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What is the Greyt Universal Elevator v2?






The Greyt Universal Elevator V2 is an upgrade to the original Greyt Elevator.

Some improvements include:

- Double chain lifting
- Dual motor option
- Falcon support
- Bearings on all surfaces.



Recommended Tools

Picture	Name
	Allen Wrench Set
	7/16" Wrench
	3/8" Wrench
	Drill w/ Drill Bit Set
	Rivet Gun (Pneumatic version recommended)



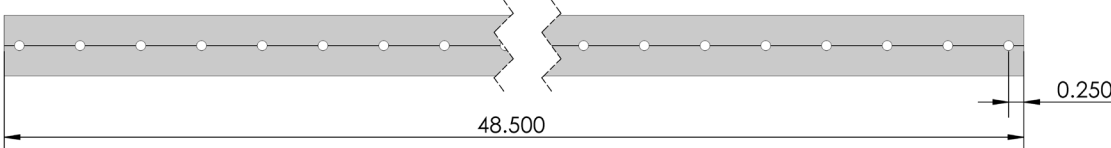
Tubing Cut Guide

The overall length for these tubes is for the elevator represented in the CAD model. This can be changed to fit the requirements of any design.

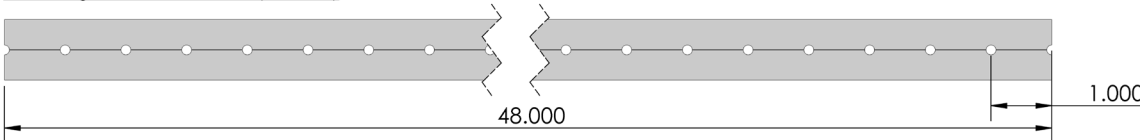
Ensure that when cutting tubes, the distance from the last hole to the end of the tube is the same as the image below. Usually this means that the tube length must be in 1/2" increments. This distance is required for the gussets to align properly. If VersaFrame tubing is not used then tubes can be any length.

Note: It is recommended to cut the tubes longer than needed and then mill to the correct length. Alternately, a chop saw may be used. The ends of the tubes should be as flat and square as possible.

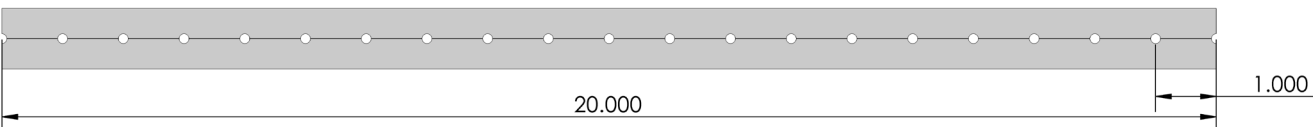
Elevator Mast Vertical Tube (QTY 2)



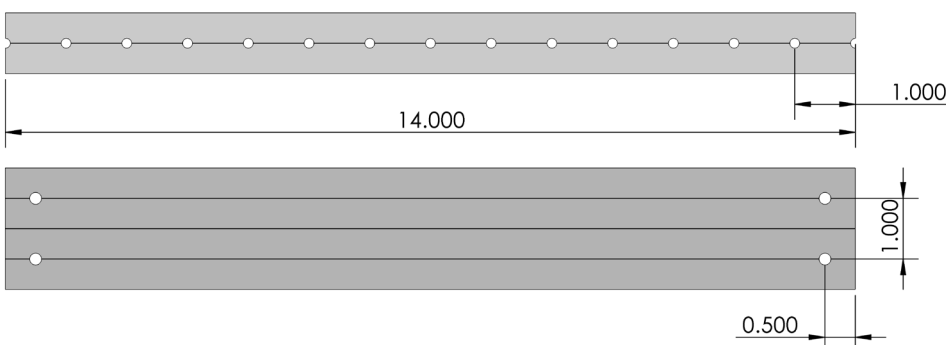
1st Stage Vertical Tube (QTY 2)



Elevator Base Tube (QTY 1)



Elevator Mast Cross Tube (QTY 1)



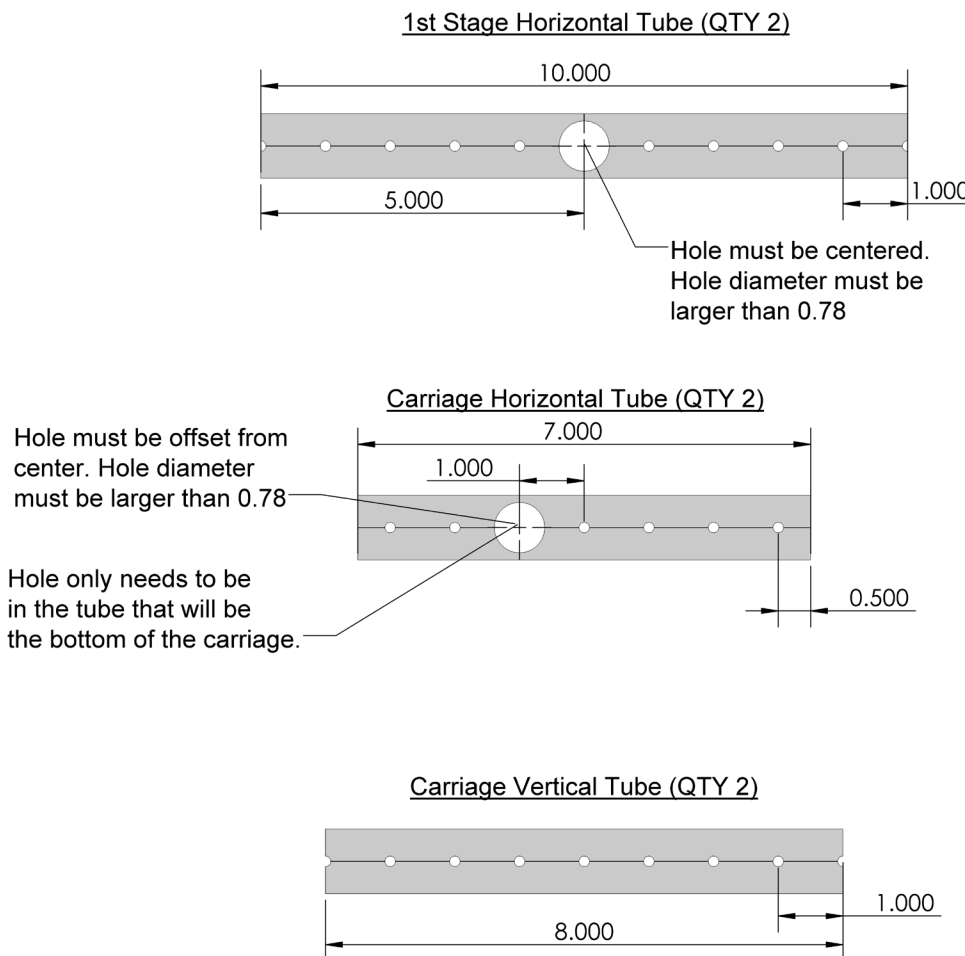
Greyt Universal Elevator v2- User Guide (Rev 1)



The overall length for these tubes is for the elevator represented in the CAD model. This can be changed to fit the requirements of any design.

Ensure that when cutting tubes, the distance from the last hole to the end of the tube is the same as the image below. Usually this means that the tube length must be in 1/2" increments. This distance is required for the gussets to align properly. If VersaFrame tubing is used then tubes can be any length.

Note: It is recommended to cut the tubes longer than needed and then mill to the correct length. Alternately, a chop saw may be used. The ends of the tubes should be as flat as possible.





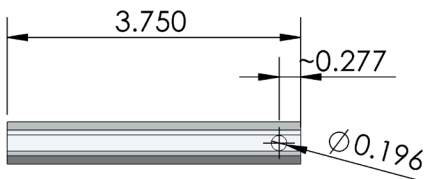
Hex Shaft Cut Guide

The “Pulley Shaft” length is universal regardless of the size of the elevator made.

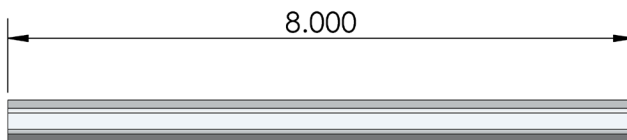
The “VersaPlanetary Connecting Shaft” should be measured and cut after the motors have been installed to ensure the shaft is not too long. This shaft can have up to a 1/4” gap between it and the VersaPlanetary output shaft.

The “Sprocket Shaft” length is dependent on the size of the elevator that is made.

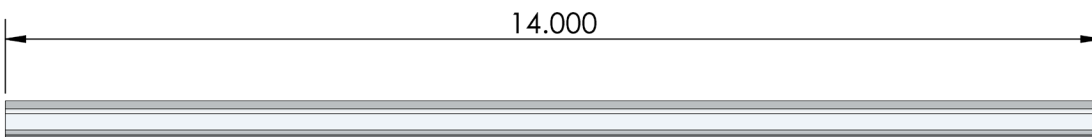
Pulley Shaft (QTY 3)



VersaPlanetary Connecting Shaft (QTY 1)



Sprocket Shaft (QTY 1)

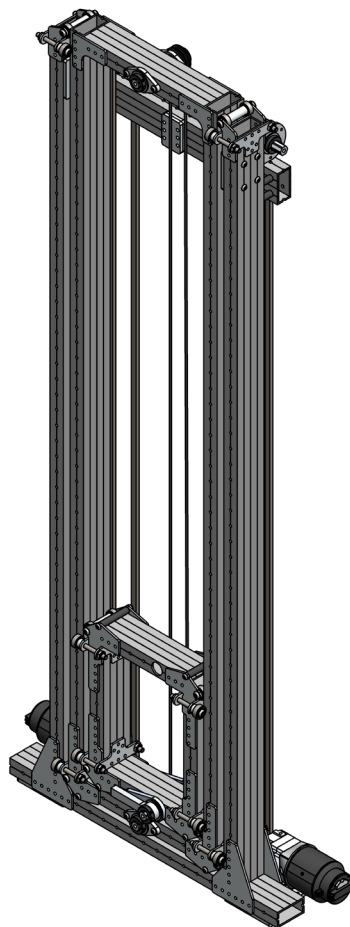




Greyt Universal Elevator v2 Assembly Instructions

For the purpose of this manual, all tubes were cut to dimensions used in the CAD model. The tubes can be cut to any length to fit the design required.

Note: #10-32 bolts and 3/16" rivets are recommended for assembly.

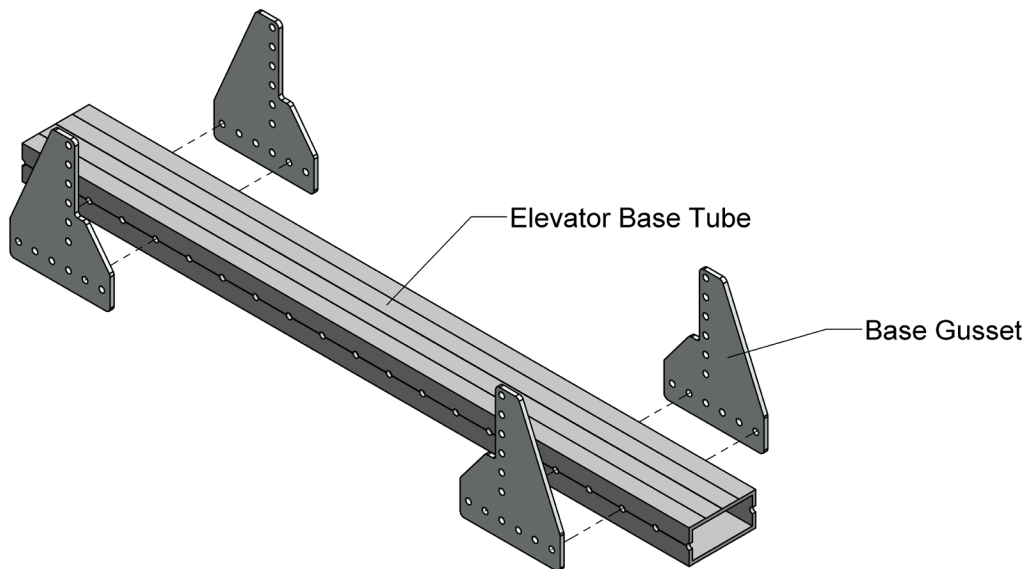
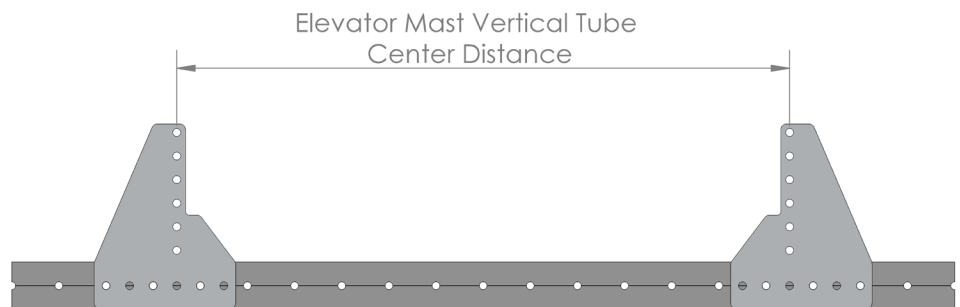




Step 1

Determine the center to center distance for the elevator mast tubes. Use this length to position the base gusset centered on the elevator base tube.

Note: Rivets or bolts may be used to attach these components. Rivets are recommended.

