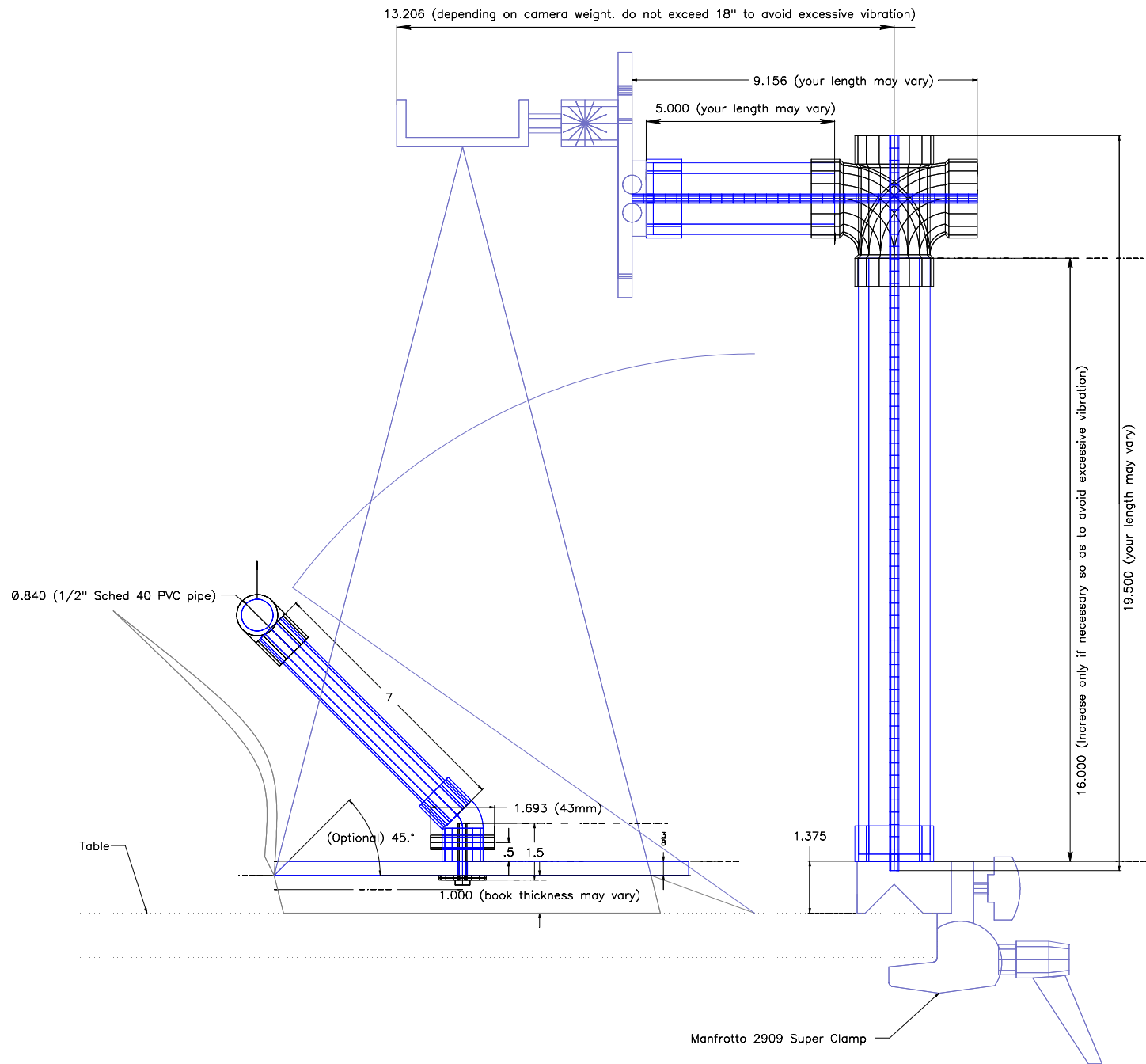


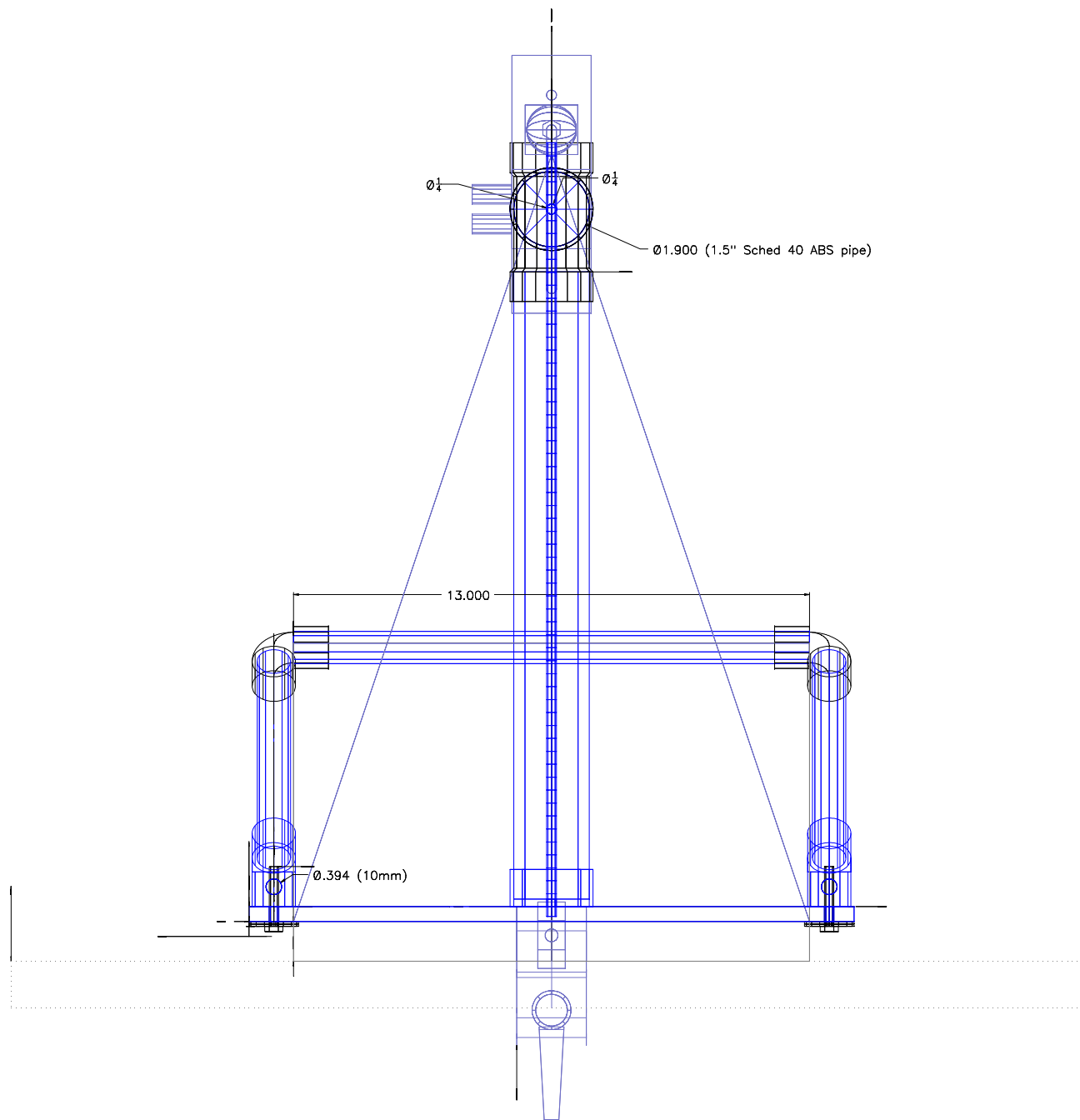


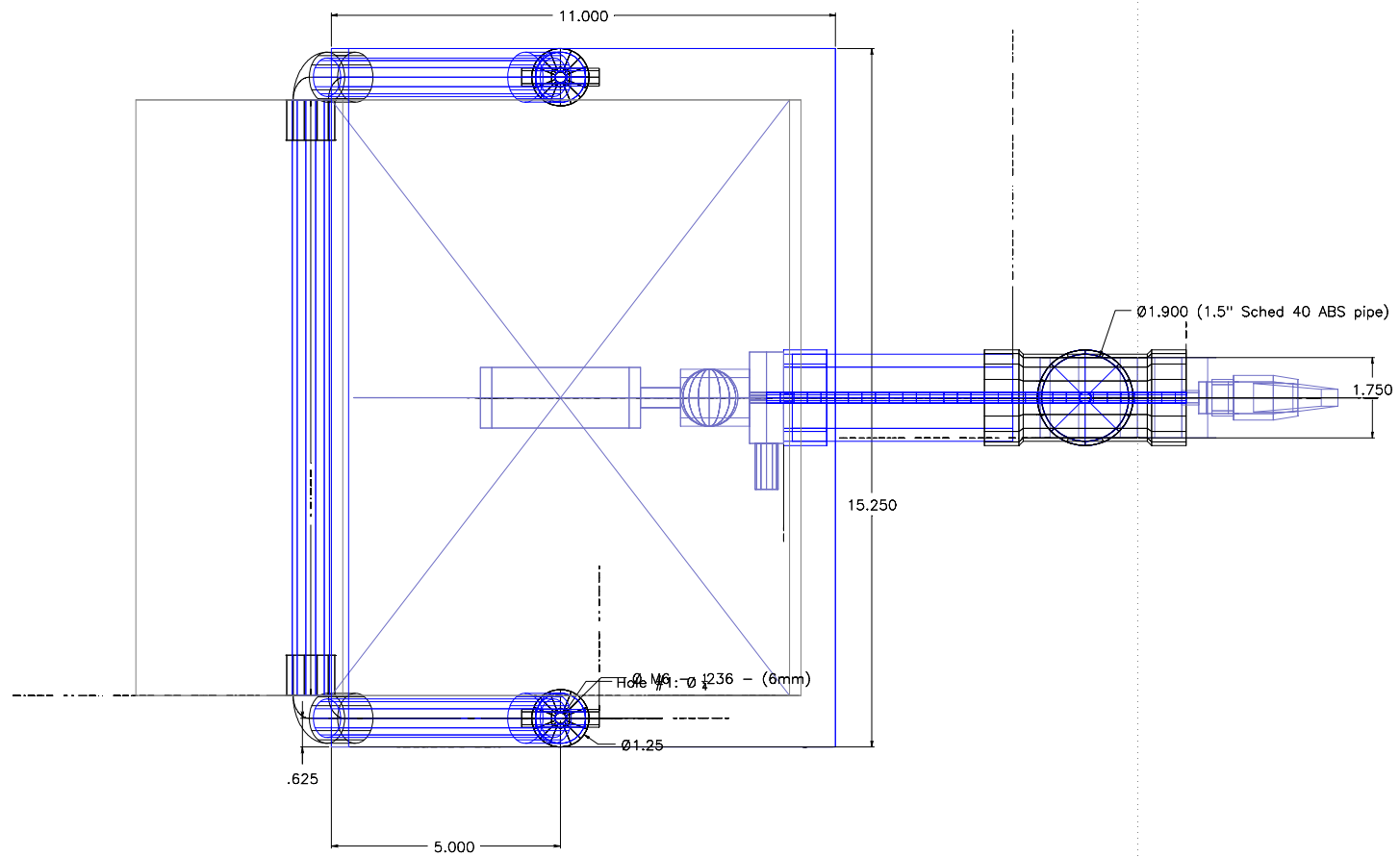




