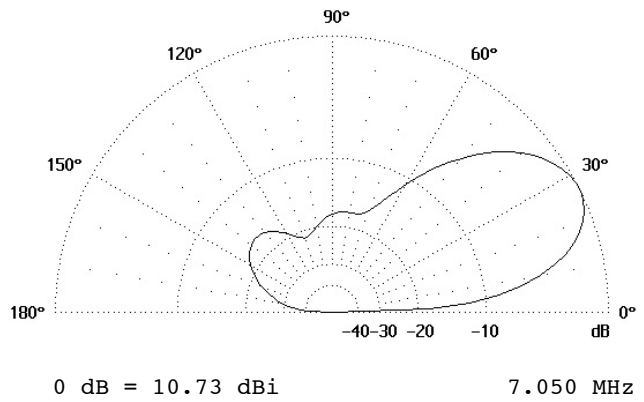
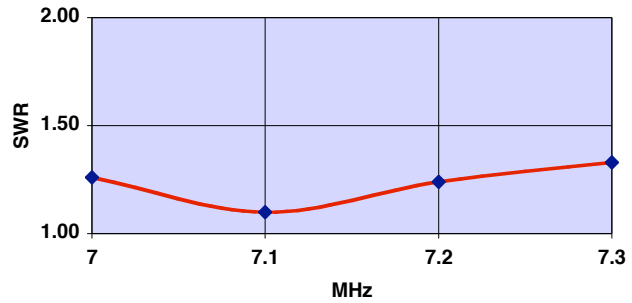


W6NL Moxon on Cushcraft XM240



- **99.5% Efficiency**
- **High F/B**
- **300+ kHz VSWR BW**



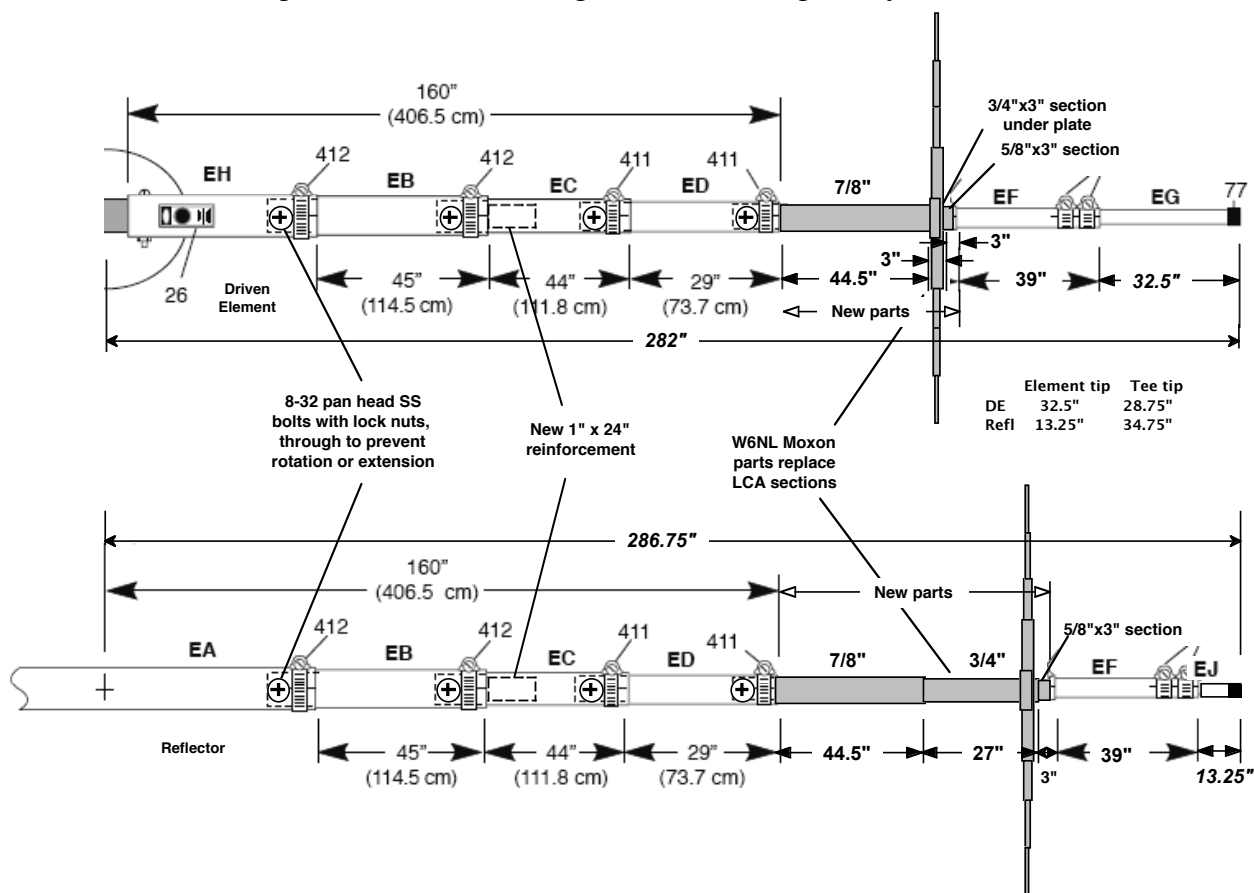
Construction of W6NL Moxon on Cushcraft XM240