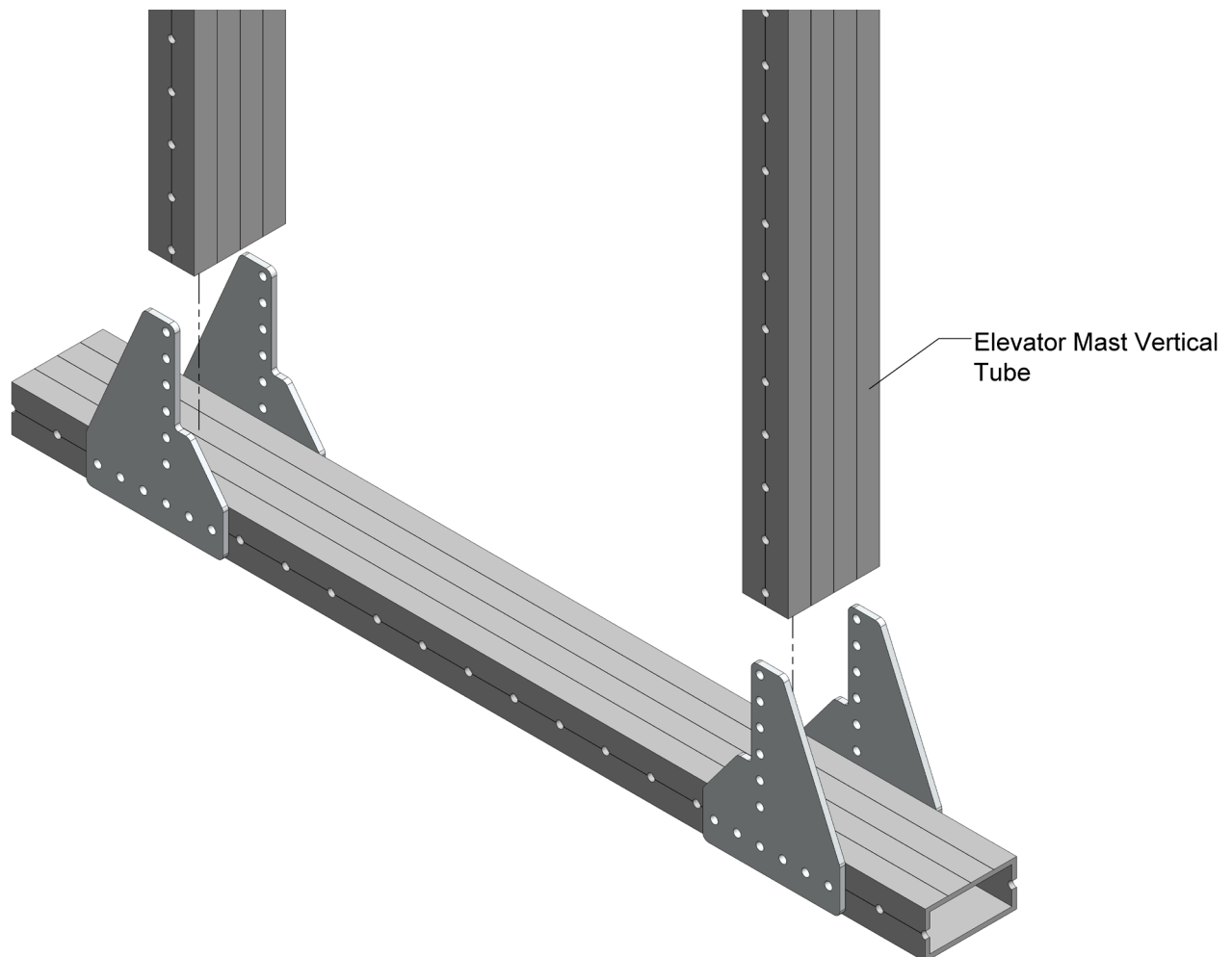




Step 2

Slide the elevator mast tube between the gussets. If there is a gap at the bottom due to the tube being cut short, that is fine.

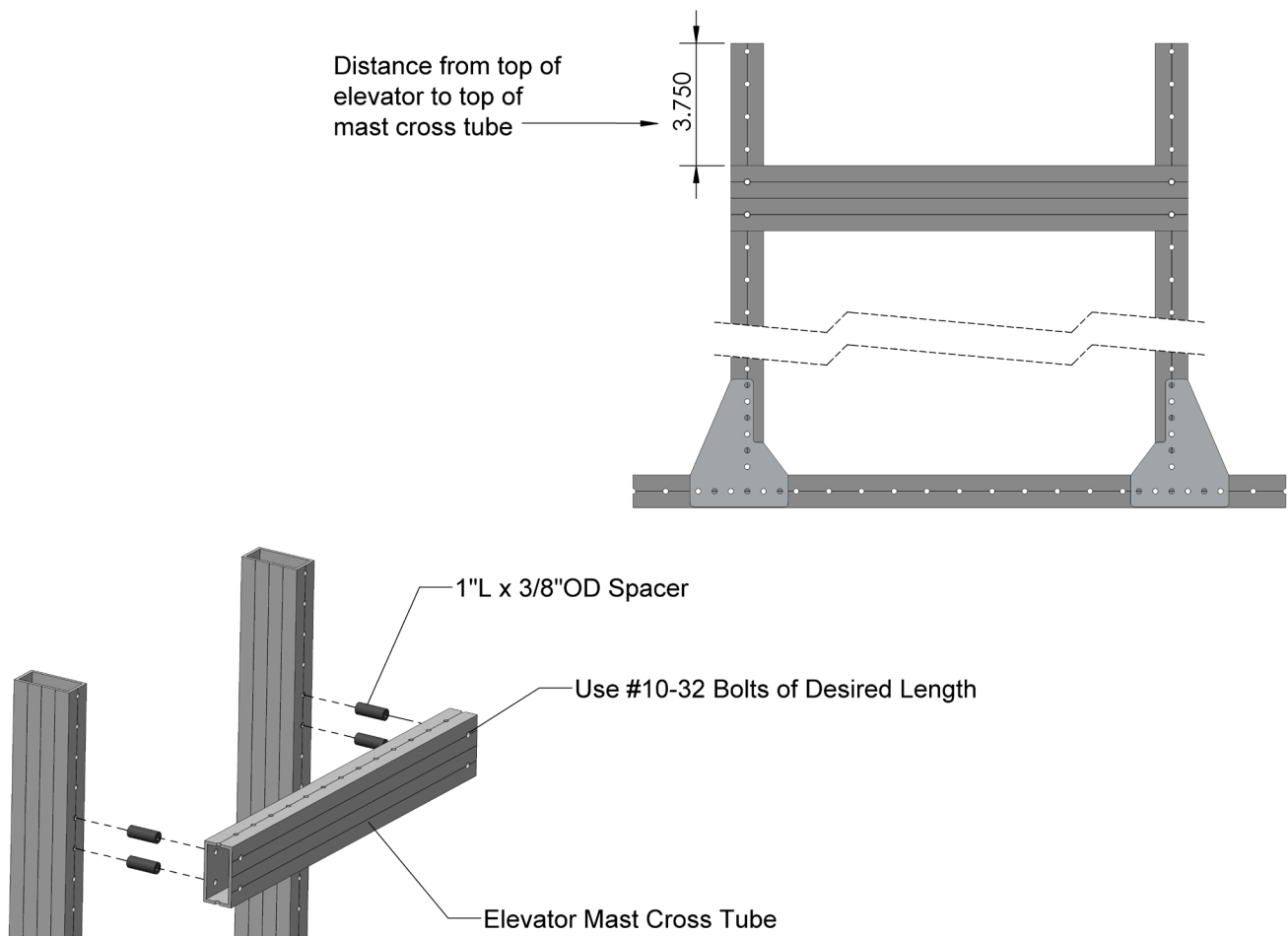
Note: Rivets or bolts may be used to attach these components. Rivets are recommended.





Step 3

Attach the elevator mast cross tube to the elevator mast vertical tubes using 4 #10-32 bolts and the 1" long spacers. The distance from the top of the main tube to the top of the cross tube is determined by the stack up of gussets that attach later. The tube may be lower but it cannot be higher.



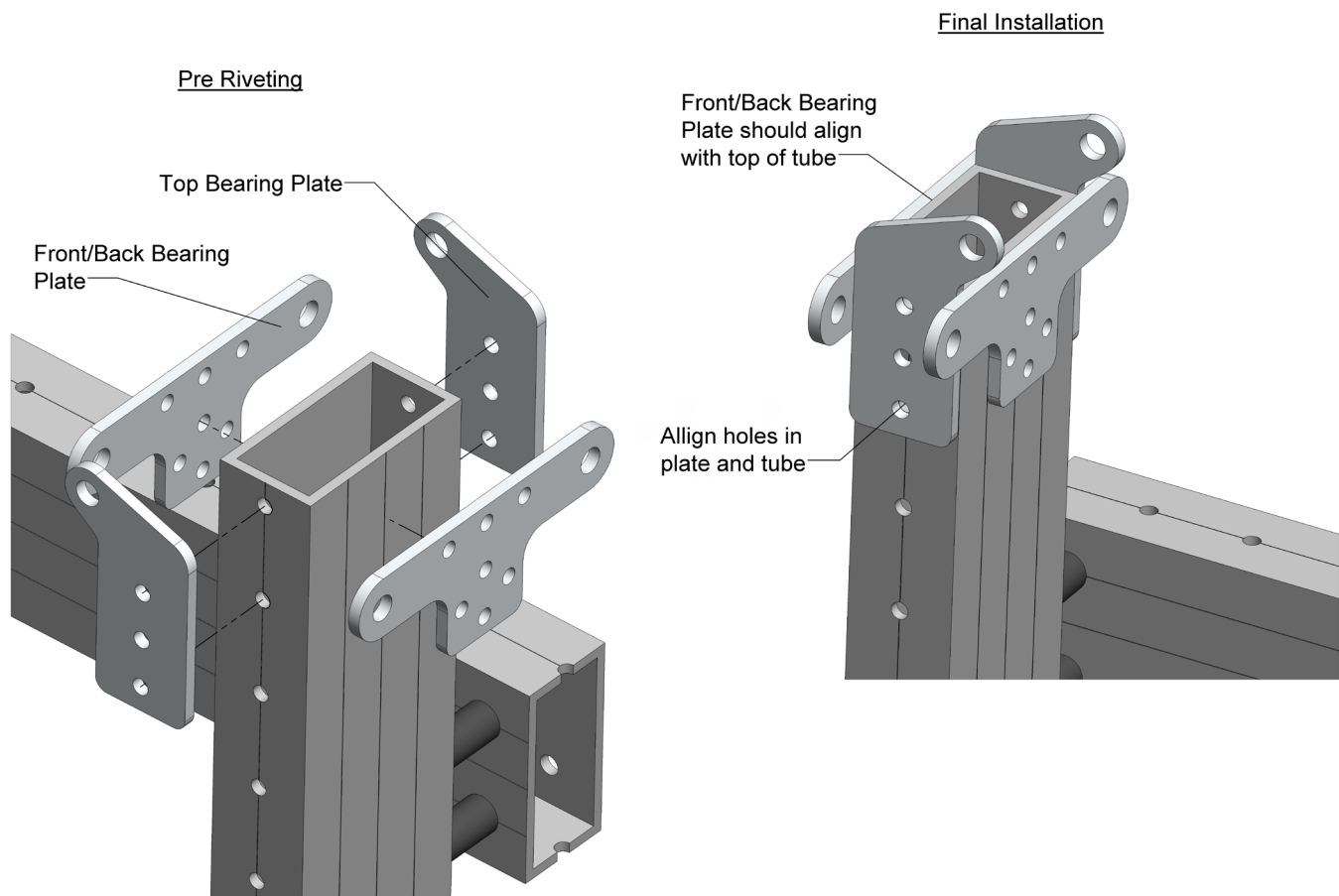


Step 4

Align the top of the front/back bearing plate with the top of the elevator mast vertical tube. Use two 1/4"-20 bolts to ensure that the plates are aligned to each other. The 3/4"OD bearing can be installed between the plates to help center them on the tube. All three of top holes in the plate should align with the grooves in the VersaFraming. Use these to ensure that the plates are centered on the tube. When everything is properly aligned drill out the desired amount of holes and install rivets.

Use the pre-drilled holes in the VersaFrame to align the top bearing plate. Drill out the third hole and install rivets.

Note: All holes are recommended to be drilled out and rivets should be used. Bolts will interfere with each other if used.



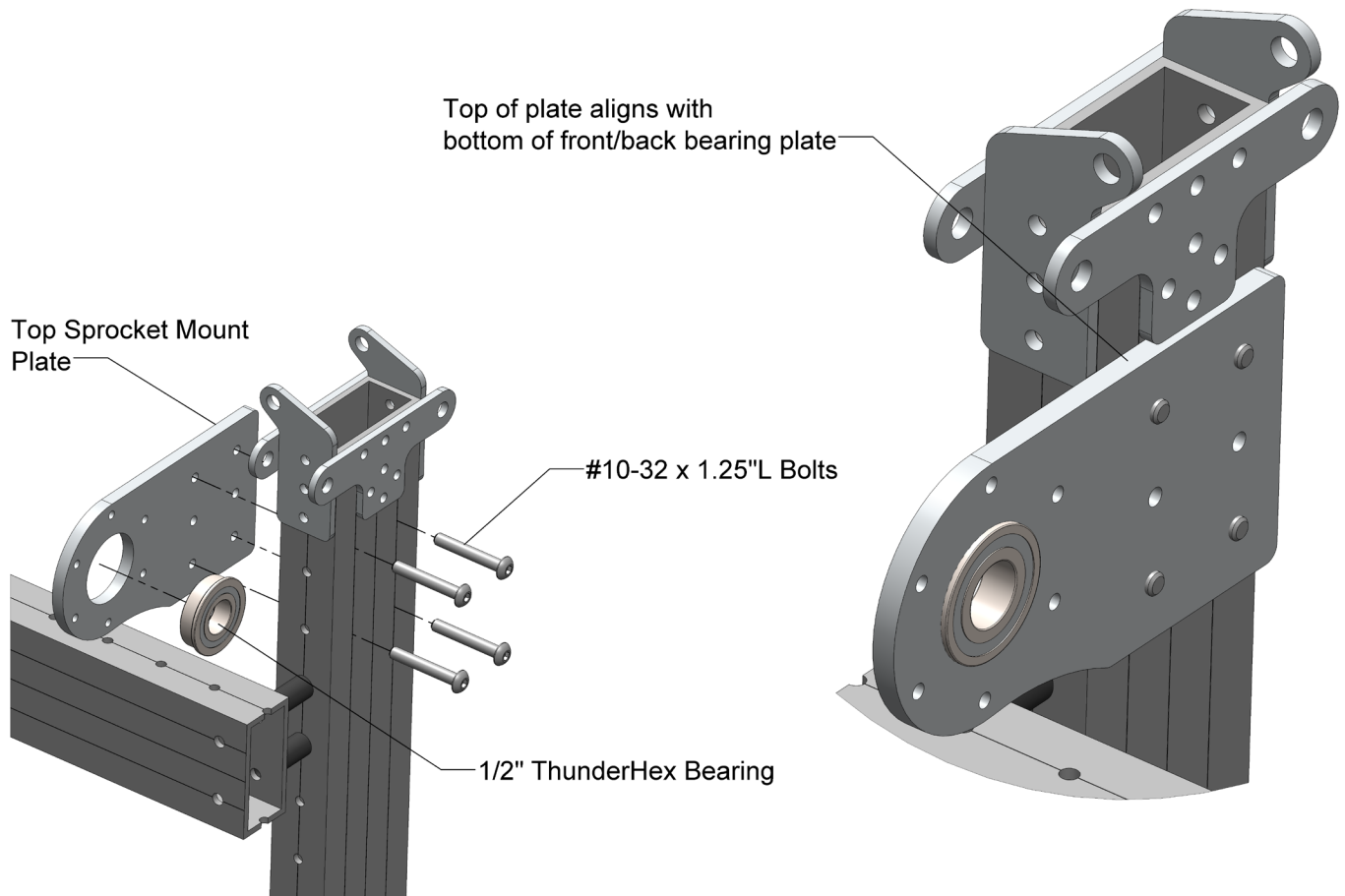


Step 5

Press the bearing into the top sprocket mount plate. Repeat this in the other plate but ensure the bearings are on opposite sides of the plate. The top sprocket mount plate gets aligned flat with the front of the elevator mast vertical tube. The top of the top sprocket mount plate gets pushed against the bottom of the front/back bearing plate. Use a #21 drill bit to match drill the holes. Remove the gusset and then drill to clearance for a #10 bolt. After holes have been drilled, install 4 #10-32 x 1.25"L bolts.

Repeat this step on the opposite main elevator tube.

Note: Holes are not tapped in the top sprocket mount plate. They will need to be tapped before installation.



