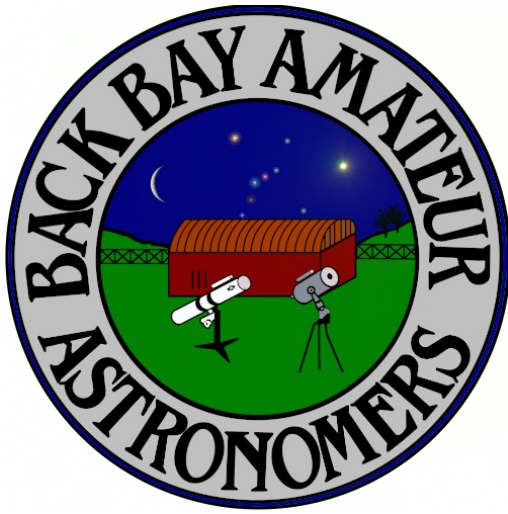




Banner Frame CONSTRUCTION



Table of Contents

Cover Page.....	1
Introduction.....	2
Banner Frame Construction.....	2
Original Banner Frame Design Parts and Cost.....	4
Illustration 1: Original Banner Frame Disassembled.....	4
Illustration 2: New Banner Frame Parts List with measurements.....	5
Illustration 3: Original Banner Frame Assembled.....	6
Illustration 4: New Banner Frame Glue Points.....	7
Illustration 5: New Banner Frame In Use.....	8
Illustration 6: Marking PVC for Banners 1.....	9
Illustration 7: Marking PVC for Banners 2.....	9
Illustration 8: Carrying Bag.....	10

Introduction

The BBAA is a 501(c)(3) non-profit educational organization dedicated to “Bringing Astronomy to the People of Hampton Roads.” Founded on December 14, 1978, we are a group of amateur astronomers drawn together by a common interest in observational astronomy. The BBAA is an active member society of the [Astronomical League](#) and a part of [NASA’s Night Sky Network](#).

Visit backbayastro.org to see our calendar of events, club information, newsletters and links to astronomy-related sites. If you have a question for us please send an e-mail to info@backbayastro.org.

The BBAA would like to thank Jerelyn Ramirez of the Kansas Astronomical Observers for their original design of the banner frame.

Banner Frame Construction

Our club purchased the parts listed in [table 1](#) below and constructed the banner frame using the instructions provided by the Kansas Astronomical Observers. The banner frame has served us well at many outreach events so we decided to construct another one so we could have two for club use. We decided to modify the original design of the banner frame. The new design is cheaper, stronger, uses less parts, and it took less time to make (see [table 2](#)). The original design utilizes $\frac{3}{4}$ " PVC tubing which is a little too flexible (see [illustration 1](#)). Usually while we are assembling the frame the PVC tubing flexes too much and in colder weather they are susceptible to breaking. One of our leg pieces also broke over the winter while staking it into the ground. The new design utilizes 1" and 1 $\frac{1}{4}$ " PVC tubing that slides into each other (see [illustration 4](#)). This design prevents all flexing and simplifies assembly at outreach events. There are only eight pieces of PVC tubing that make up the frame instead of 19 on the old design and all eight are used every time so there is no need to color code end pieces. Not having to color code the end pieces saves at least a day of work during the construction of the banner frame (see [illustration 2](#)). This brings up another point. The old banner frame must be staked into the ground or the wind will knock it over. With the new design there has not been a need yet to affix it to the ground although we do have the stakes ready in case the need arises. The new design also does not need the ropes attached. We do have some in case we

encounter extreme winds though. The new design doesn't need any eye bolts, washers, or carabiners either. The banner is attached to the frame utilizing only the bungee cords. We determined that all of the banners we might use were under 72" so each side of the frame uses two pieces of PVC pipe that are 36" in length. (* **see Note below**) We glued them at specific points (see [illustration 3](#)). Once the banner frame was assembled we drilled one hole through the middle of the PVC pipe and used a lock pin to hold them together. We also marked on the PVC pipe with the name of the banner that corresponded with the hole that was drilled (see [illustration 5 and 6](#)). When we want to attach a specific banner now we just slide open the frame to the mark and pin the frame using a lock pin. In case you are wondering our bag to carry it all is a Christmas tree bag bought off of Amazon (see [illustration 7](#)).