Dave Leeson, W6NL

The W6NL Moxon Yagi is a high efficiency two-element 40m Yagi that uses cross elements to provide both loading and Moxon coupling. The upgrade of the XM240 to the W6NL Moxon consists of replacing the loading coil LCA sections with four new assemblies, each consisting of two new sections and the new tee loading element. The remaining parts are original Cushcraft¹.

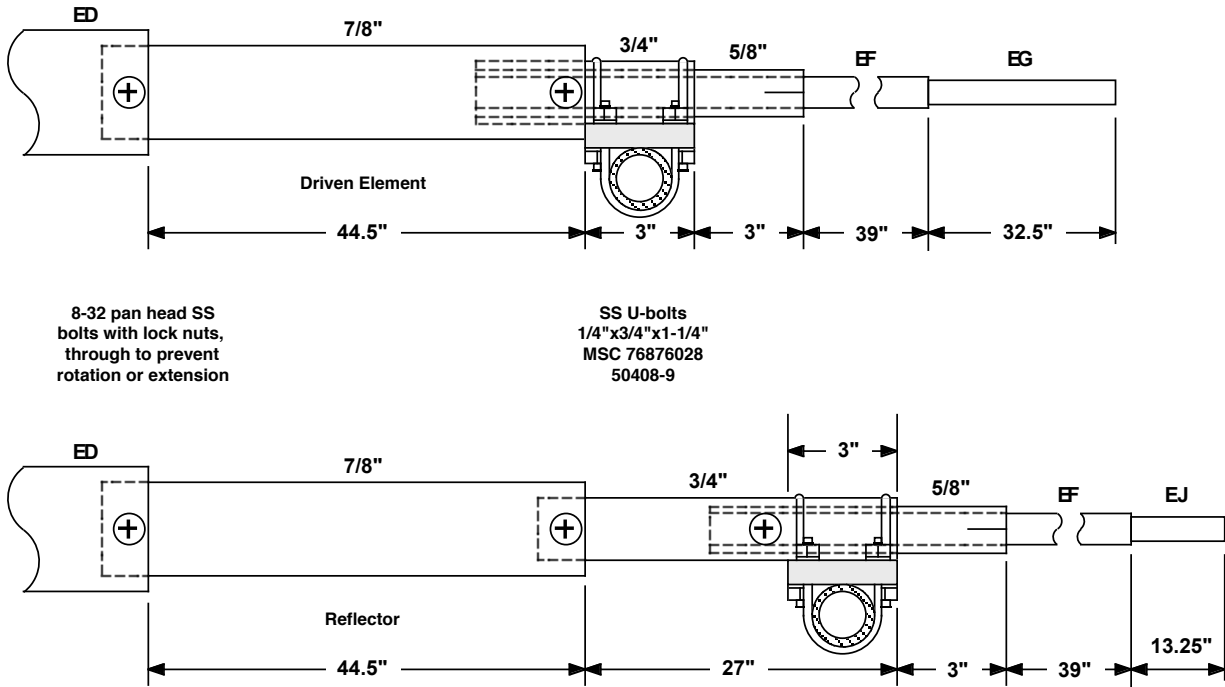
To construct the antenna, build the boom and the elements including the sections EH through ED (driven element) and EA through ED (reflector), as shown in the Cushcraft XM240 manual. Add a 1" x 0.058" x 24" internal reinforcements to spigot into EB at the inner end of EC. The elements will have a half-length of 160" to ED. The tip sections EF and EG/EJ are used later.