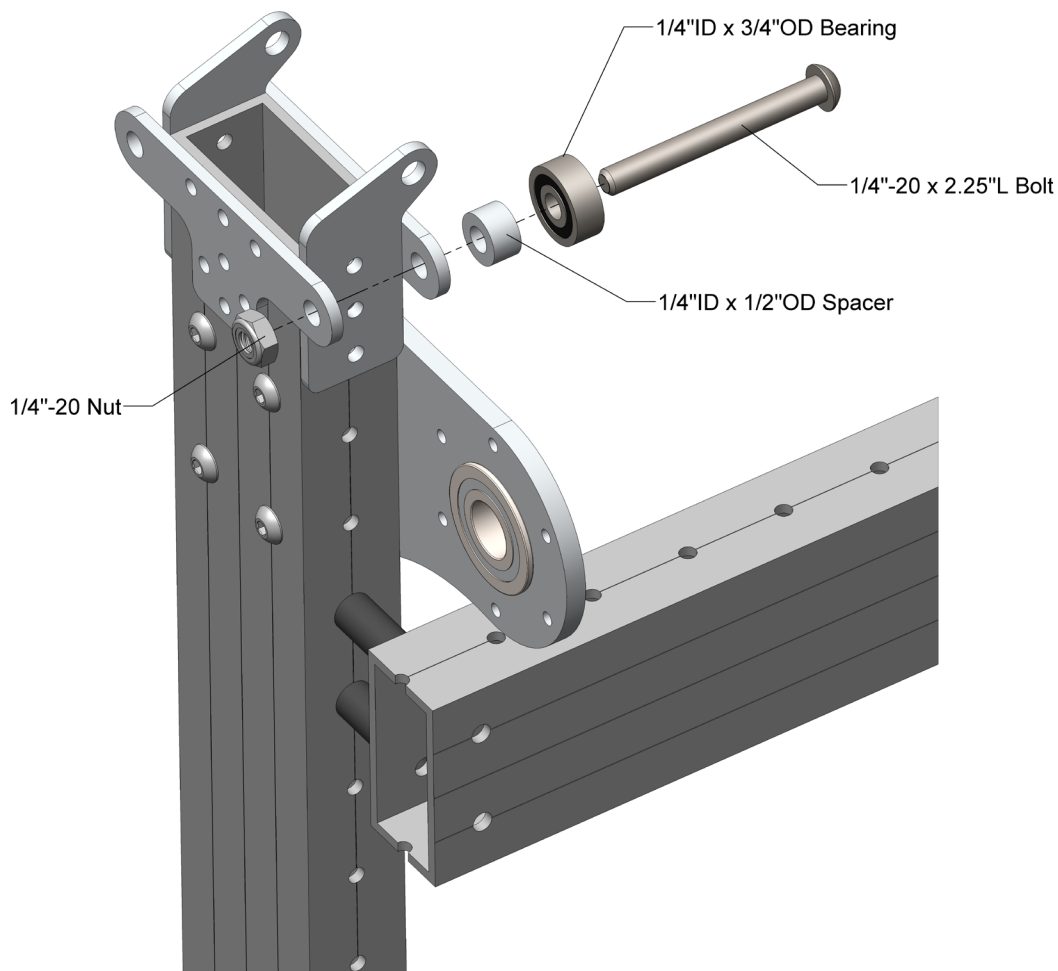


Step 6

Install the bearing and spacer with the 1/4"-20 x 2.25"L bolt into the back bolt hole of the front/back bearing plate. Repeat this step on the opposite side of the elevator.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the plates.

Note: The front set of bearings should not be installed at this point. Leaving them out helps with the installation of the other stages later in the assembly process.



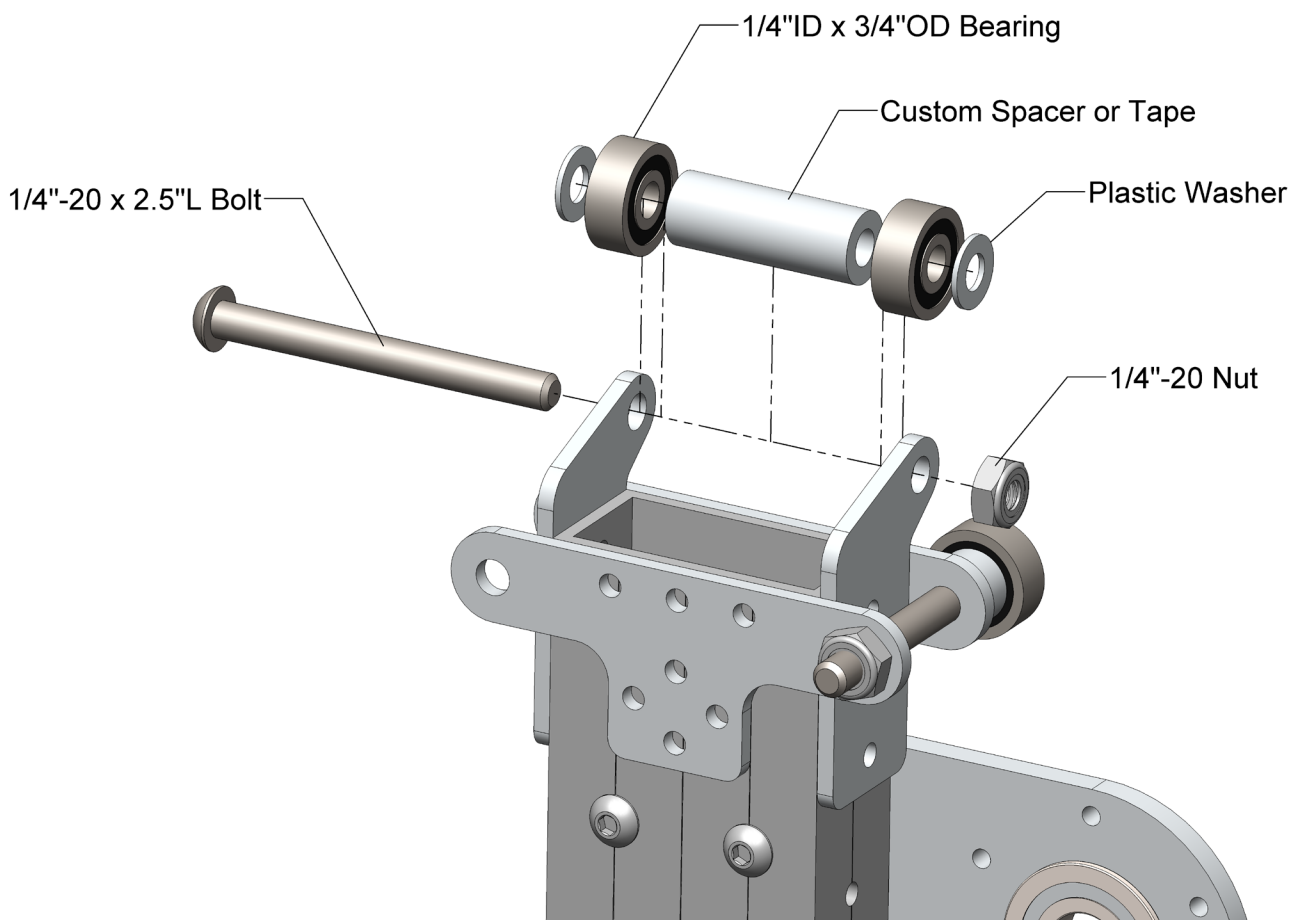


Step 7

Install the bearing and spacer stack with the 1/4"-20 x 2.5"L bolt into the bolt hole of the top bearing plate. Repeat this step on the opposite side of the elevator.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the gusset.

Note: The middle spacer is NOT included. The middle spacer may be made out of aluminum/plastic or tape may be used instead. This is not a critical component. The spacer is only meant to keep the bearings spaced far enough apart.

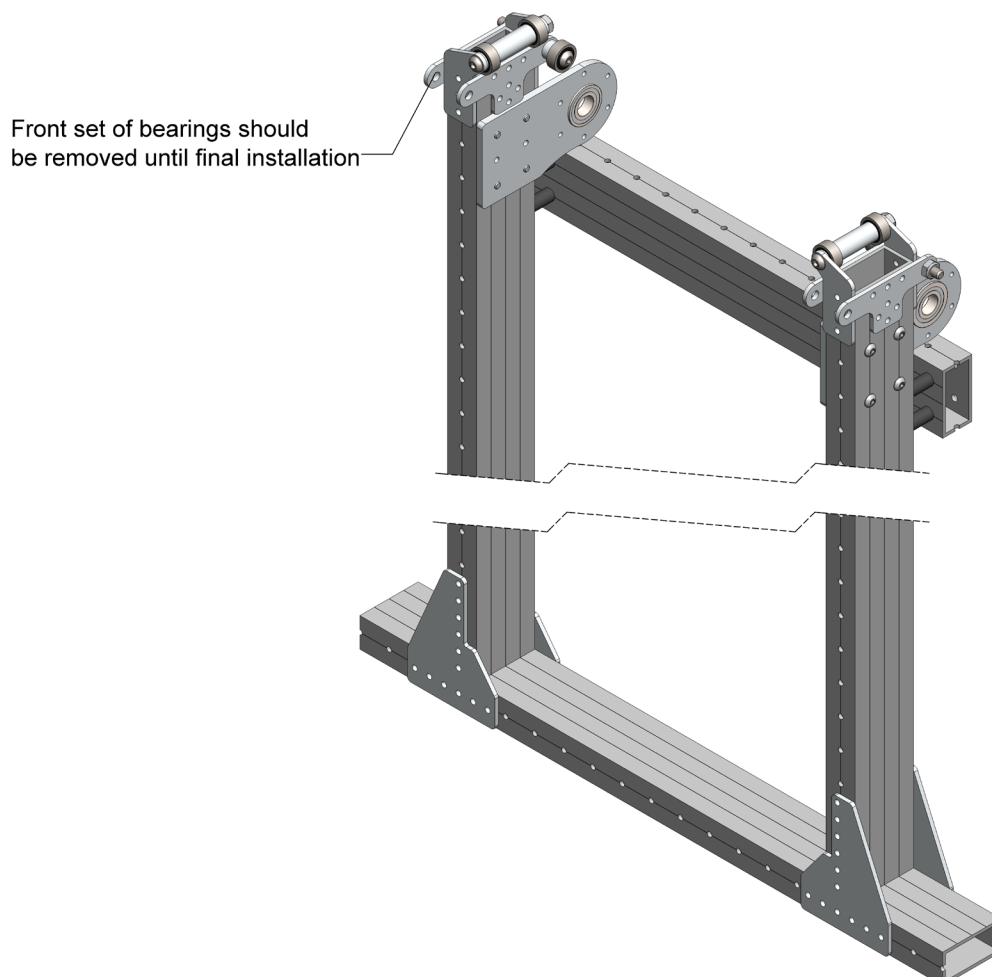




Elevator Mast Complete

At this point the elevator mast should be mainly assembled. The rest of the components will be installed during final assembly of all sub-assemblies. This sub-assembly can be set to the side for now.

The assembly instructions of the 1st stage will follow.



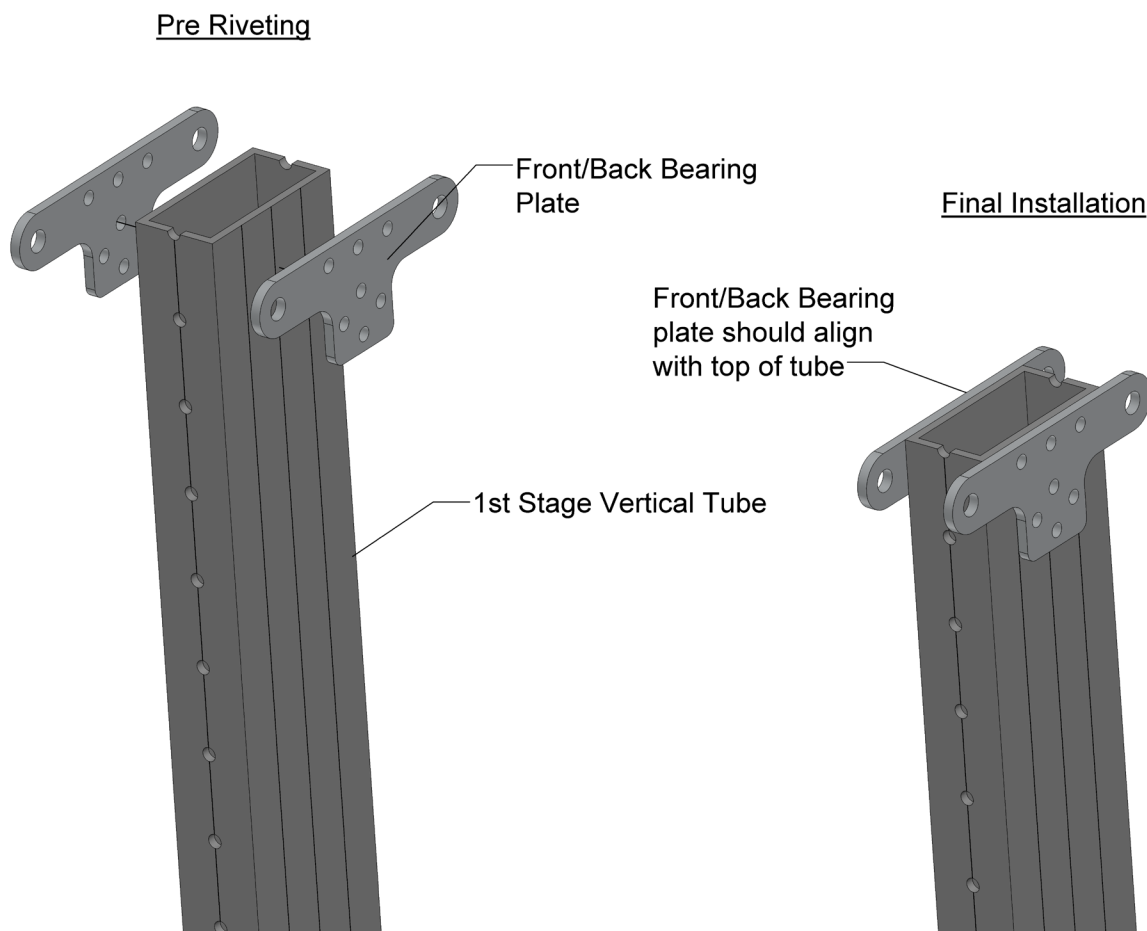


Step 8

Align the top of the front/back bearing plate with the top of the 1st Stage Vertical Tube. Use two 1/4"-20 bolts in to ensure that the plates are aligned to each other. The 3/4"OD bearing can be installed between the plates to help center them on the tube. All three of top holes should align with the grooves in the VersaFraming. Use these to ensure that the plates are centered on the tube. When everything is properly aligned drill out the desired amount of holes and install rivets.

These plates are installed on the bottom of the 1st stage vertical tubes.

Note: All holes are recommended to be drilled out and rivets should be used.