*** To provide more clarification on the length of each piece three additional photos have been provided at the end of this document.**

For the banners provided to us by NASA's Night Sky Network we didn't need to make a frame larger than 72". Since the pipes slide into each other that means each length of pipe was cut at 36 " for the sides only. The legs were kept short (1 foot) for two reasons. First to lower the whole frame to help on windy days. Second reason was to allow smaller children a closer view of the banner. The base pieces can be cut to whatever length you desire. Ours are sized to allow the maximum length for stability while also fitting in the trunk of the vehicle that carries it the most which turned out to be about 2 feet per section.

If you have questions please feel free to email us at info@backbayastro.org.

Original Banner Frame Design Parts and Cost

QUANTITY	ITEM	COST EACH	COST TOTAL
5	¾-IN 10-FT SCH40 PVC PIPE	\$2.62	\$11.80
6	¾-IN 10-FT SCH40 ELBOW	\$0.56	\$3.00
2	¾-IN 10-FT SCH40 CROSS	\$2.48	\$4.46
7	¾-IN 10-FT SCH40 COUPLING	\$0.33	\$2.10
2	¾-IN 10-FT SCH40 TEE	\$0.50	\$0.90
4	SPRING SNAP LINK	\$3.92	\$15.68
1	MASKING TAPE	\$3.98	\$3.98
1	FLAT WASHERS 5/16" PACKAGE OF 50	\$5.58	\$5.58
1	45FT VELCRO	\$2.97	\$2.97
1	¼-IN X 100-FT ROPE	\$9.98	\$9.98
1	8-PC ADJUSTABLE TOGGLE	\$5.98	\$5.98
8	5/16-INX3 ¼-IN ZINC EYE	\$0.63	\$4.56
2	50-LB PLAY SAND (ANCHOR ON CONCRETE)	\$3.97	\$7.14
1	SET OF 10 GALVANIZED TENT STAKES	\$12.82	\$12.82
1	12-OZ RED SPRAY PAINT	\$3.98	\$3.98
1	12-OZ GREEN SPRAY PAINT	\$3.98	\$3.98
1	12-OZ PURPLE SPRAY PAINT	\$3.98	\$3.98
1	12-OZ ORANGE SPRAY PAINT	\$3.98	\$3.98
1	12-OZ BLUE SPRAY PAINT	\$3.98	\$3.98
1	12-OZ BLACK SPRAY PAINT	\$0.99	\$0.99
1	12-OZ WHITE SPRAY PAINT	\$3.98	\$3.98
1	STORAGE BAG, (2) LARGE BAGS - GREEN	\$19.88	\$19.88
			\$135.70



Illustration 1: Original Banner Frame Disassembled

New Banner Frame Design Parts and Cost				UPDATED W/2022 PRICES
NEEDED	QTY	ITEM	COST EACH	COST TOTAL
12 FEET	1	1-IN 10-FT SCH40 PVC PIPE	\$9.26	\$9.26
	1	1-IN 5-FT SCH40 PVC PIPE	\$7.87	\$7.87
22 FEET	5	1 ¼-IN 5-FT SCH40 PVC PIPE	\$3.93	\$19.65
	2	1 ¼ IN X 1-IN ELBOW	\$2.98	\$5.96
	1	1 ¼-IN x 1-IN 480 PSI BUSHING PVC BUSHING	\$3.78	\$3.78
	1	8-PC ADJUSTABLE TOGGLE	\$8.98	\$8.98
	4	5/16 X 2 ¾ WIRE LOCK PIN	\$4.13	\$16.52
	1	1 ¼-IN X 1-IN TEE	\$2.85	\$2.85
	3	1 ¼-IN SCH40 TEE	\$2.46	\$7.38
	1	1 ¼-IN x 1-IN 480 PSI BUSHING PVC BUSHING	\$3.78	\$3.78
				\$91.23