Now build the four new element sections and the four tee loading elements. The new assemblies will be mounted between the Cushcraft element 160" inner sections and the tip sections, as shown in the drawing here (full size drawings are attached separately):



¹ There are some options: Rather than shortening the original Cushcraft parts, the element tips can be made from any 3/8" x 0.058 6061-T6 or 6063-T832 aluminum tubing, the reflector can be grounded at its center or the Cushcraft reflector mounting plate can be replaced with a thick plate and U-bolts or muffler clamps.

The tee loading elements are attached to the reinforced 3/4" diameter element sections by plates with 3/4" SS U-bolts. The details of the element sections are shown here:

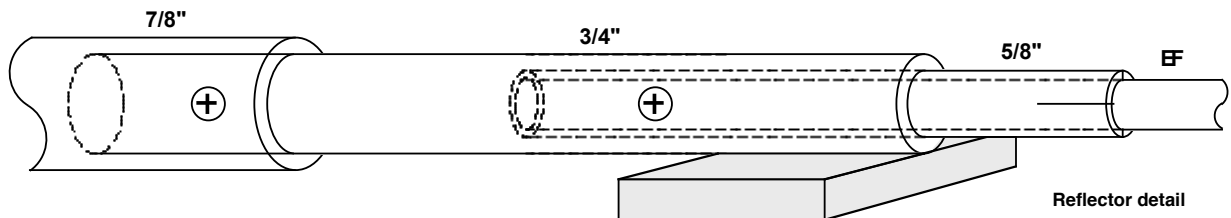
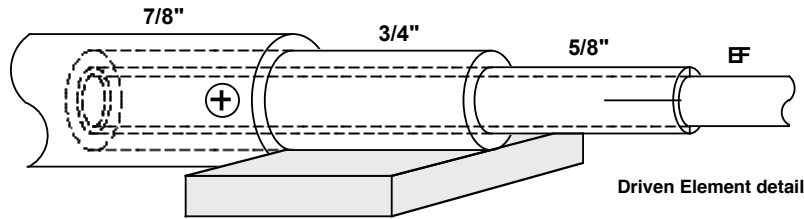


8-32 pan head SS bolts with lock nuts, through to prevent rotation or extension

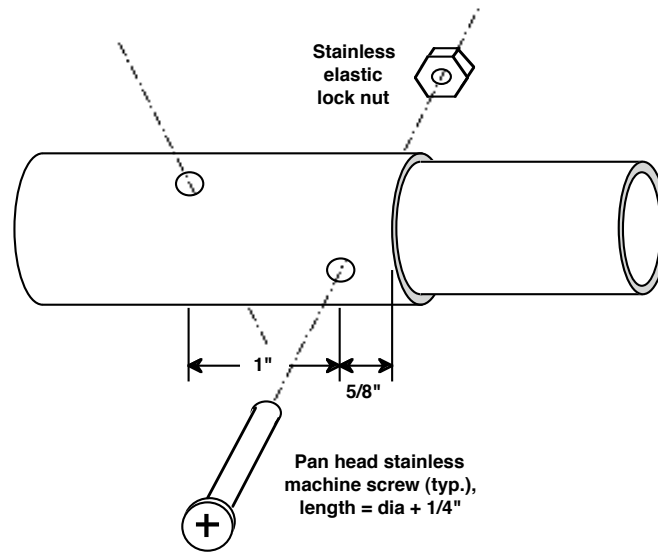
SS U-bolts
1/4"x3/4"x1-1/4"
MSC 76876028
50408-9

The element assemblies consist of the following sections, also shown in a different view below:

Driven Element			Reflector	
Diameter	Exposed length	Material length	Exposed length	Material length
EH/EA to ED	160"		160"	
7/8"	44.5	48"	44.5	48"
3/4"	3	6	27	30
5/8"	3	9	3	9
EF 1/2"	39	48	39	48
EG/EJ 3/8"	32.5	36	13.5	18
Total	282		286.75	