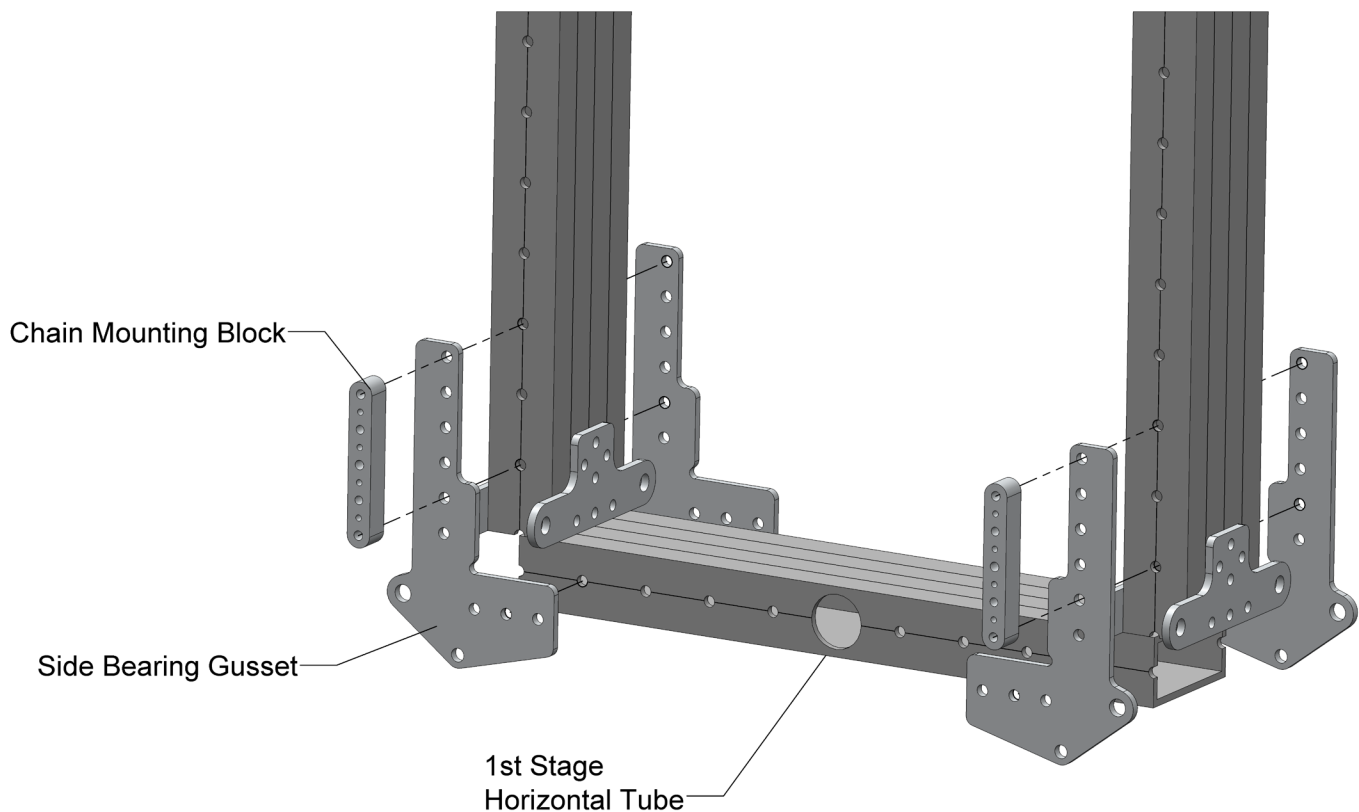


Step 9

Attach the side bearing gussets to the 1st stage vertical tube using three #8-32 x2.5"L bolts that tap into the chain mounting block. These three bolts are sufficient for attaching to the 1st stage vertical tube.

Align the holes in the gussets with the holes in the 1st stage horizontal tube. The edge of this tube should be close to the center of the vertical tubes. Use rivets to attach the gussets to the horizontal tube.

These gussets and the 1st stage horizontal tube are installed on the bottom of the 1st stage elevator tubes.

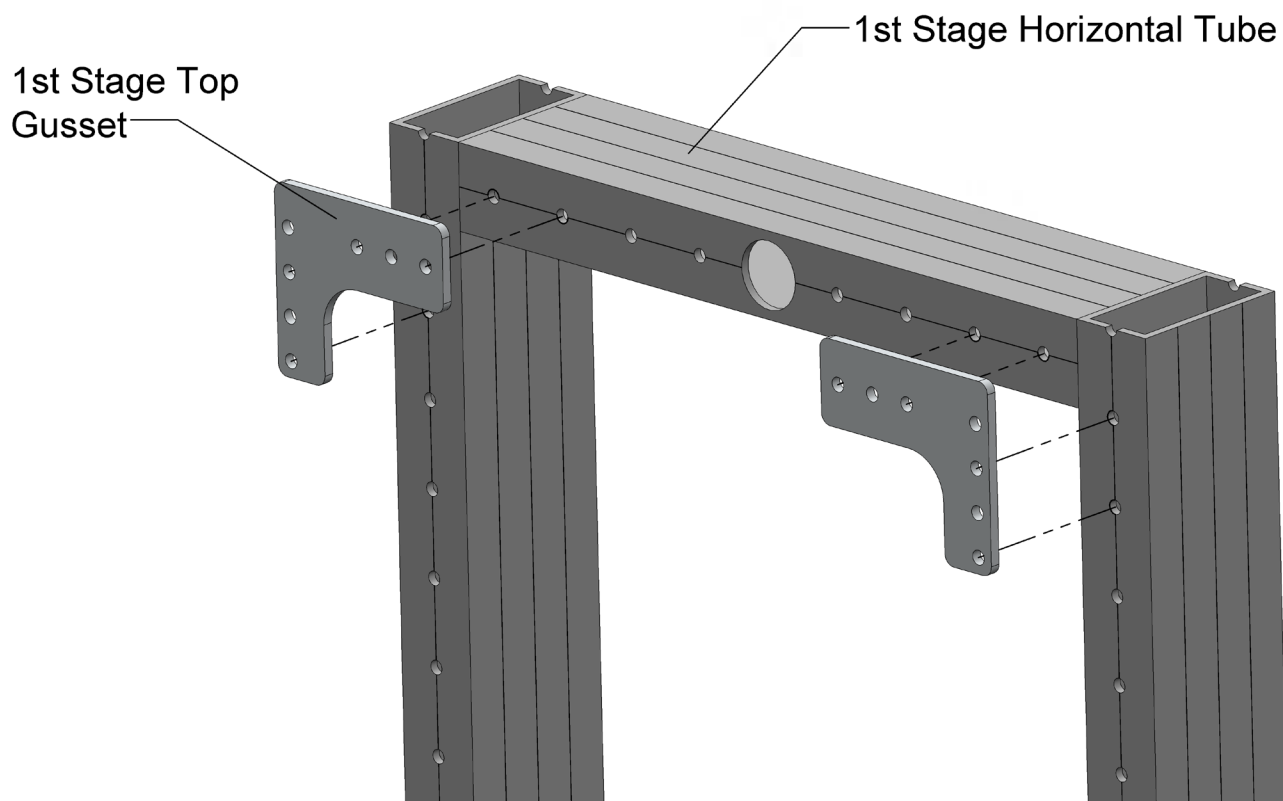




Step 10

Align the top of the 1st stage horizontal tube with the top of the 1st stage vertical tube. Attach the horizontal tube to the vertical tubes using the 1st stage top gusset.

Note: Rivets or bolts may be used to attach these components. Rivets are recommended.



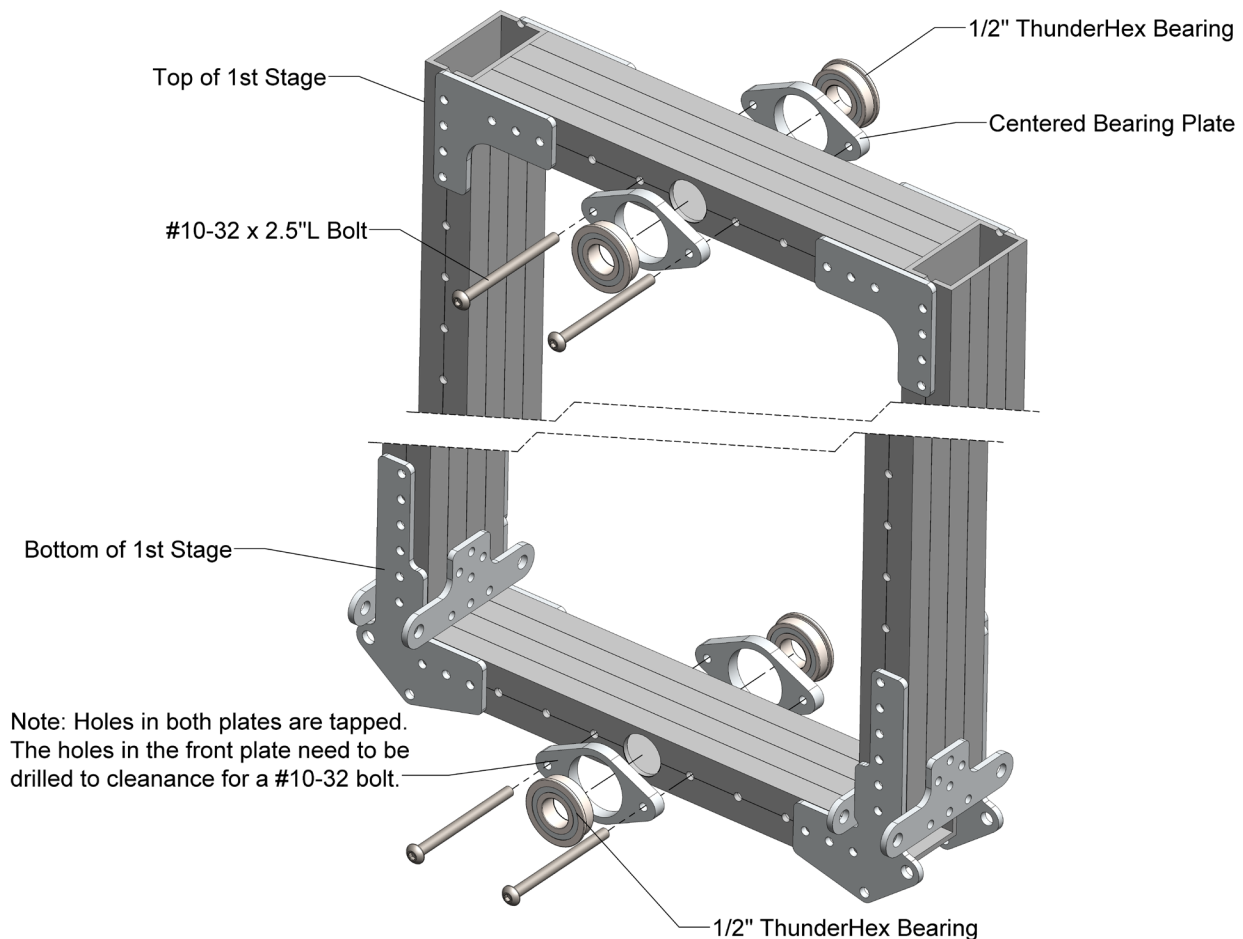


Step 11

The bearings should be a slip or a light press fit into the centered bearing plate. Install the bearings into the plates before installation onto the elevator.

Use two #10-32 x 2.5" L bolts to attach each pair of bearing plates to the 1st stage horizontal tubes.

Note: All the holes in the bearing plates are tapped. On two plates the tapped holes need to be drilled to clearance for #10-32 bolts.



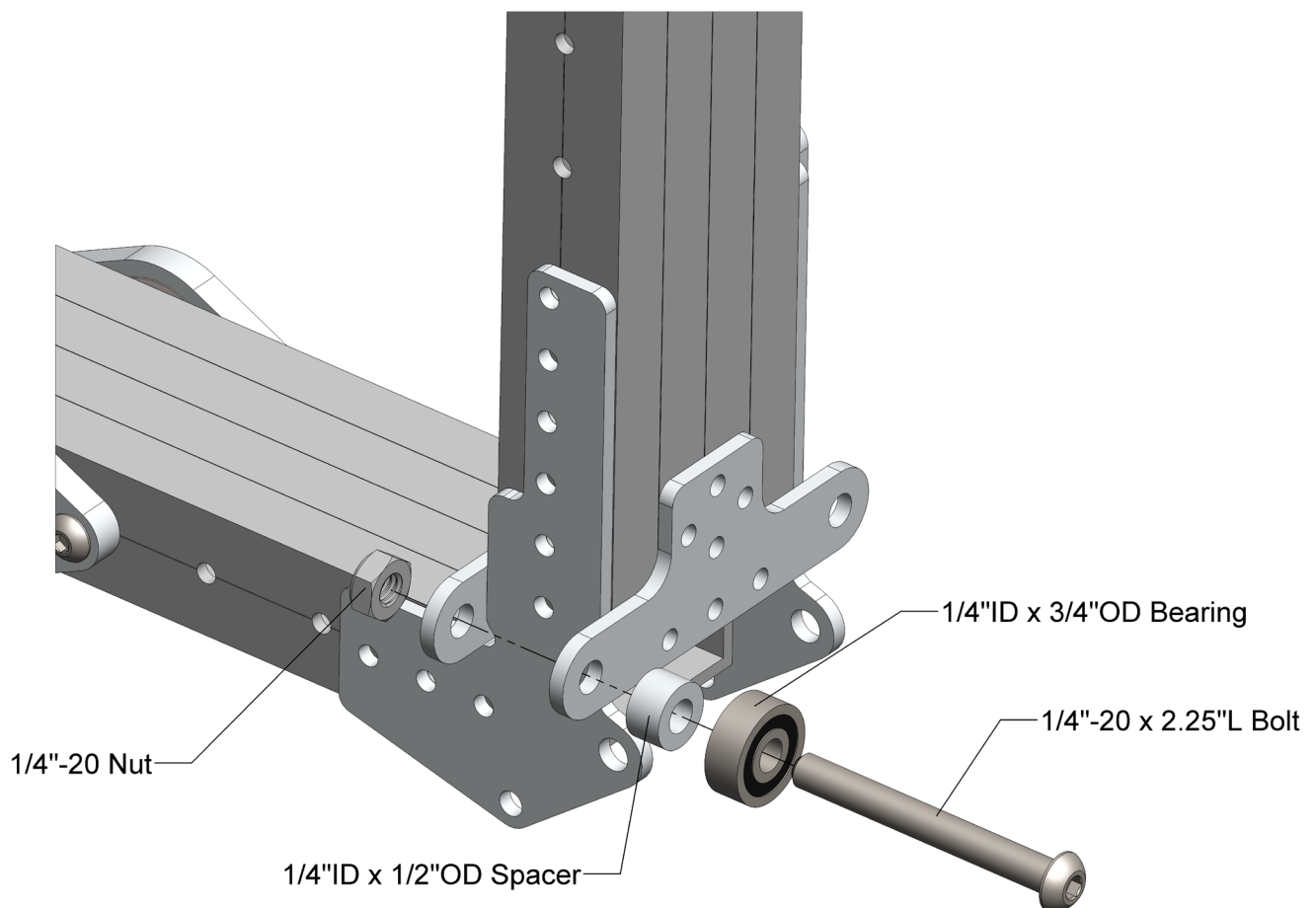


Step 12

Install the bearing and spacer with the 1/4"-20 x 2.25"L bolt into the front bolt hole of the front/back bearing plate. Repeat this step on the opposite side of the elevator.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the plate.