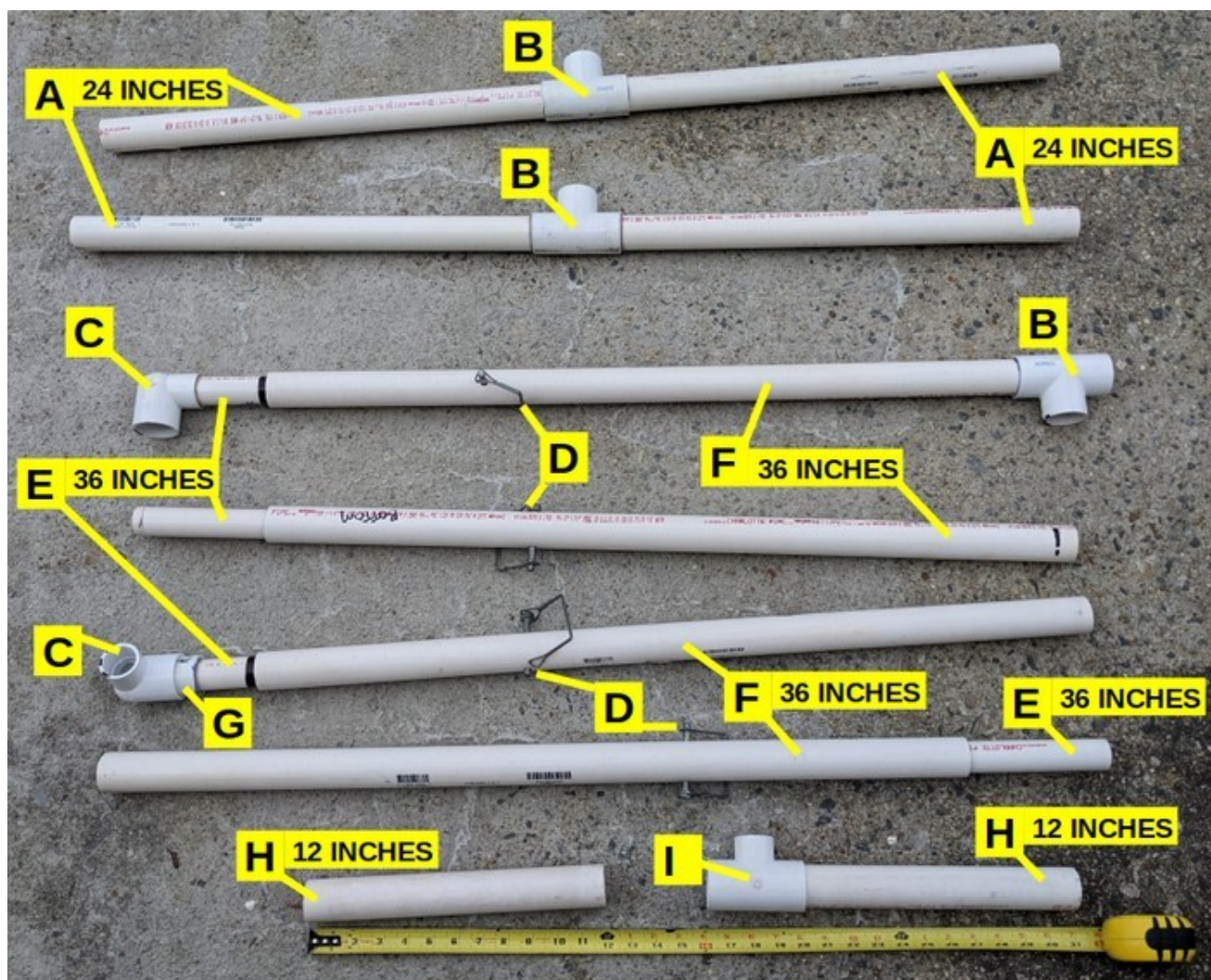


Illustration 2: New Banner Frame Parts List with measurements



Illustration 3: Original Banner Frame Assembled



Illustration 4: New Banner Frame Glue Points