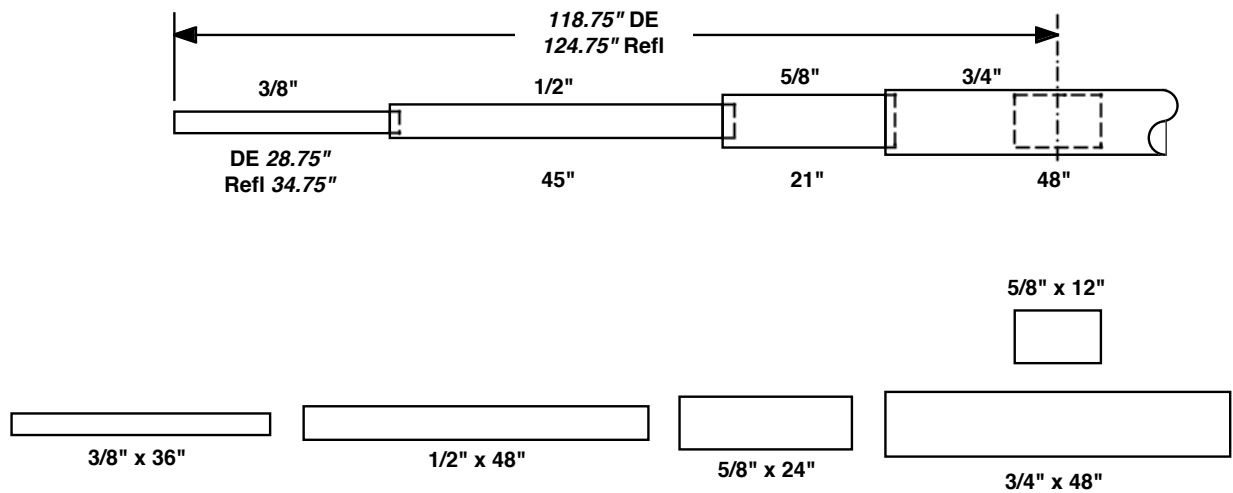


The new sections are joined with cross-drilled 8-32 stainless machine screws and lock nuts:



The tip sections EF can be secured with either hose clamps on the 5/8" extensions or cross-bolts. The exposed length of EF can be shortened by 3" (to 42") and the exposed length of EG and EJ can be extended by 3" to use cross-bolting, with no measurable effect on element tuning.

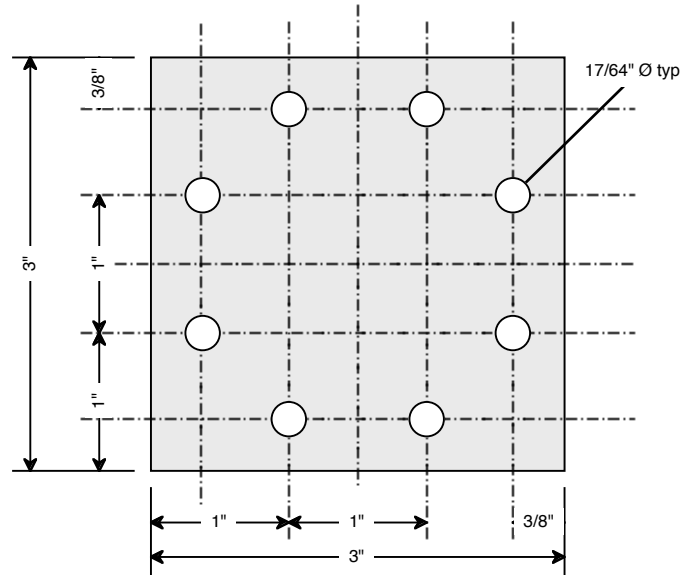
The tee sections are built from new tubing, 6061-T6 or 6063-T832 aluminum, 0.058" wall thickness, as shown here:



Diameter	Driven Element Tee		Reflector Tee	
	Exposed length	Material length	Exposed length	Material length
3/4"	24"	48"	24"	48"
5/8"	0	12	0	12
5/8"	21	24	21	24
1/2"	45	48	45	48
3/8"	28.75	32	34.75	38

The tee sections are secured with cross-drilled 8-32 SS machine screws and lock nuts as above. The center is reinforced to withstand the compression of the U-bolts with which it's attached, and can be held in place with a dimple from a center punch.