Note: The back set of bearings should not be installed at this point. Leaving them out helps with the installation of the other stages later in the assembly process.



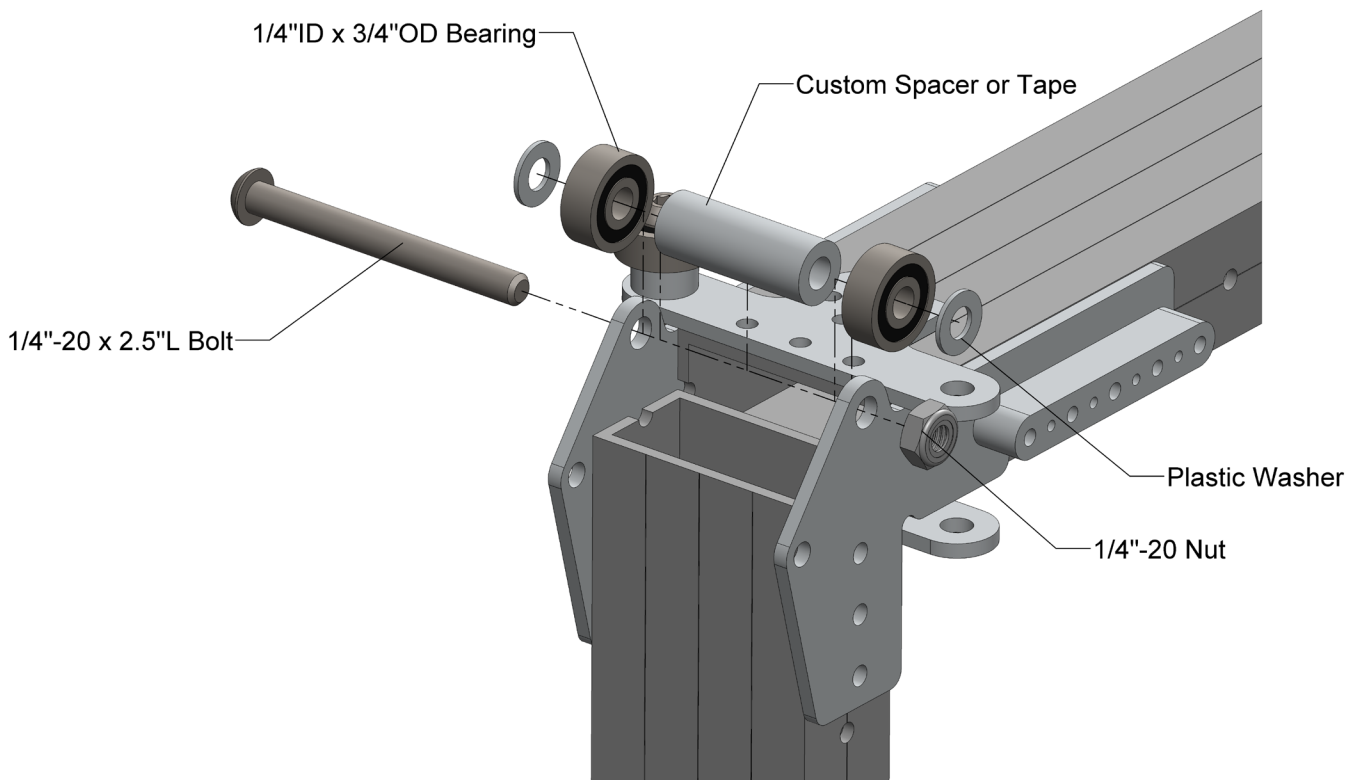


Step 13

Install the bearing and spacer stack with the 1/4"-20 x 2.5"L bolt into the bolt hole of the side bearing gusset. Repeat this step on the opposite side of the elevator.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the gusset.

Note: The middle spacer is NOT included. The middle spacer may be made out of aluminum/plastic or tape may be used instead. This is not a critical component. The spacer is only meant to keep the bearings spaced far enough apart.

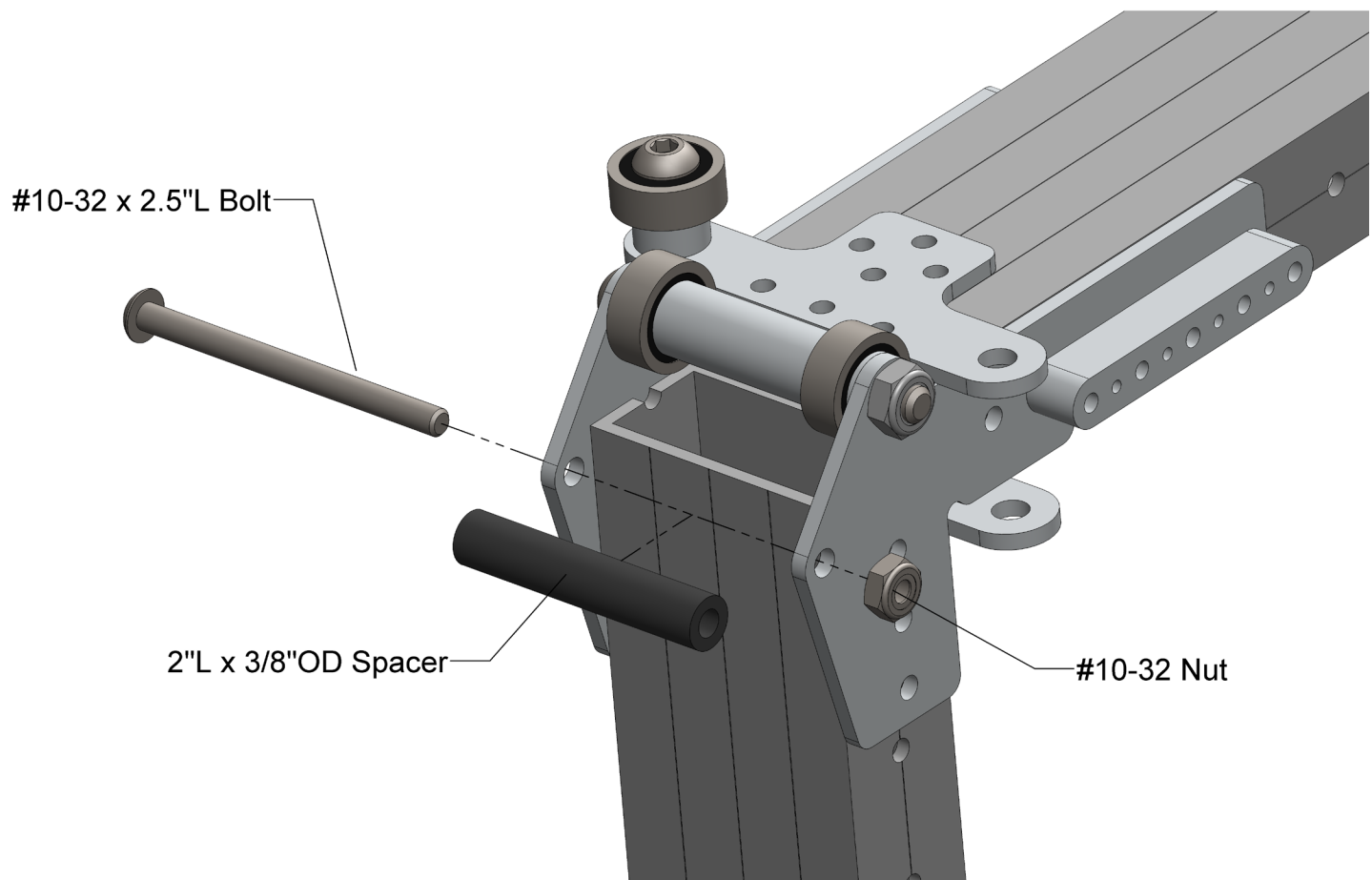




Step 14

Install the #10-32 x 2.5"L bolt and spacer into the large side bearing gusset.

Repeat this step on the opposite side of the 1st stage.

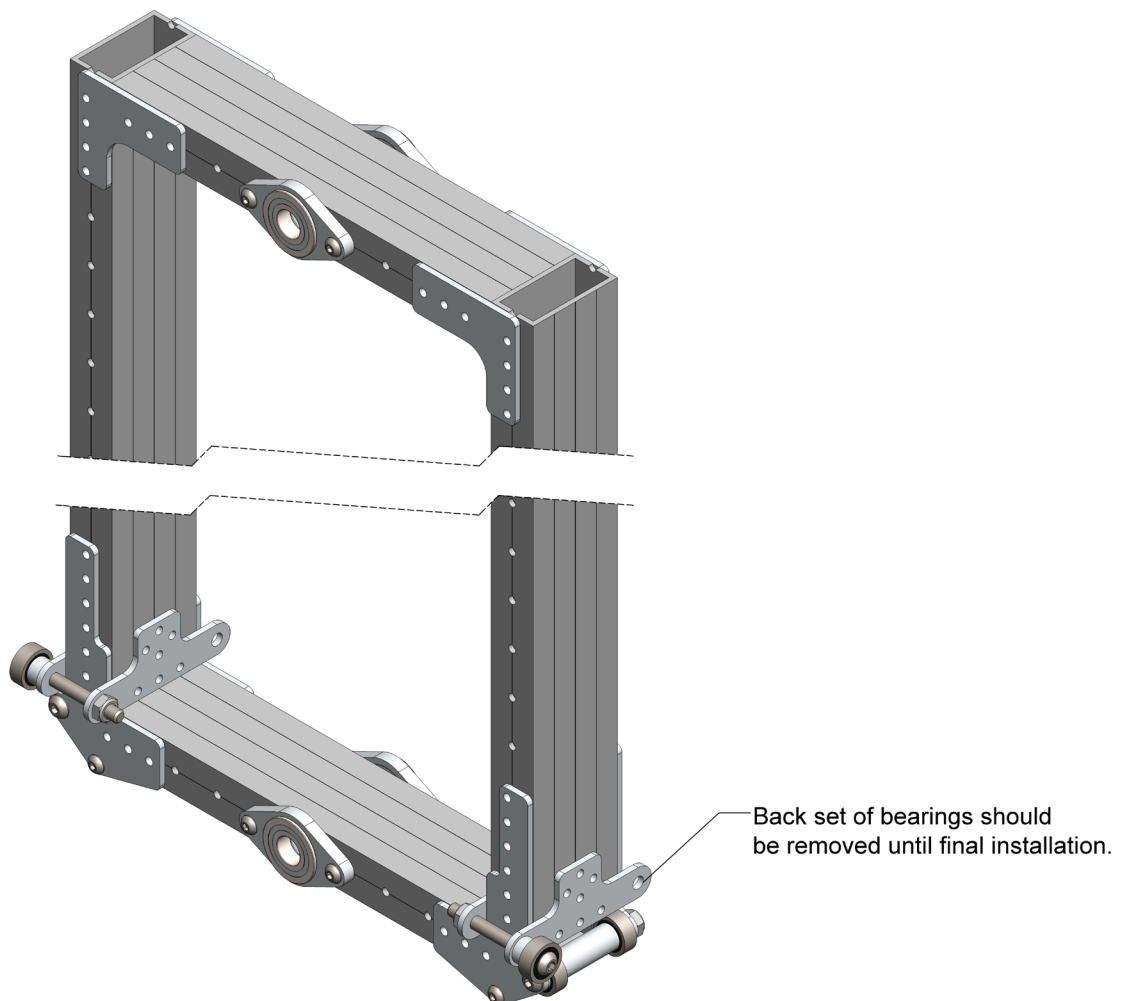




Elevator 1st Stage Complete

At this point the 1st stage of the elevator should be mainly assembled. The rest of the components will be installed during final assembly of all sub-assemblies. This sub-assembly can be set to the side for now.

The assembly instructions of the carriage will follow.



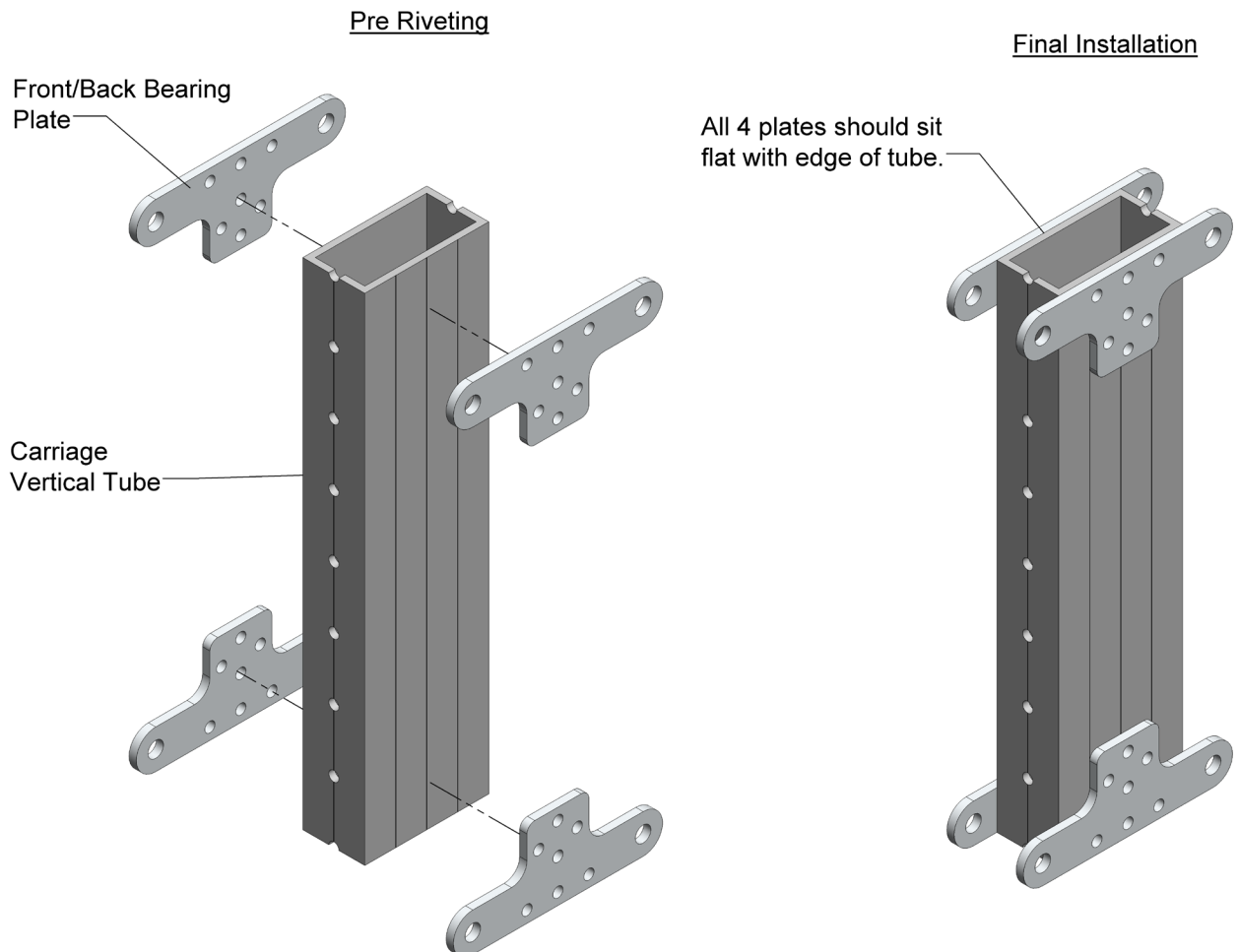


Step 15

Align the top of the front/back bearing plate with the end of the carriage vertical tube. Use two 1/4"-20 bolts in to ensure that the plates are aligned to each other. All three of top holes should align with the grooves in the VersaFraming. Use these to ensure that the plates are centered on the tube. When everything is properly aligned, drill out the desired amount of holes and install rivets.