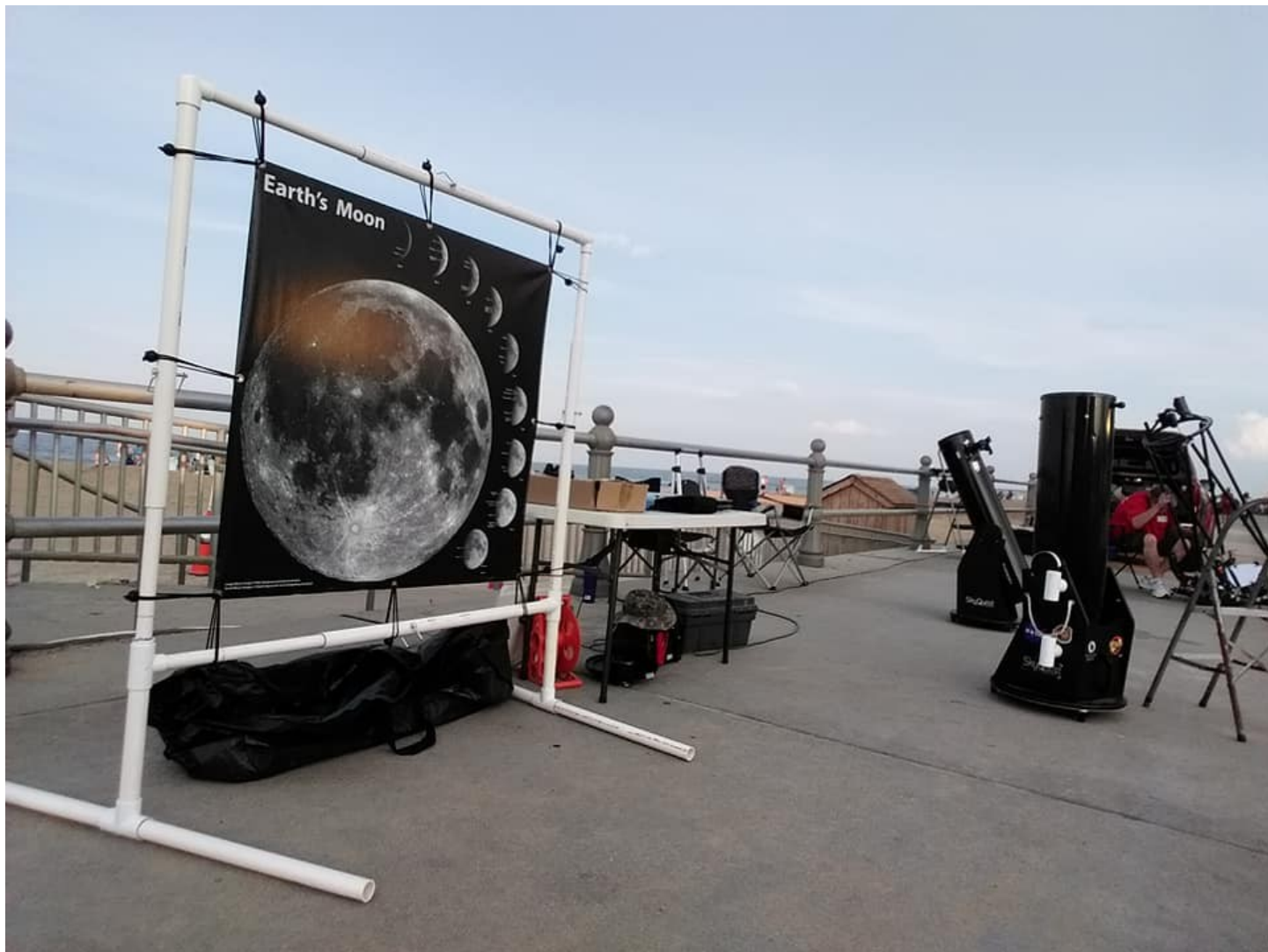


Illustration 5: New Banner Frame In Use



Illustration 6: Marking PVC for Banners 1



Illustration 7: Marking PVC for Banners 2



Illustration 8: Carrying Bag