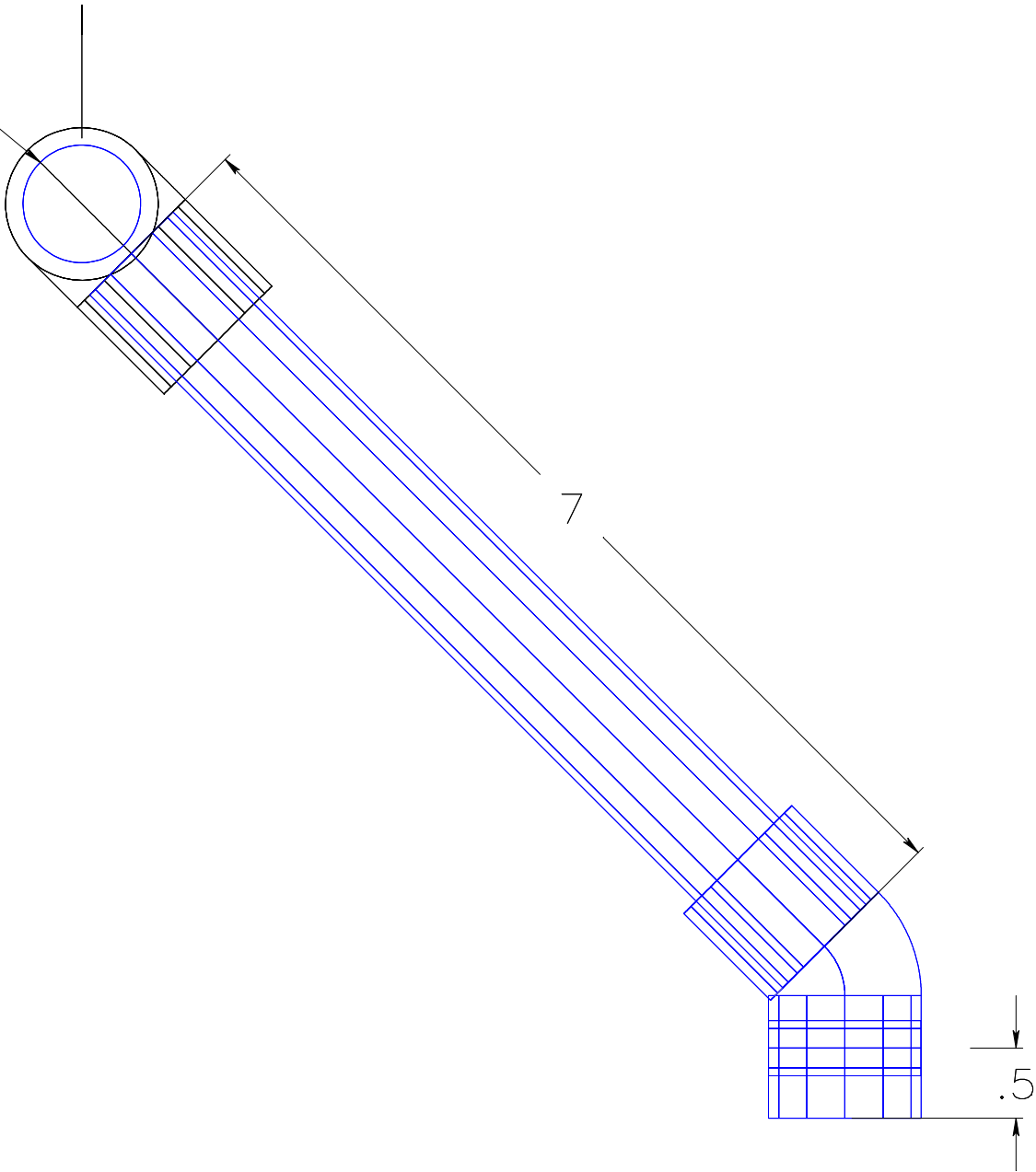


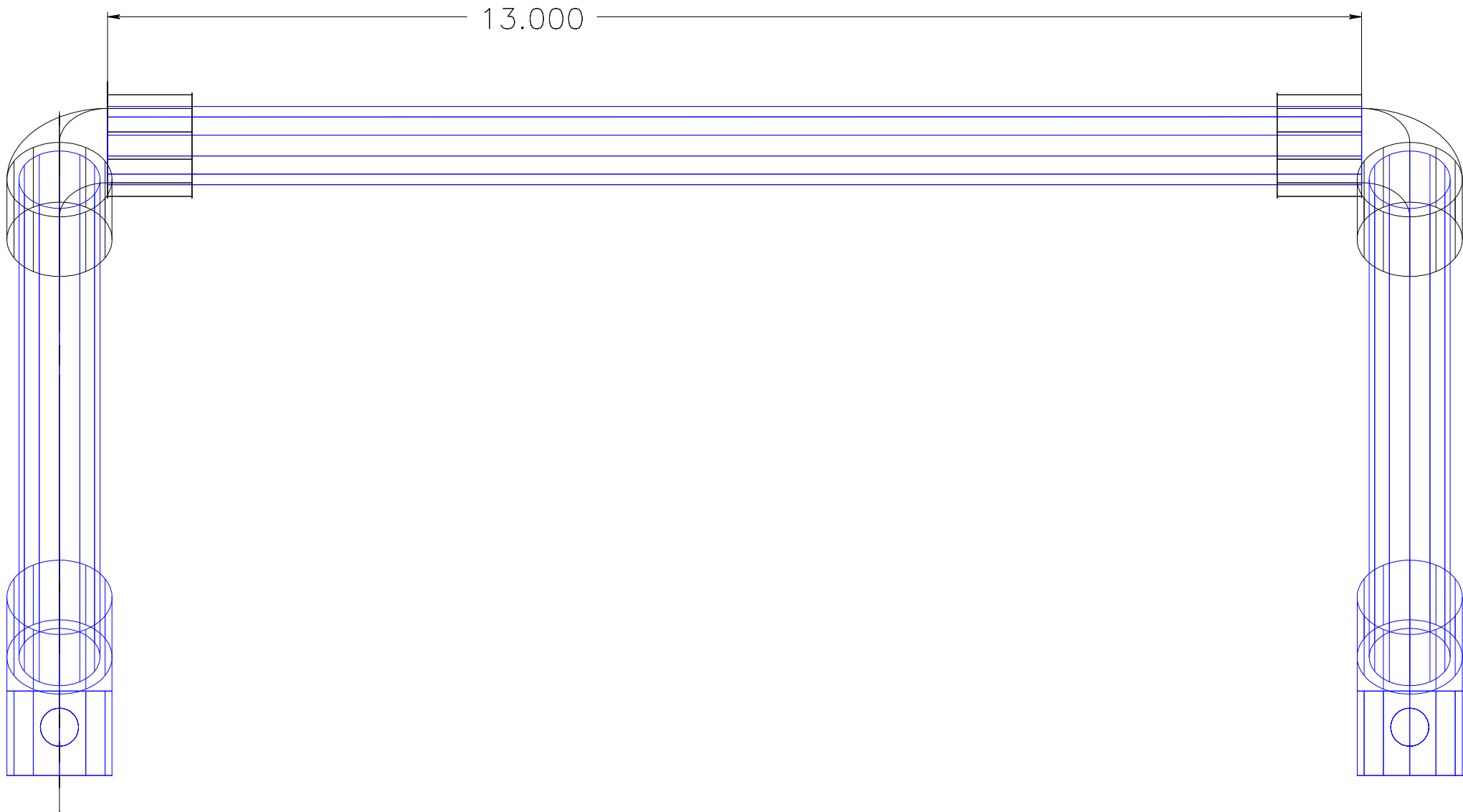