Repeat this on both ends of the carriage vertical tube and on both tubes. After this step there should be two tubes identical to the final installation example below.

Note: All holes are recommended to be drilled out and rivets should be used.





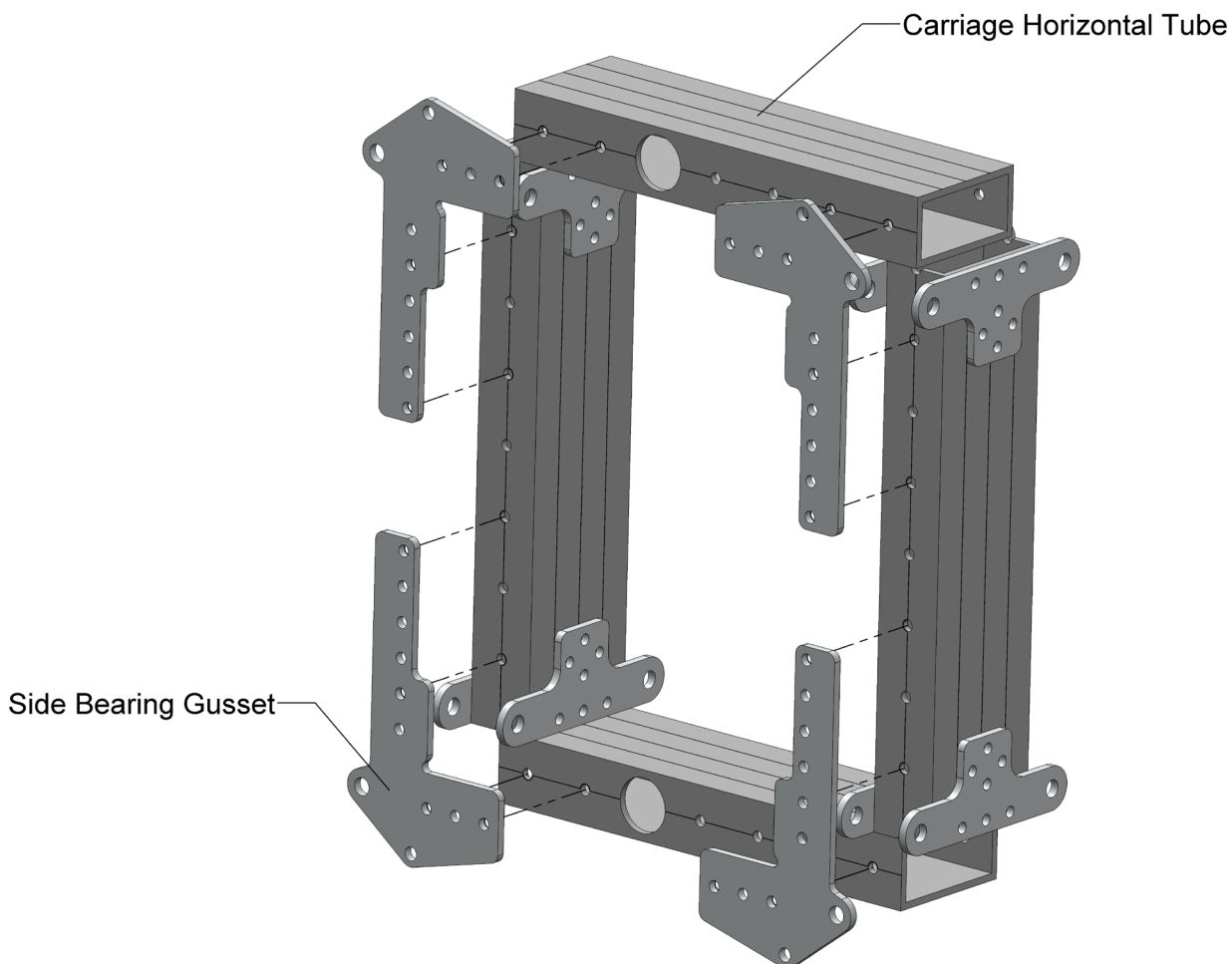
Step 16

Align the holes in the side bearing gussets with the holes in the carriage horizontal tubes. The edge of horizontal tubes should be close to the center of the vertical tubes. Use rivets to attach the gussets to this tube.

Add rivets to all holes.

Repeat this step on the back of the carriage as well.

Note: In the image below both tubes have a large clearance hole. Only one tube needs to have this hole. The tube with the clearance hole will be the bottom tube.



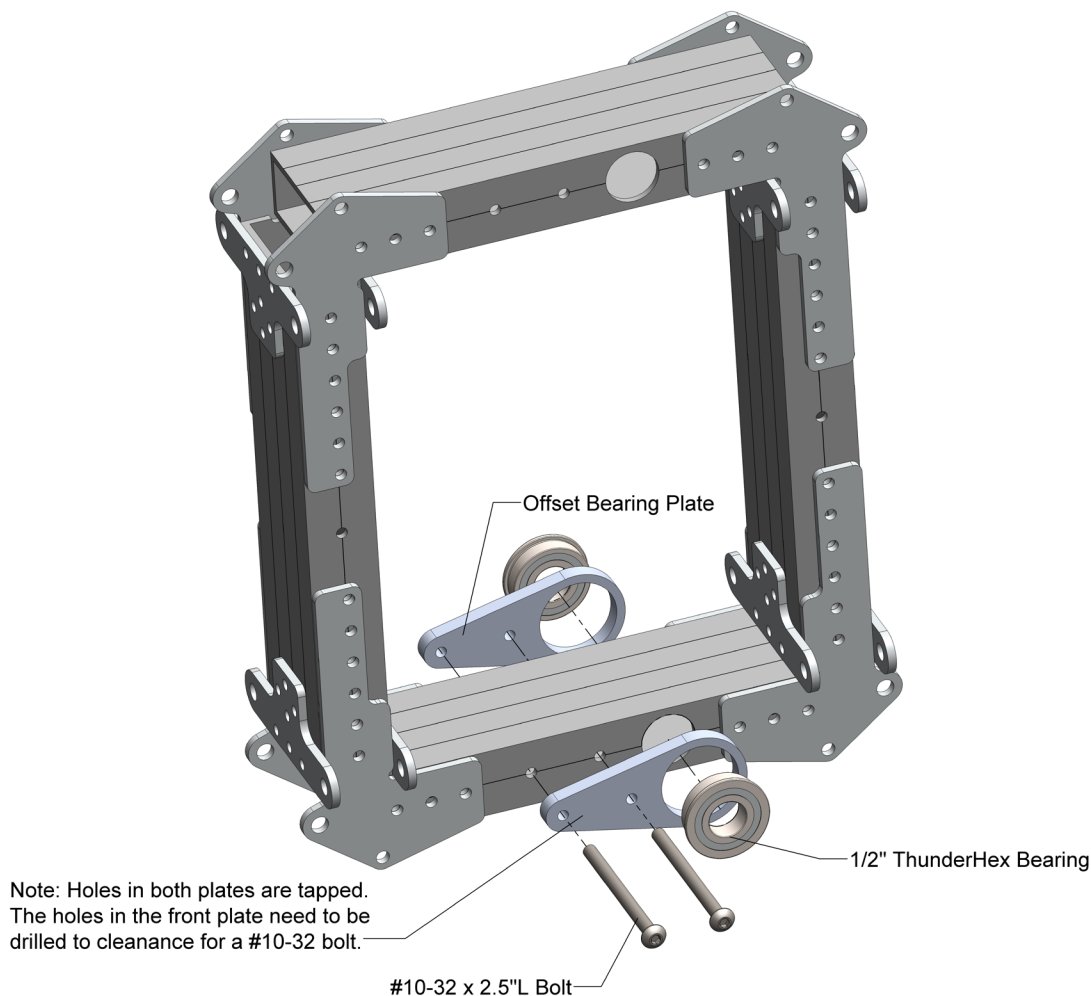


Step 17

The bearings should be a slip or a light press fit into the offset bearing plate. Install the bearings into the plates before installation onto the elevator.

Use two #10-32 x 2.5”L bolts to attach the bearing plates to the carriage.

Note: All the holes in the bearing plates are tapped. On one plate the tapped holes need to be drilled to clearance for #10-32 bolts.



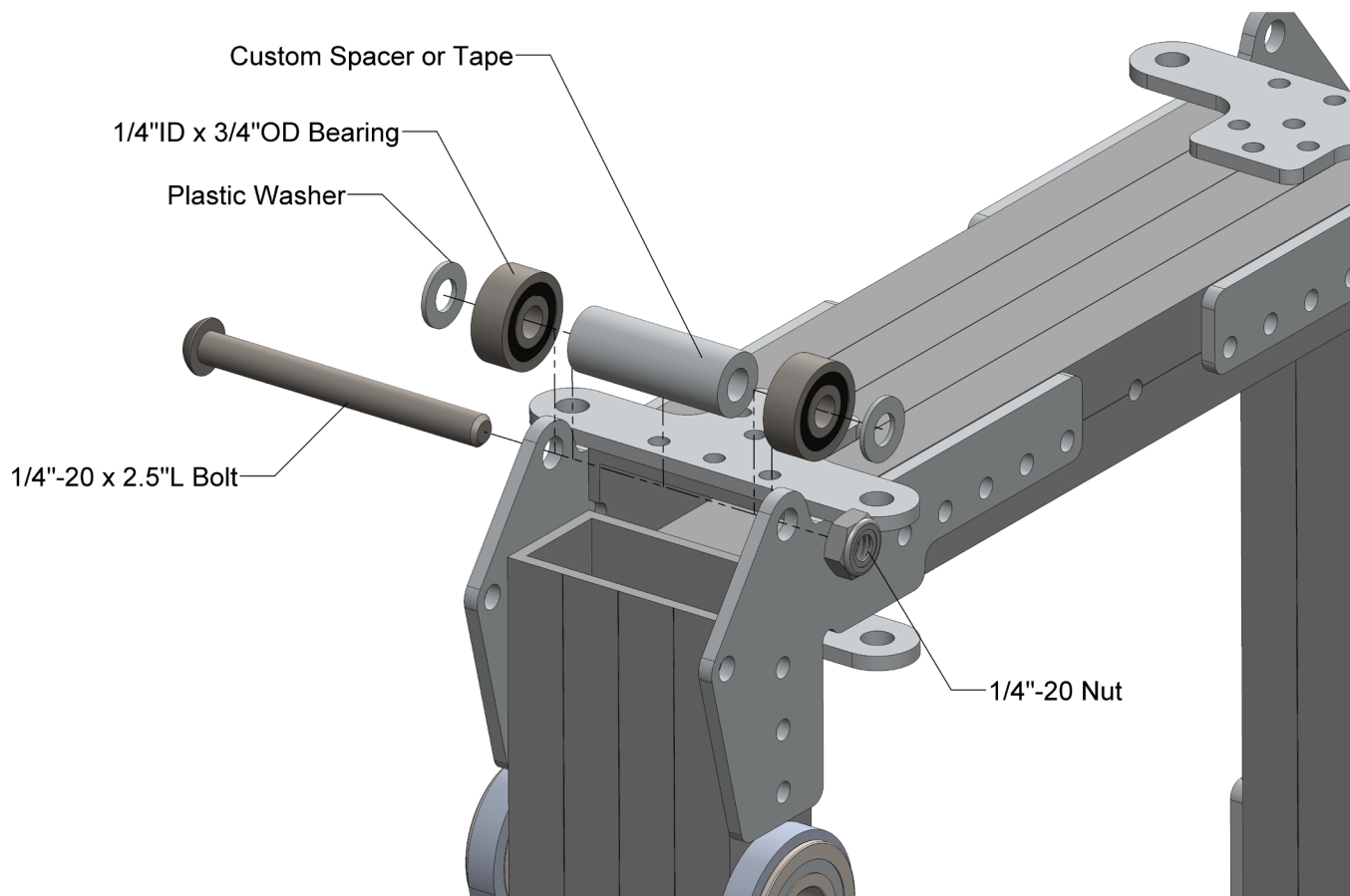


Step 18

Install the bearing and spacer stack with the 1/4"-20 x 2.5"L bolt into the bolt hole of the side bearing gusset. Repeat this step on all four corners of the carriage.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the gusset.

Note: The middle spacer is NOT included. The middle spacer may be made out of aluminum/plastic or tape may be used instead. This is not a critical component. The spacer is only meant to keep the bearings spaced far enough apart.

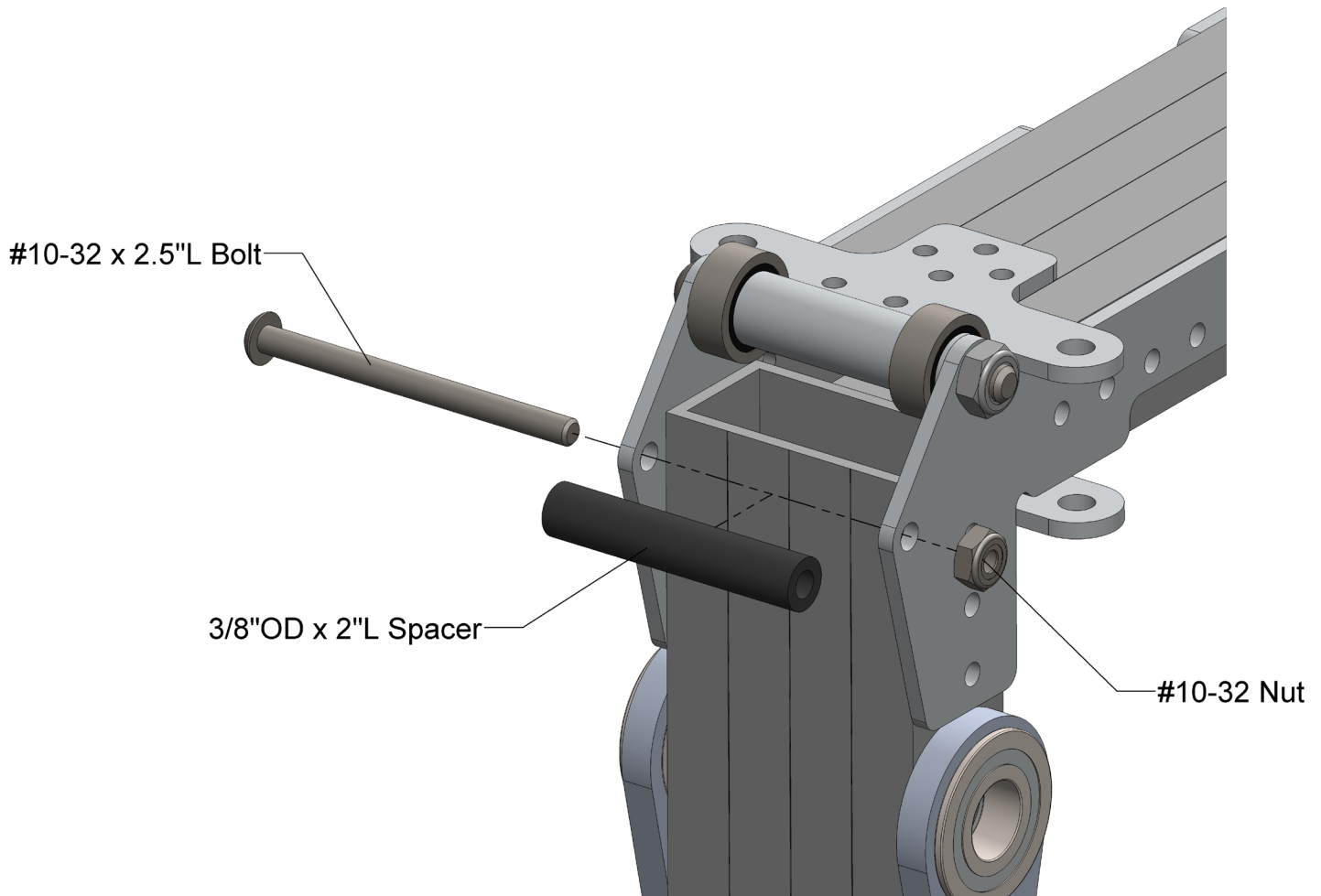




Step 19

Install the #10-32 x 2.5"L bolt and spacer into the side bearing gusset.