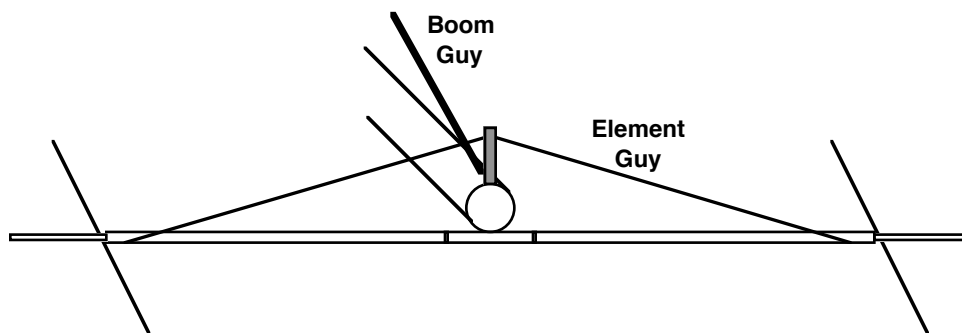
The tee sections are attached to the new element sections with 1/4" x 3/4" x 1-1/4" U-bolts MSC #76876028 and the plate shown here:



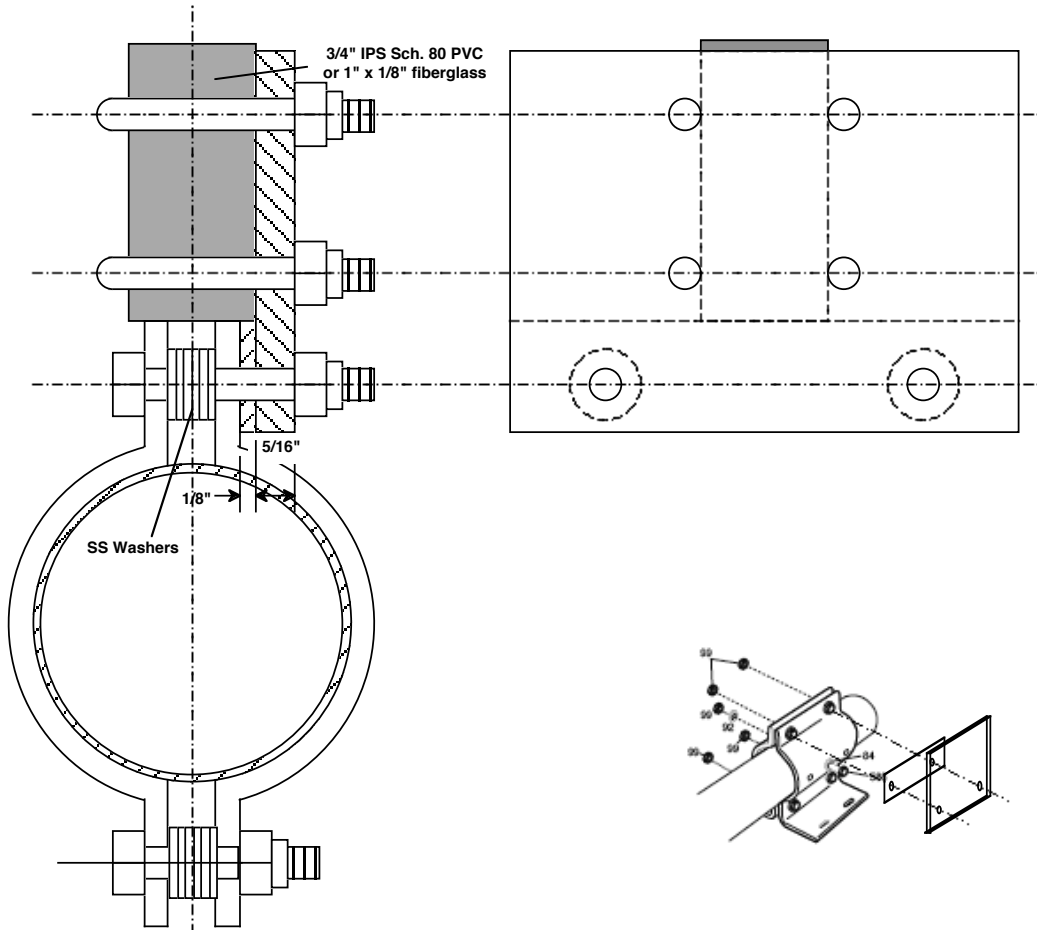
After the elements are assembled, the tee loading sections are set horizontal by rotating the joint between the new element assemblies and the Cushcraft inner boom sections. This is best done after the boom guys are set, so the boom is held horizontal. The tip loading sections can be sighted against the boom, or leveled with a bubble level, and then the cross-bolt holes are drilled in the tips of the ED sections.