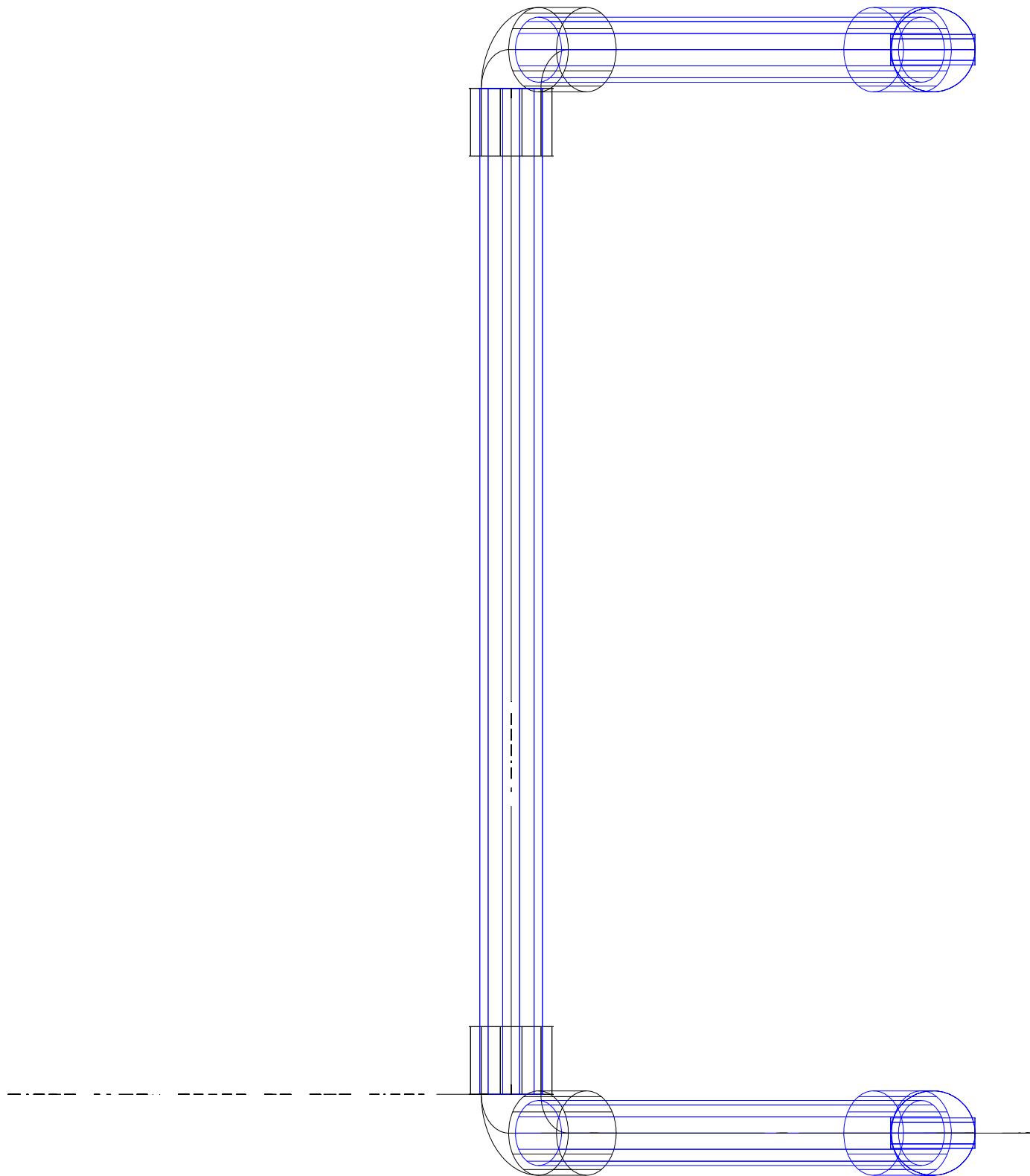


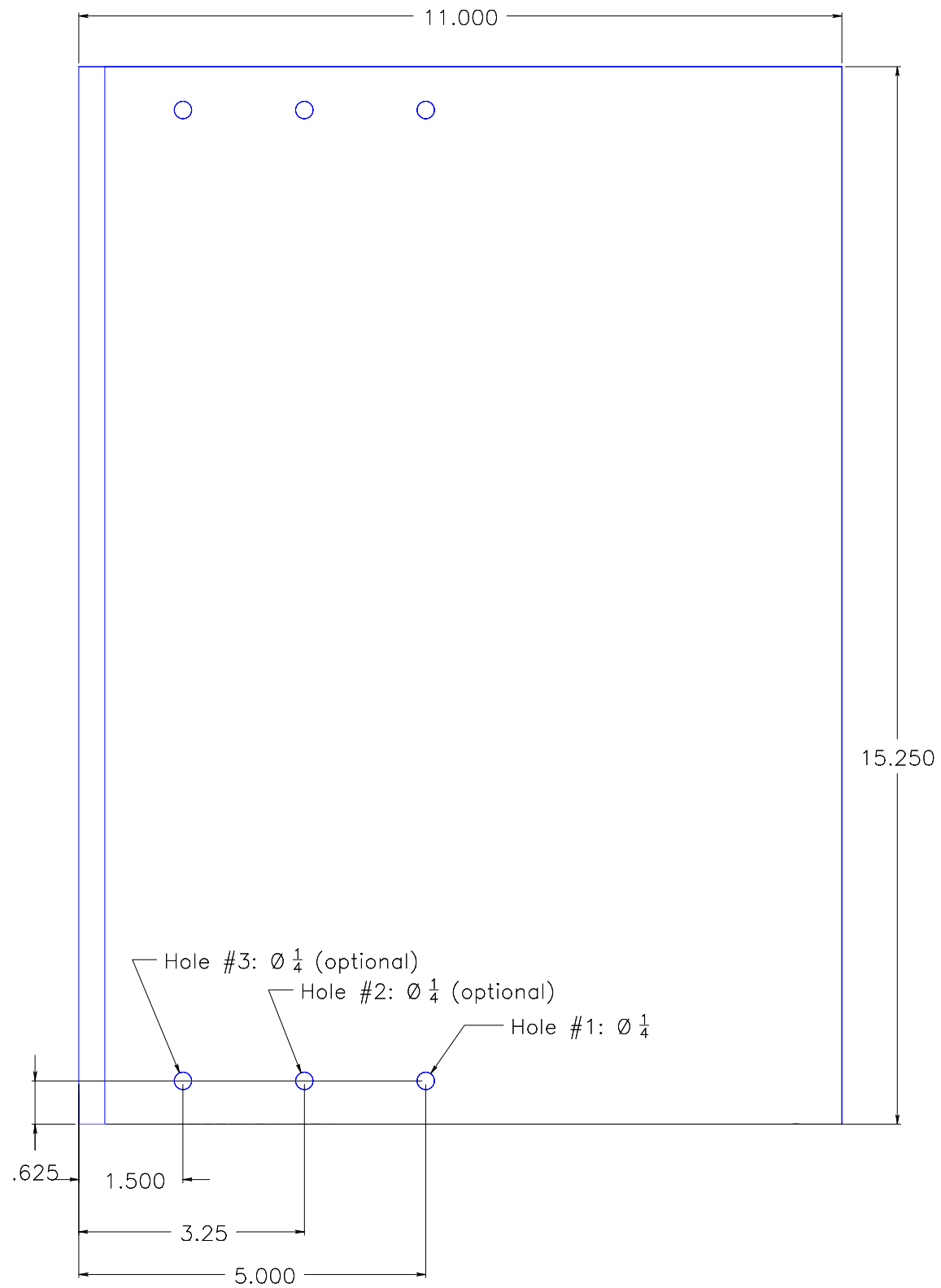


Ø.840 (1/2" Sched 40 PVC pipe)