Repeat this step in all four corners of the carriage.



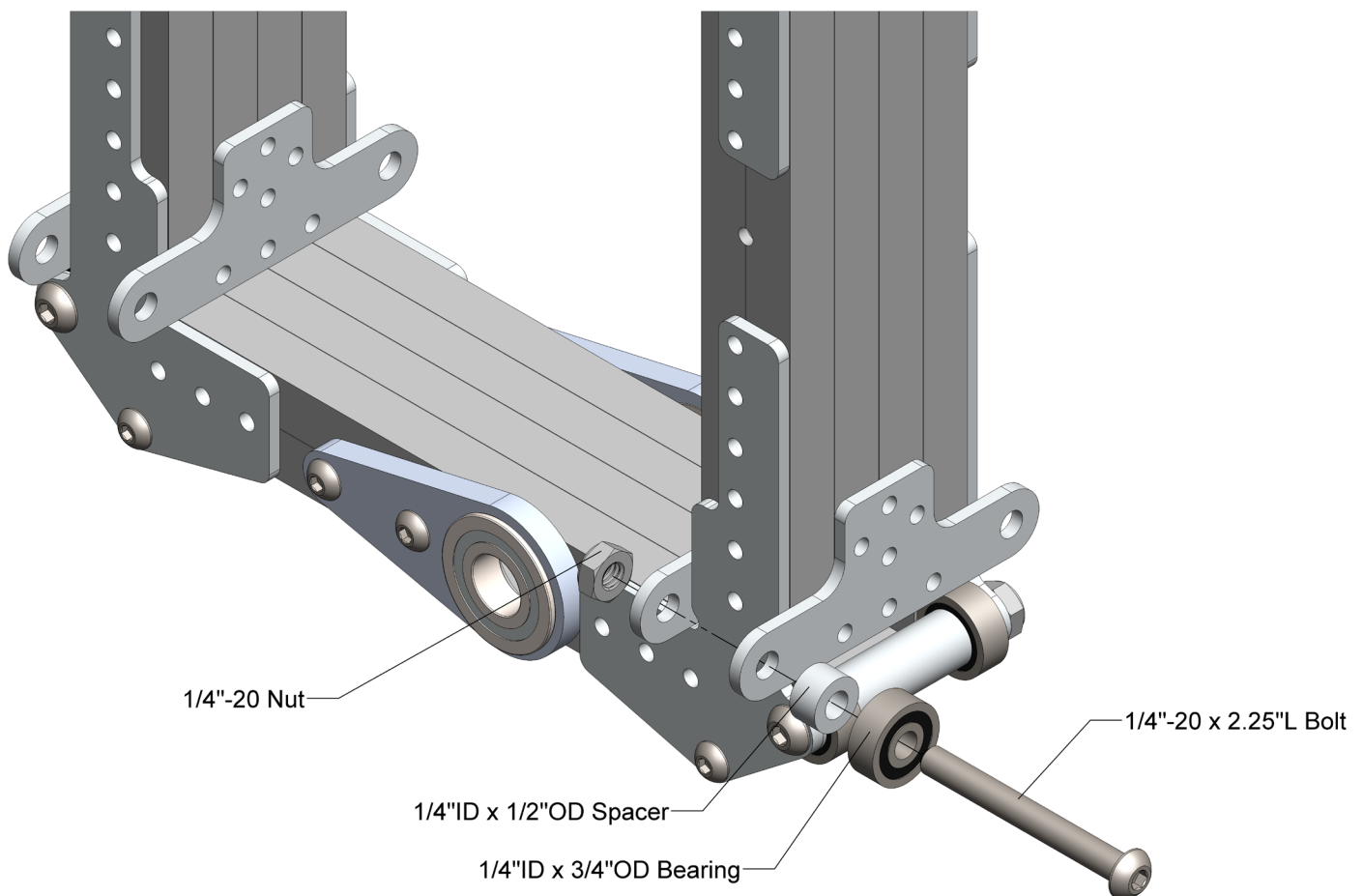


Step 20

Install the bearing and spacer stack with the 1/4"-20 x 2.25"L bolt into the front bolt hole of the front/back bearing plate. Repeat this step on all four corners of the carriage.

The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin or bend the plate.

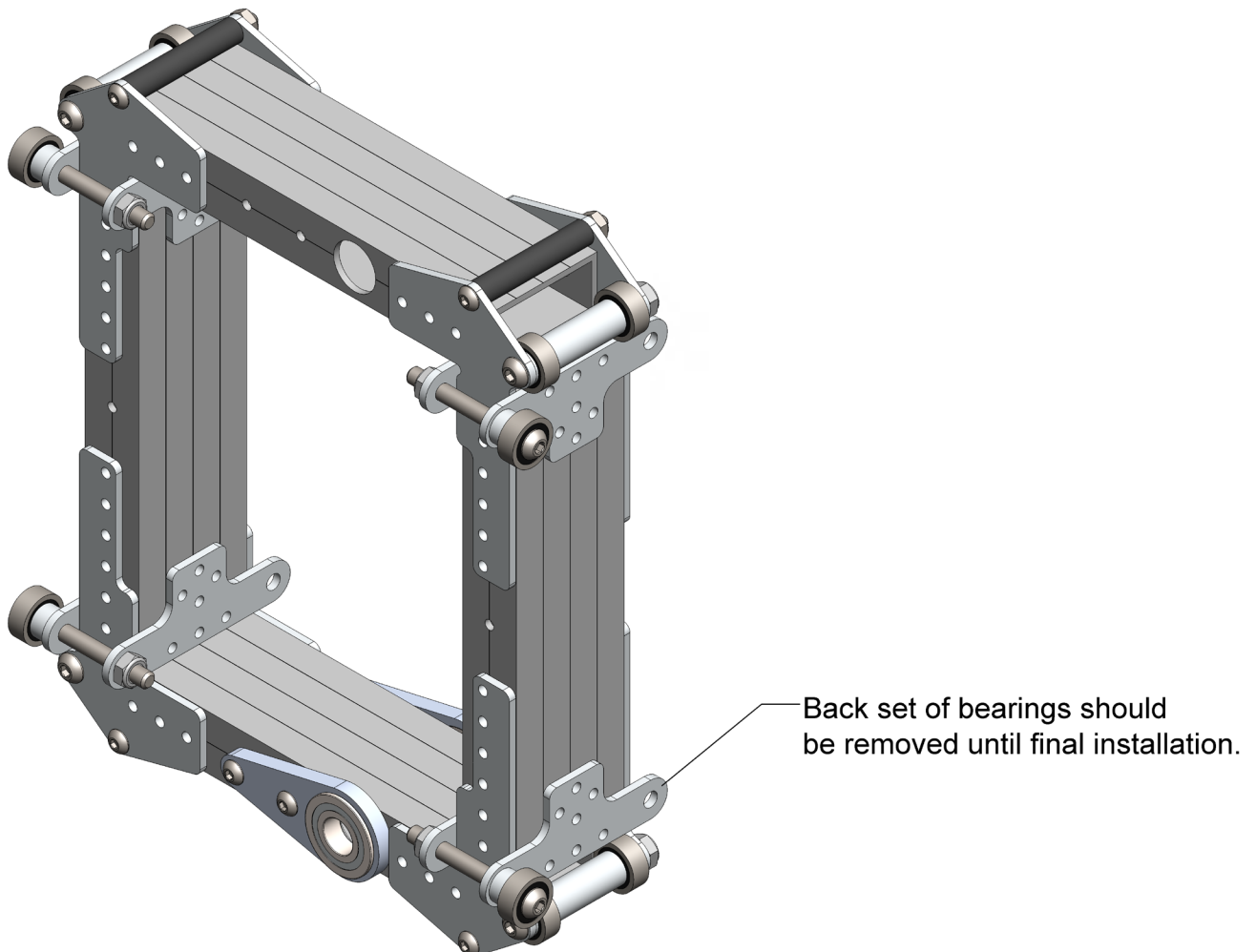
Note: The back set of bearings should not be installed at this point. Leaving them out helps with the installation of the other stages later in the assembly process.





Elevator Carriage Complete

At this point the elevator carriage should be mainly assembled. The rest of the components will be installed during final assembly of all sub-assemblies. This sub-assembly can be set to the side for now.

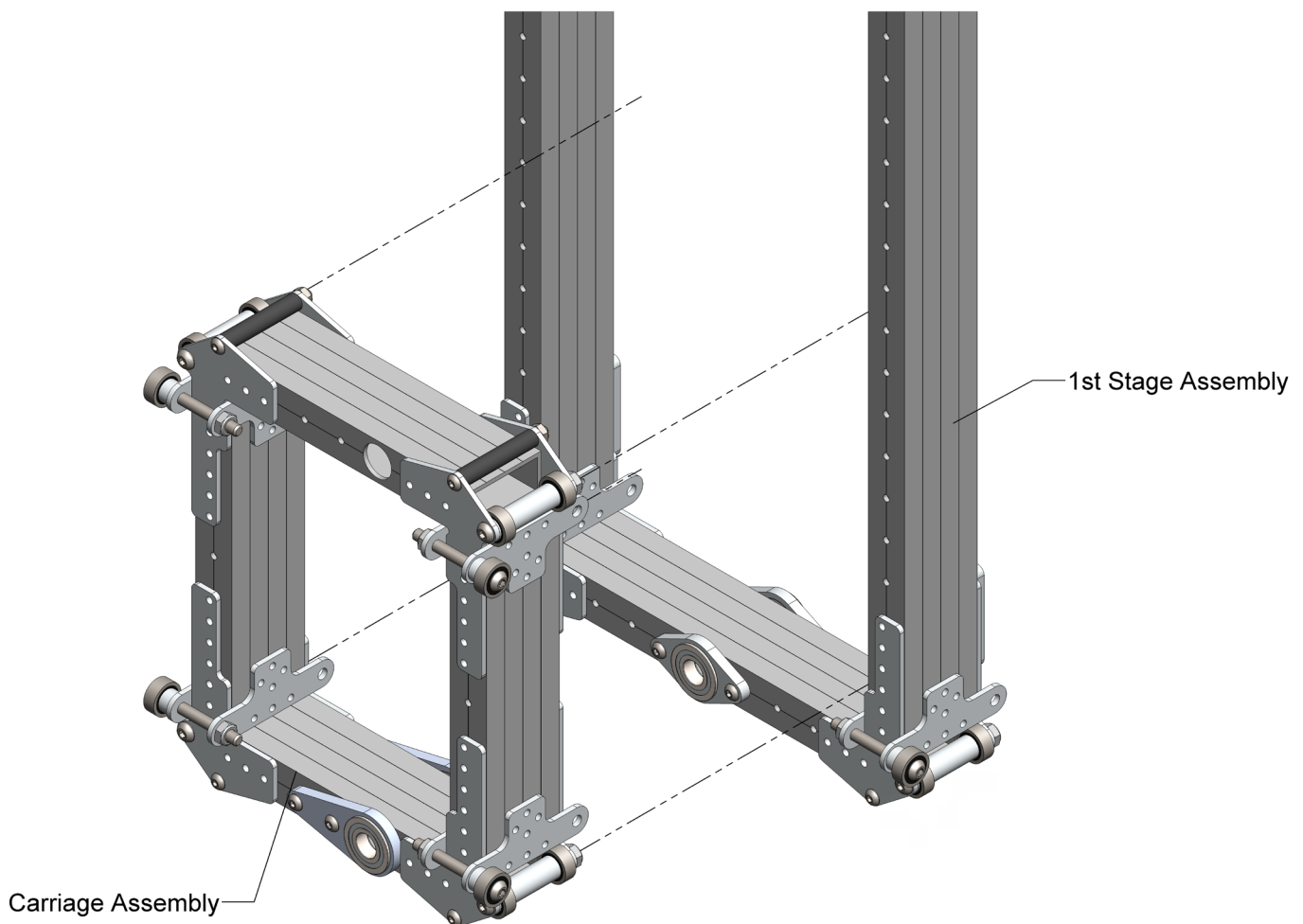




Step 21

Slide the carriage assembly into the 1st stage assembly from the front. It may help with installation to lift the carriage up from the bottom and angle forward a bit. Slide the carriage down as returning it to a vertical position

Once in, the front/back bearings in the carriage and the 1st stage should both be on the same side.