Although it is not a strength issue, the elements develop substantial sag, and should be guyed as shown in the following diagrams. It is strongly recommended to cross-bolt the Cushcraft inner element sections to prevent rotation of the tee loading elements and to preclude compression of the elements by the element guys.

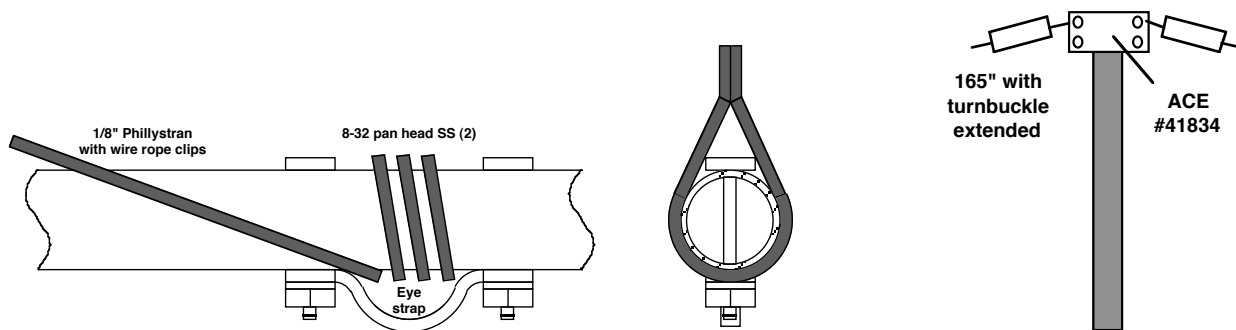
A general overview of the element guying is shown here:



The vertical brace is a 36" length of 3/4" IPS Schedule 80 PVC pipe or conduit or 1" x 0.125" fiberglass tube, held in place by a bracket mounted to the side of the element-boom clamp #509:



The element guy is 1/8" Phillystran, with 1/8" cable clamps (3 per end). The guy rope is wound one or more times around the element, so no thimbles are required. The location of the guy on the element is held by a stainless eyestraps or fairlead (Eyestraps - Narrow, 1-1/4"L x 3/8"W #8 holes West Marine #120667 RF498). The details of the attachment to the element with two stainless 8-32 through bolts, washers and lock nuts are shown here²:



The guy cables are attached to the vertical strut through 5/16" turnbuckles to a clamp made from a "pipe repair clamp," ACE Hardware #41834, with 1/4" SS bolts and locknuts substituted.

² The elements can be held in a horizontal position while the guy is tightened and clamped. The guys attach at the outer end of section ED, wrapped three times to prevent slippage. The center is also triple-wrapped.

Parts List:

Cushcraft XM240 kit, except for loading coils LCA

Element sections (4 required):

Diameter	Quantity	Material length
7/8" x 0.058"	(4)	48"
3/4" x 0.058"	(2)	6
3/4" x 0.058"	(2)	30
5/8" x 0.058"	(4)	9
1" x 0.058"	(4)	24 Intenal reinforcement for EC

Tee elements (4 required):

Diameter	Quantity	Material length
3/4" x 0.058"	(4)	48"
5/8" x 0.058"	(4)	12
5/8" x 0.058"	(8)	24
1/2" x 0.058"	(8)	48
3/8" x 0.058"	(4)	32
3/8" x 0.058"	(4)	38

8-32 SS Machine Screws and Nuts (Drill #19 for tight fit)

El section diameter	1-3/8	1-1/4	1-1/8	1	7/8	3/4	5/8	1/2	3/8
Screw length	1-5/8	1-1/2	1-3/8	1-1/4	1-1/8	1	7/8	3/4	--
# screws	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	
Tee sect. diameter						3/4	5/8	1/2	3/8
Screw length						1	7/8	3/4	5/8
# screws						(16)	(16)	(16)	--
Totals	(8)	(8)	(8)	(8)	(8)	(24)	(24)	(24)	
Nuts	(112)								

U-bolts (stainless)

1/4" x 3/4" x 1-1/4"	(16)	MSC #76876028
1/4" x 1-1/8" x 2"	(4)	MSC #76876044
Eyestrapp	(4)	West Marine #120667 RF498

Aluminum plates

1/4" x 3" x 3"	(4)
PVC pipe mounts	(2)

PVC pipe 3/4" IPS x 36"	(2)
Phillystran 1/8"	75'