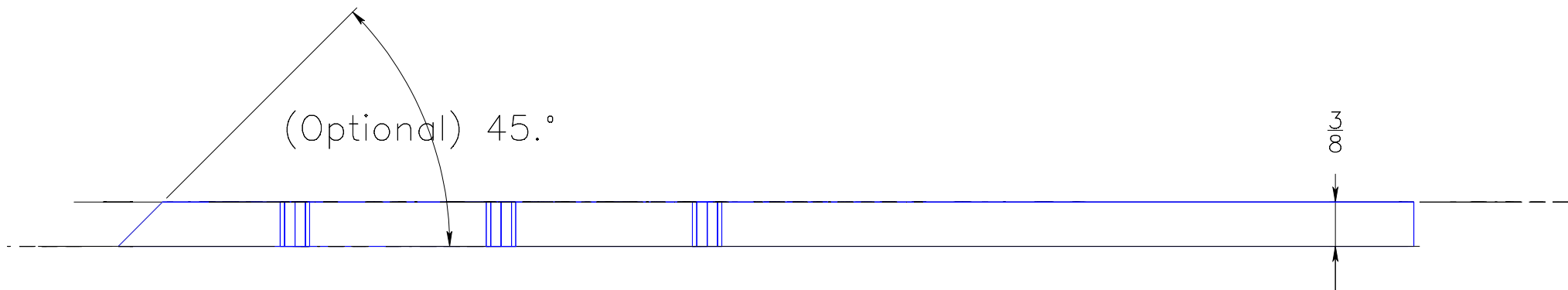


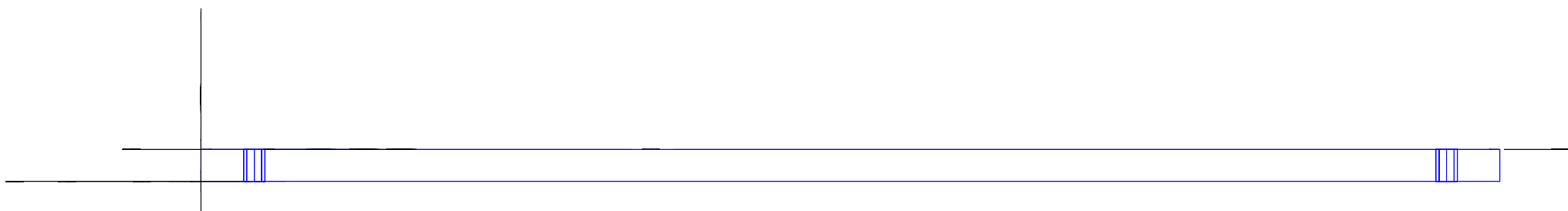


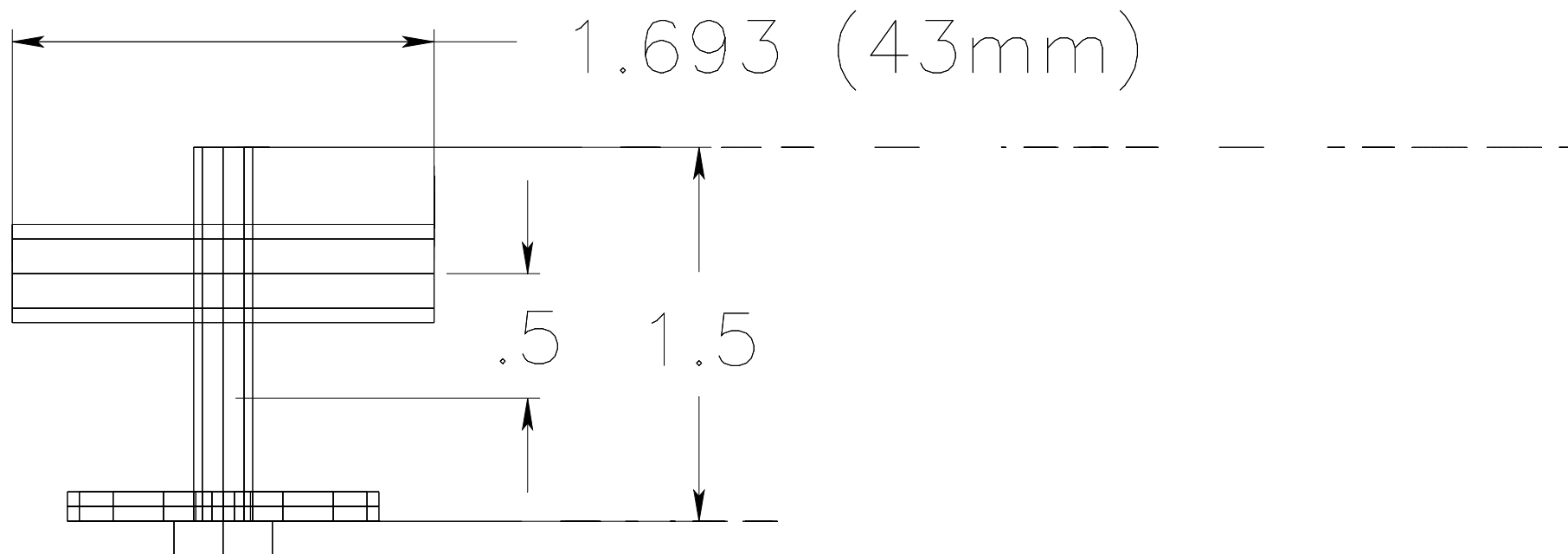


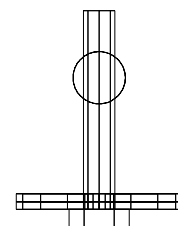
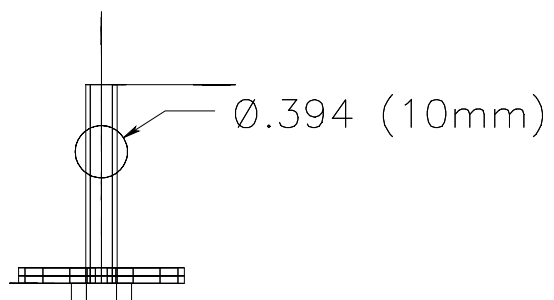


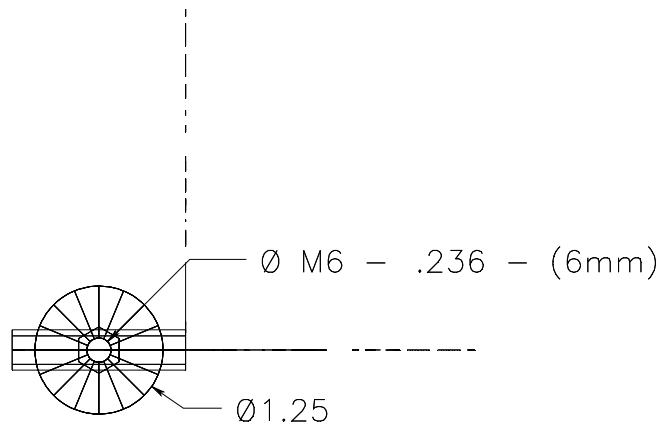
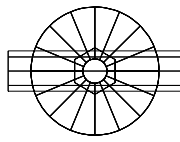


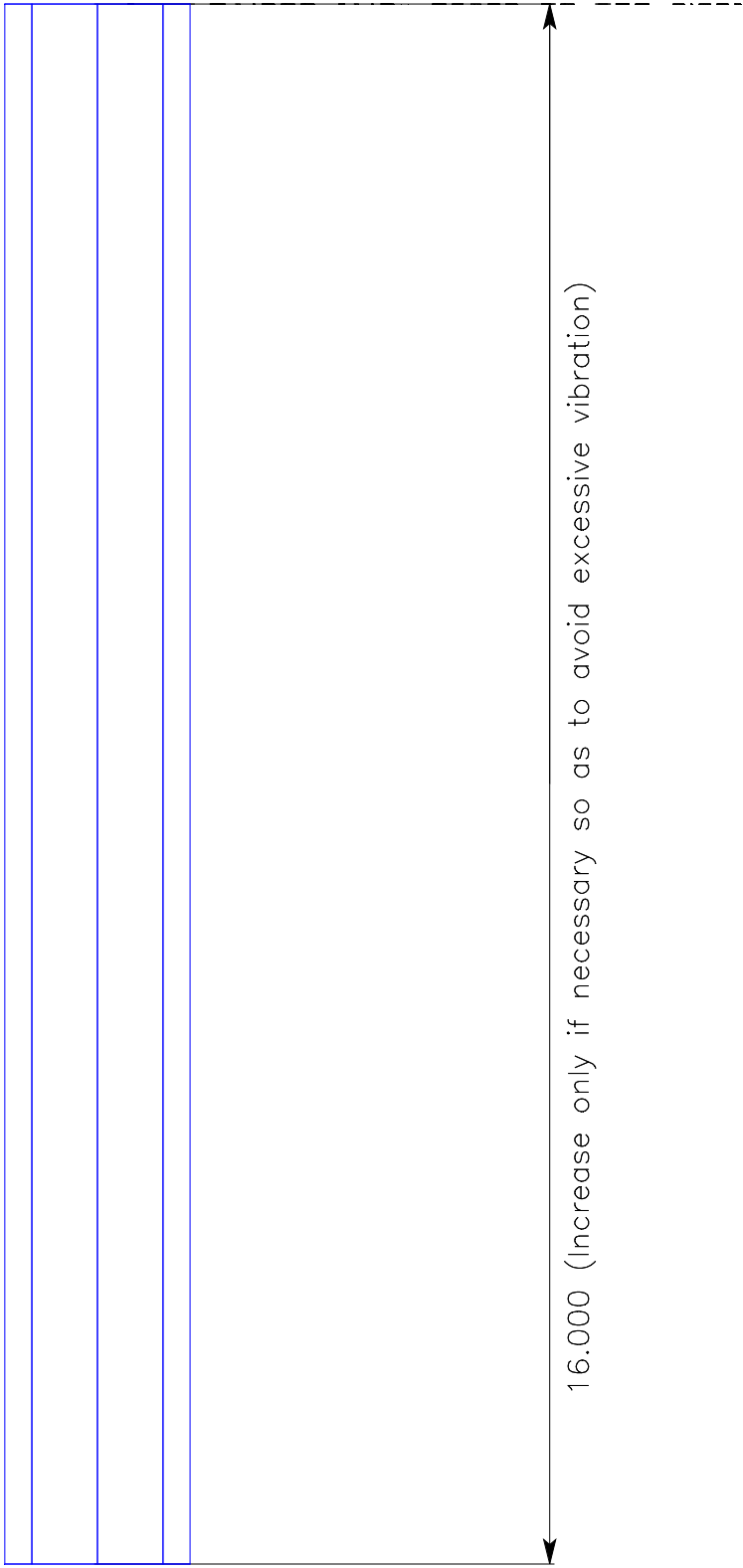


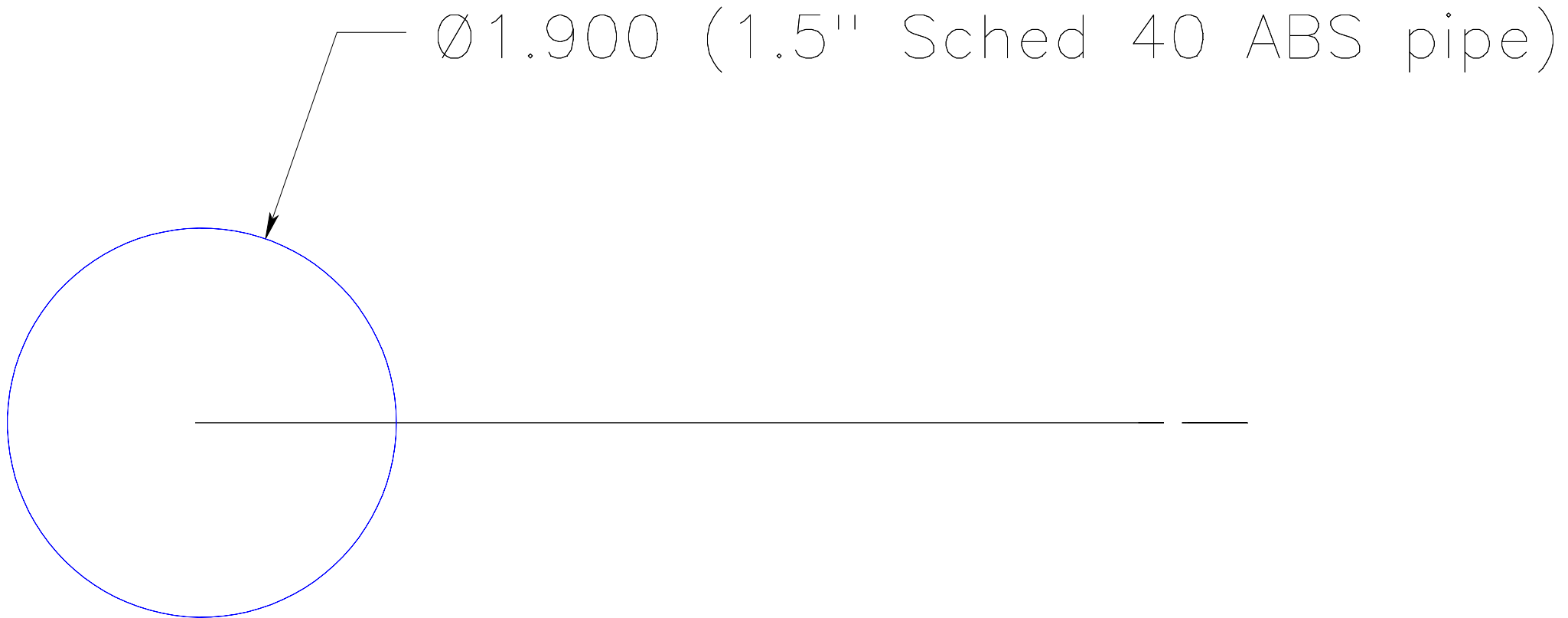


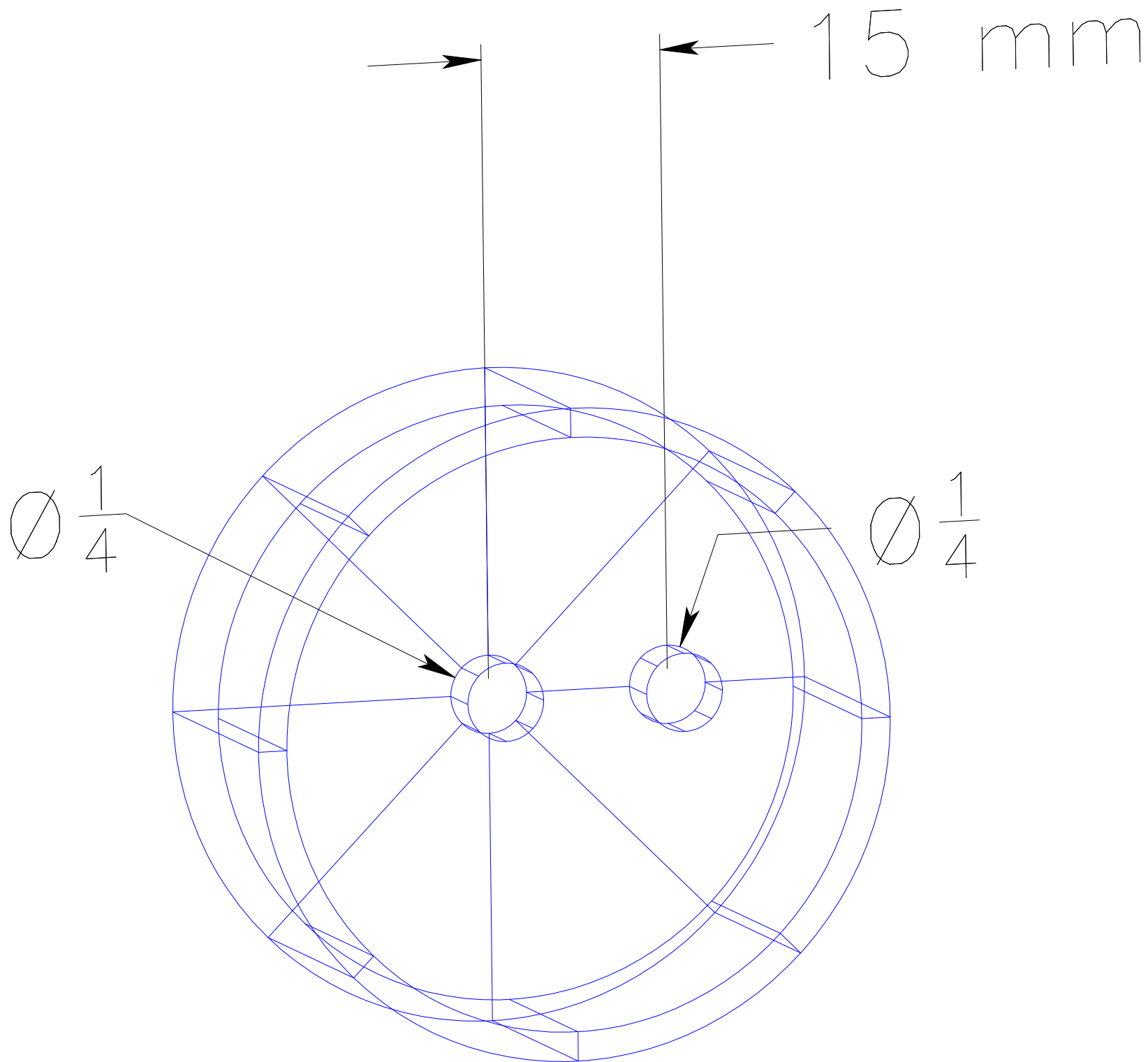










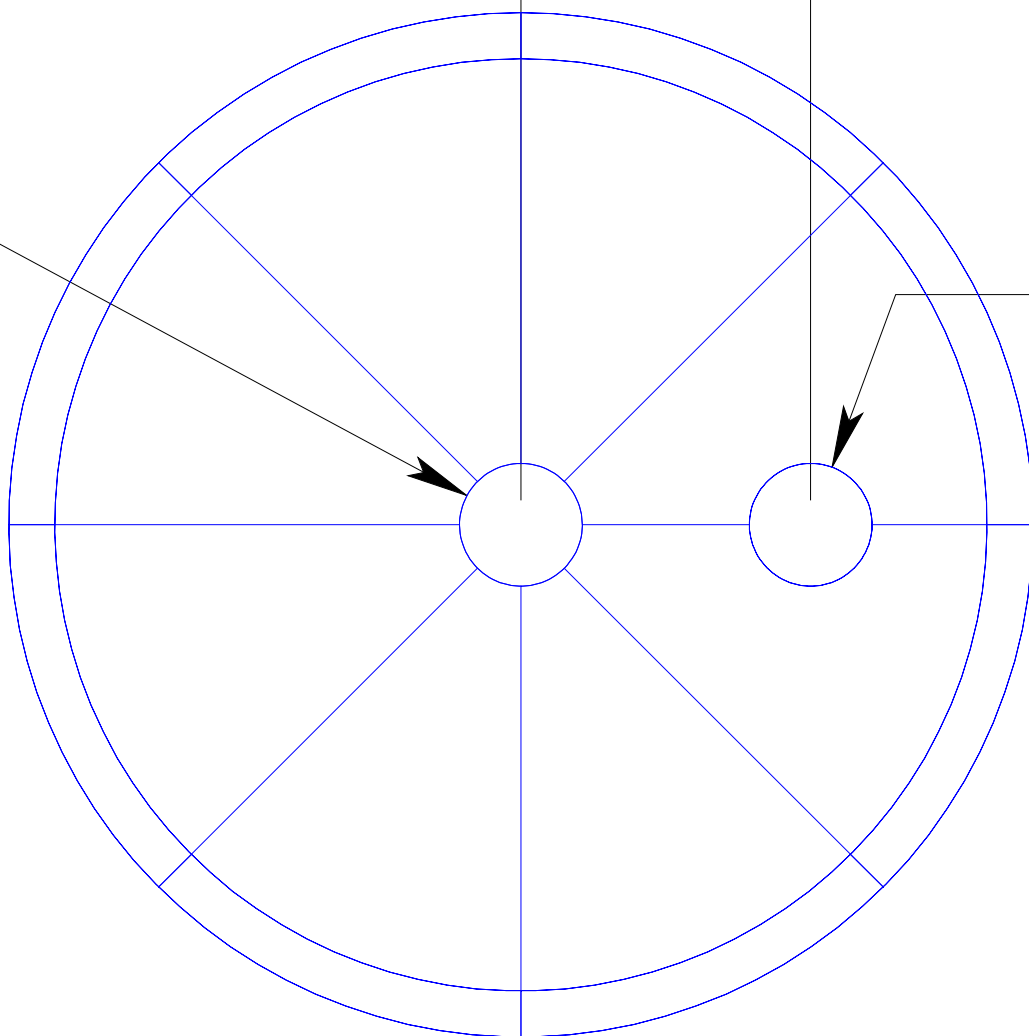


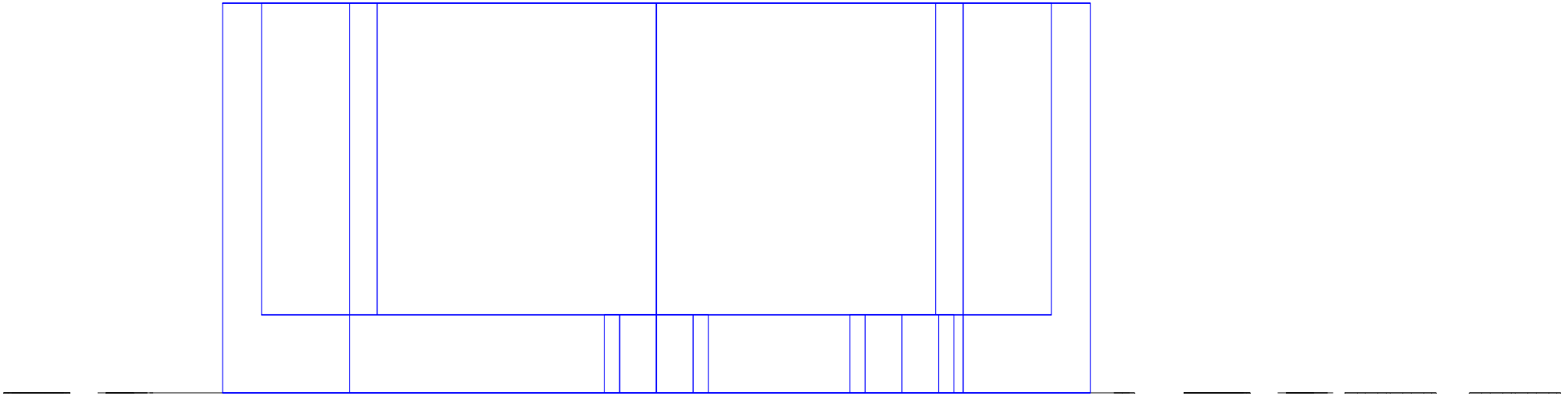


15 mm

$\varnothing \frac{1}{4}$

$\varnothing \frac{1}{4}$

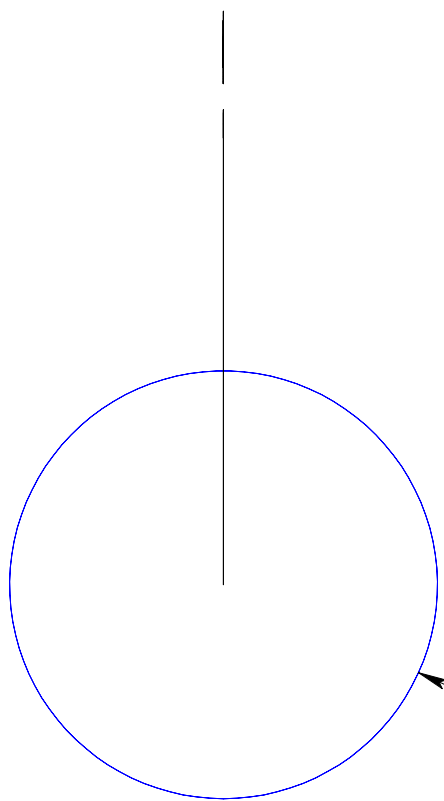




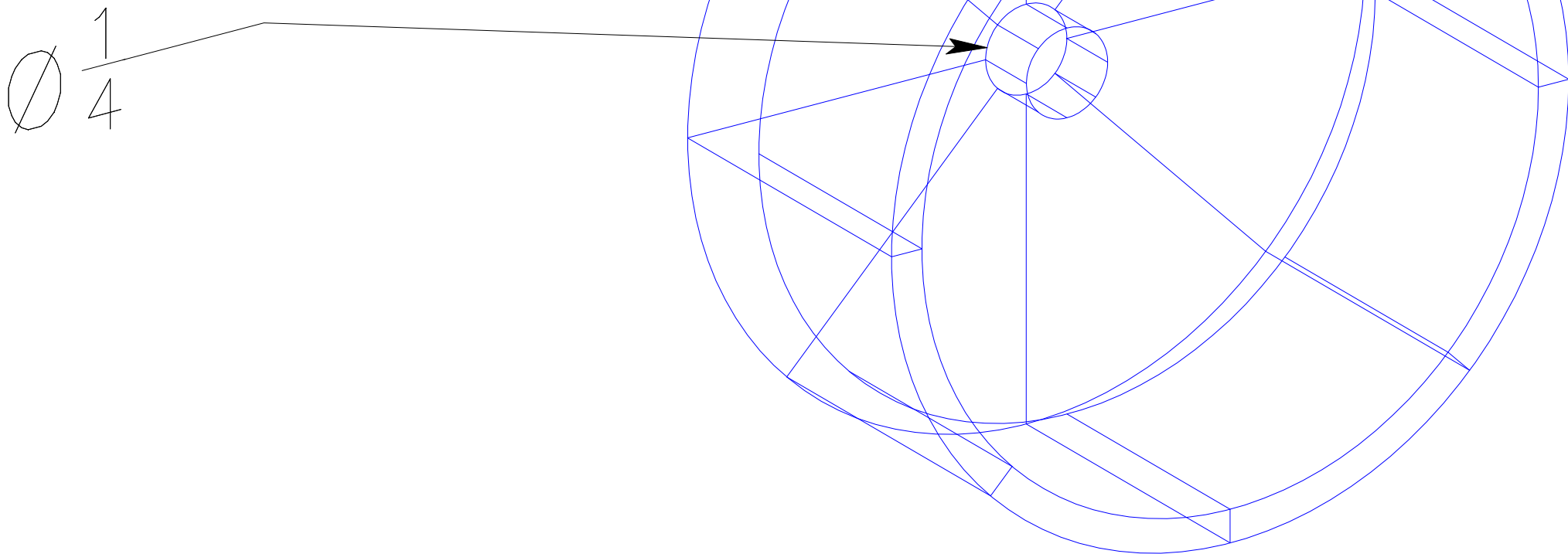




5.000 (your length may vary)

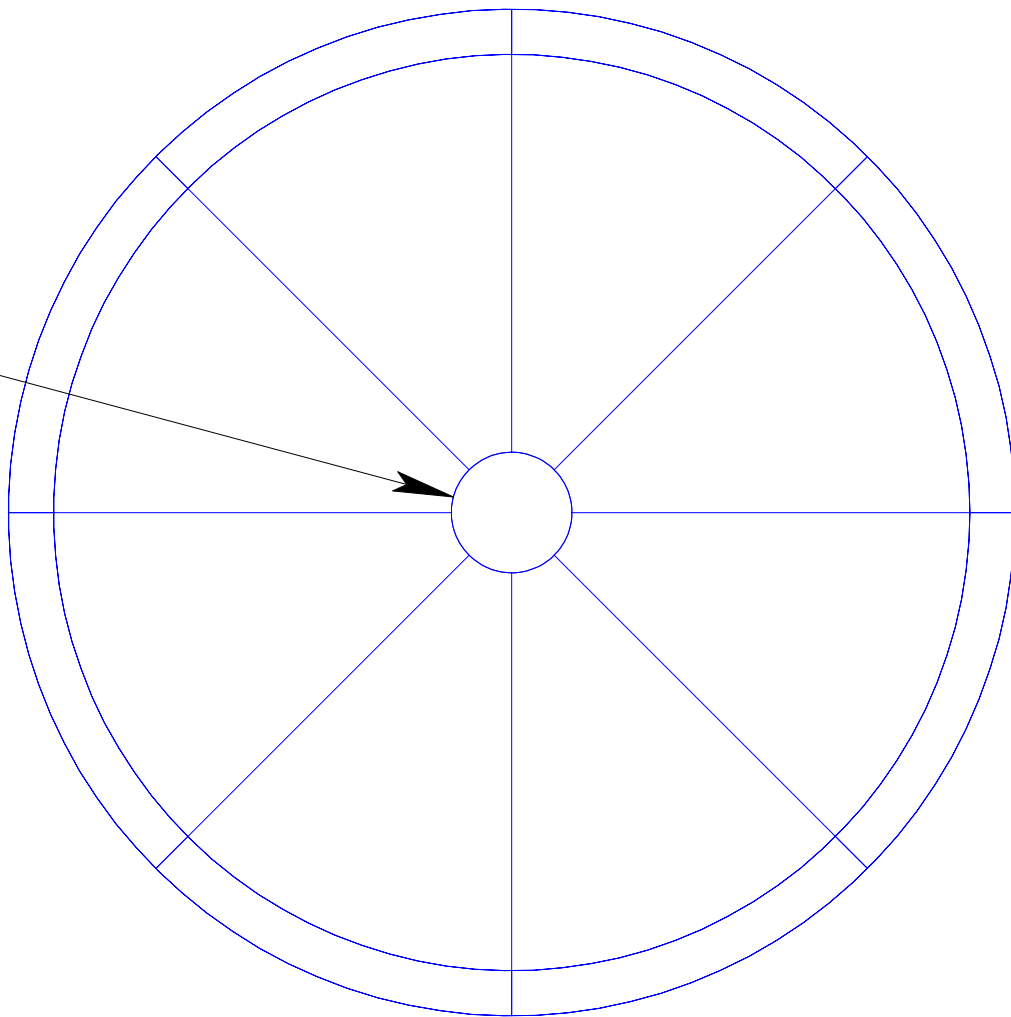
Ø 1.900 (1.5" Sched 40 ABS pipe)



[illegible]

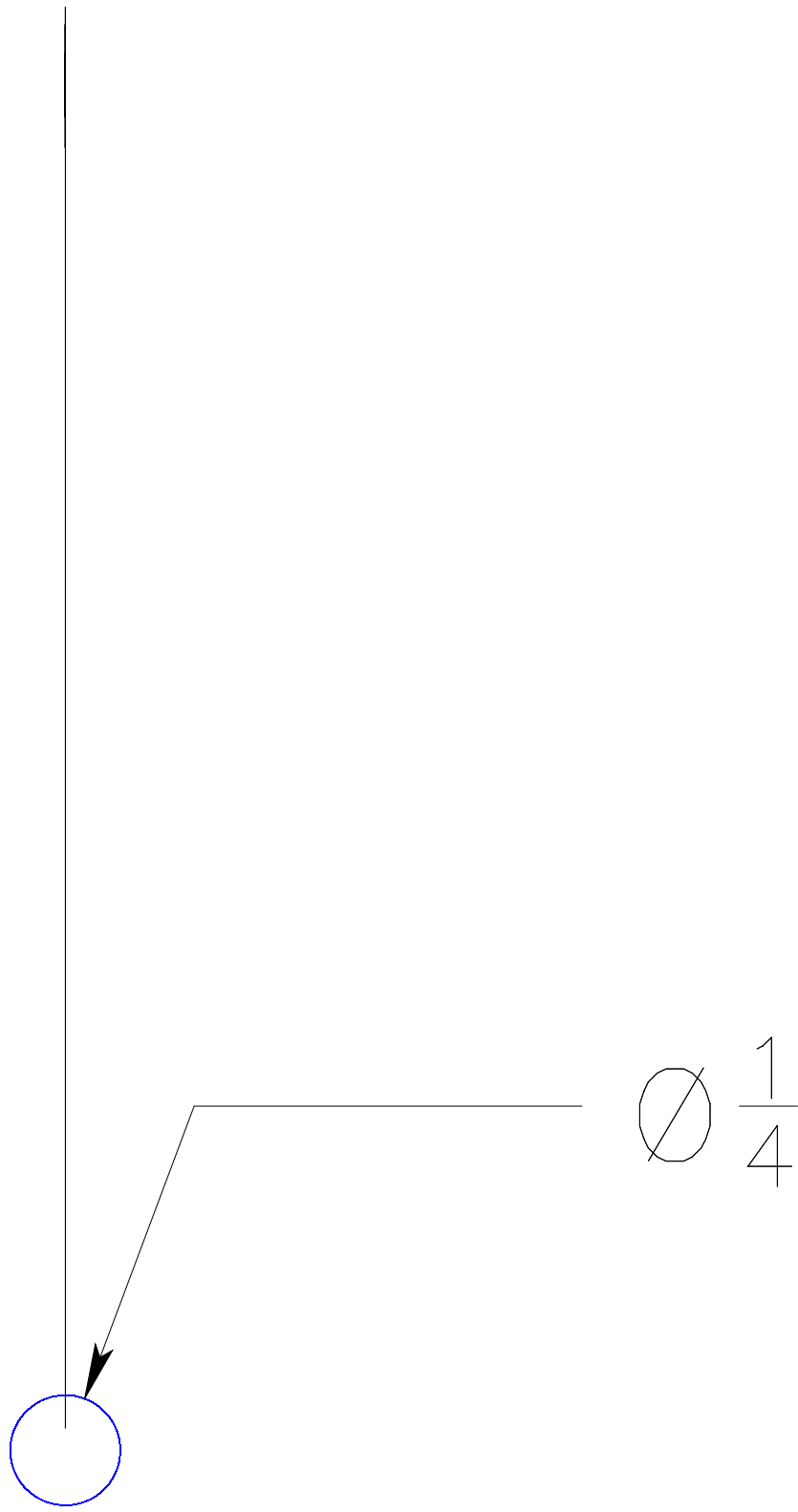


$$\frac{\emptyset}{4} \quad 1$$



9.156 (your length may vary)

[illegible]



3.000