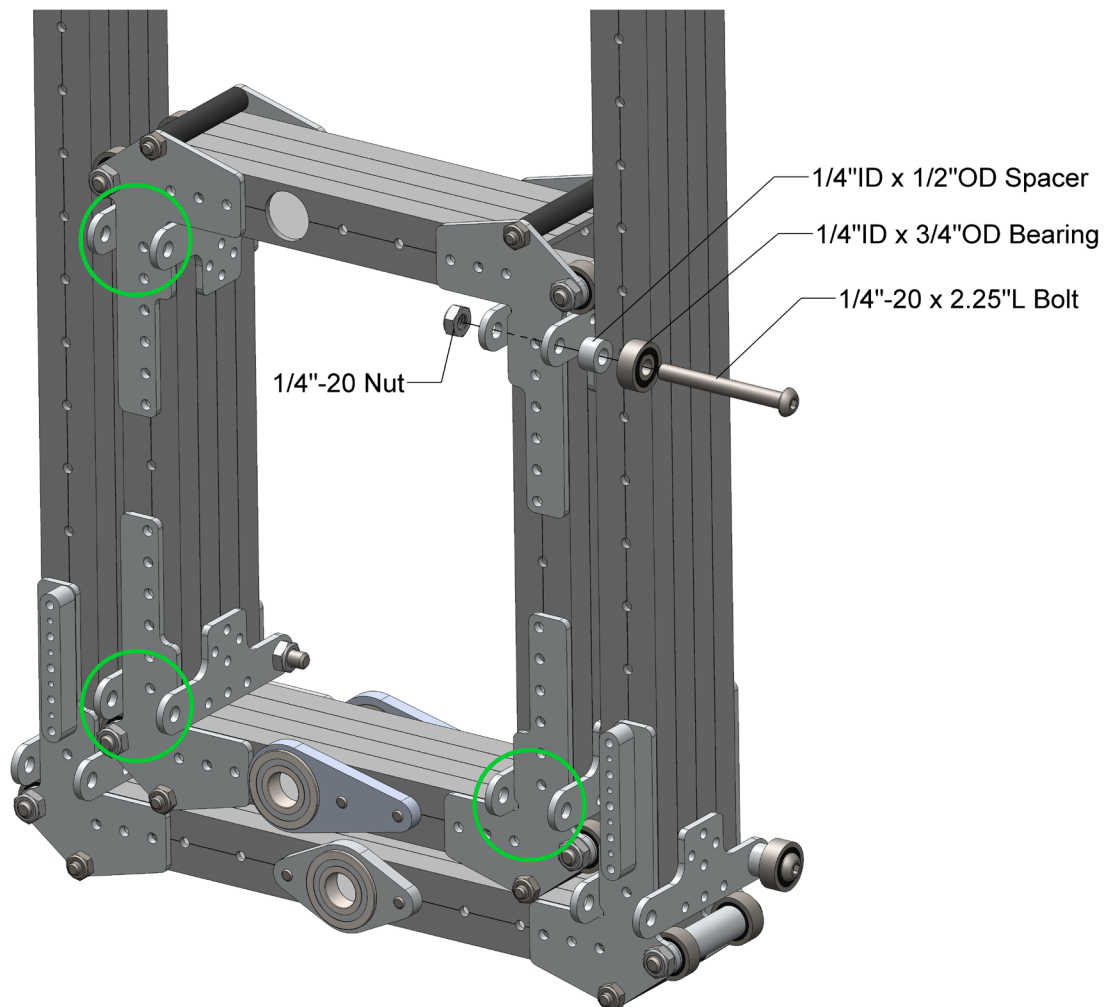


Step 22

Install the bearing and spacer stack with the 1/4"-20 x 2.25"L bolt into the back bolt hole of the front/back bearing plate. Repeat this step on all four corners of the carriage circled in green. The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin.

At this point, the elevator carriage should be able to move smoothly up/down, and a small amount of wiggle left/right and front/back is to be expected. This ensures the elevator will not bind.

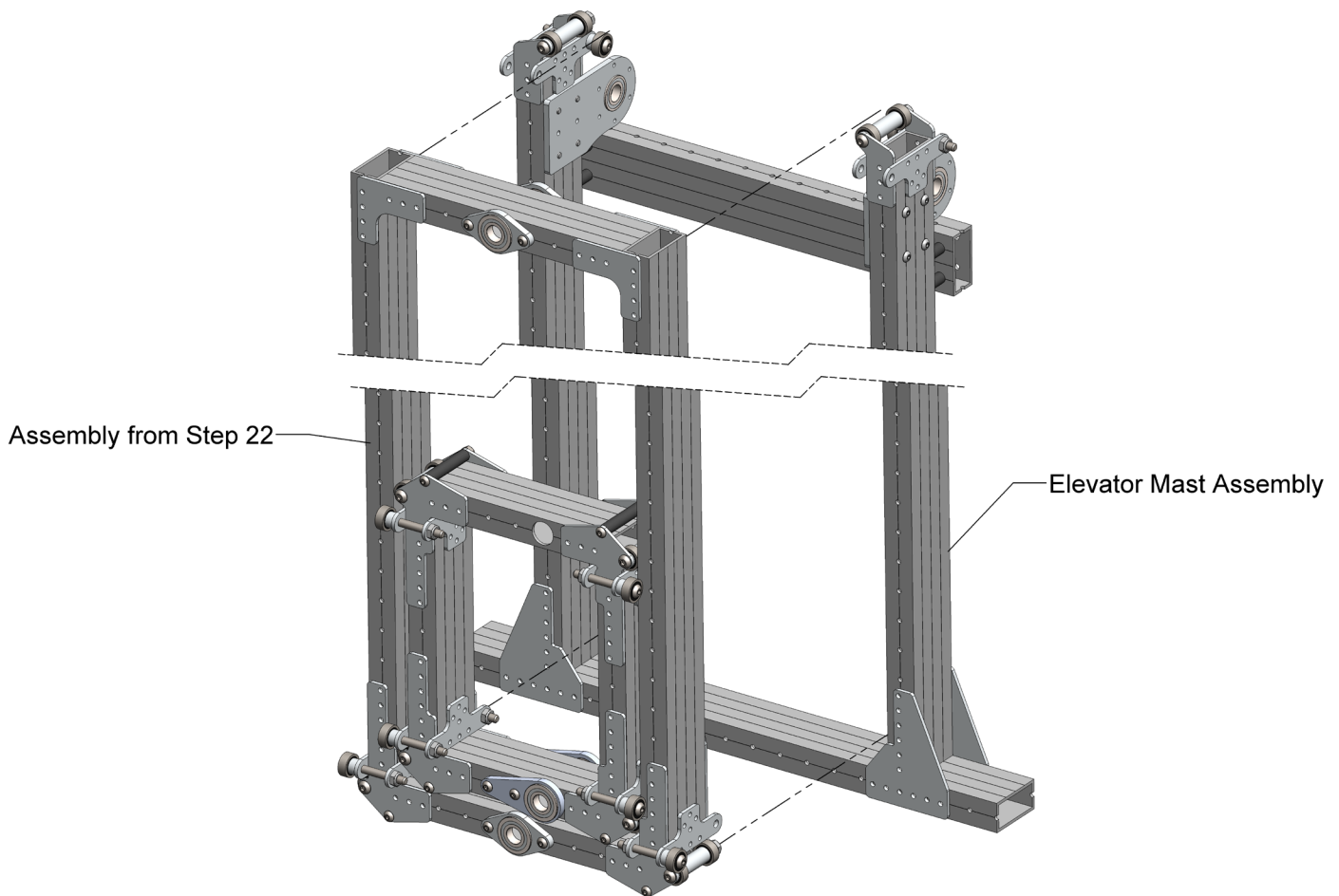
Note: The carriage may need to be lifted slightly in order to get clearance for the bolts to slide in.





Step 23

Slide the assembly from Step 22 into the elevator mast assembly from the front. It may help with installation to lift assembly from Step 22 up from the bottom and angle forward a bit. Slide that assembly down while returning it to a vertical position



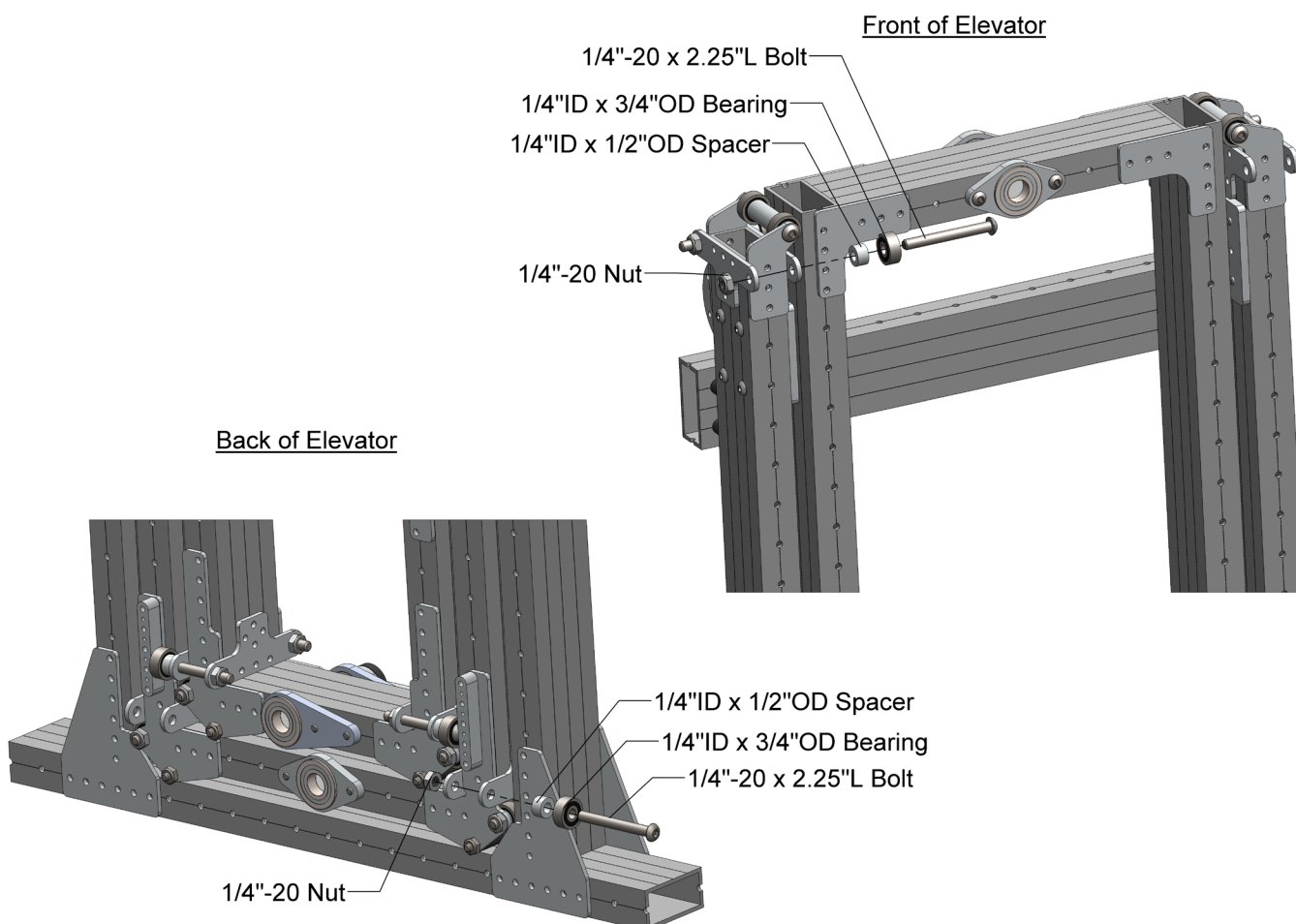


Step 24

Install the bearing and spacer stack with the 1/4"-20 x 2.25"L bolt into the back bolt hole of the front/back bearing plate in the elevator 1st stage. Repeat this step on the opposite side of the 1st stage. The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin.

Install the bearing and spacer stack with the 1/4"-20 x 2.25"L bolt into the front bolt hole of the front/back bearing plate in the elevator mast assembly. Repeat this step on the opposite side of the mast assembly. The bolt only needs to be lightly tightened. Over tightening may cause the bearing to not spin.

Note: The carriage may need to be lifted slightly in order to get clearance for the bolts to slide in.



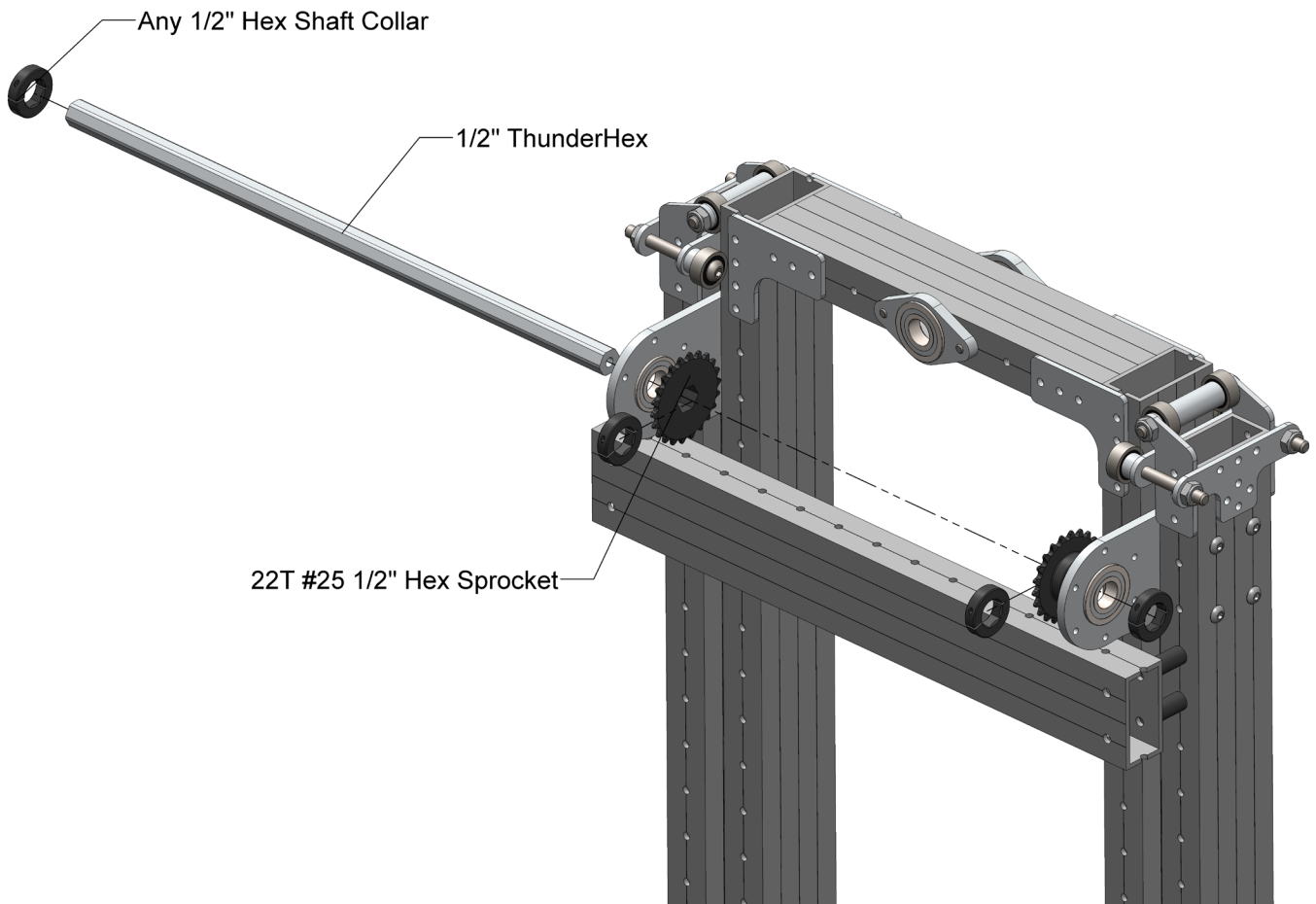


Step 25

Slide ThunderHex shaft through bearings and all components onto shaft.

Use shaft collars to constrain sprockets and shaft. Sprocket teeth should be aligned with the center of the 1st stage vertical tube.

Note: Spacers or another shaft collar may be added between the ThunderHex bearing and the sprocket to help constrain it. Tape is also a suitable substitution.





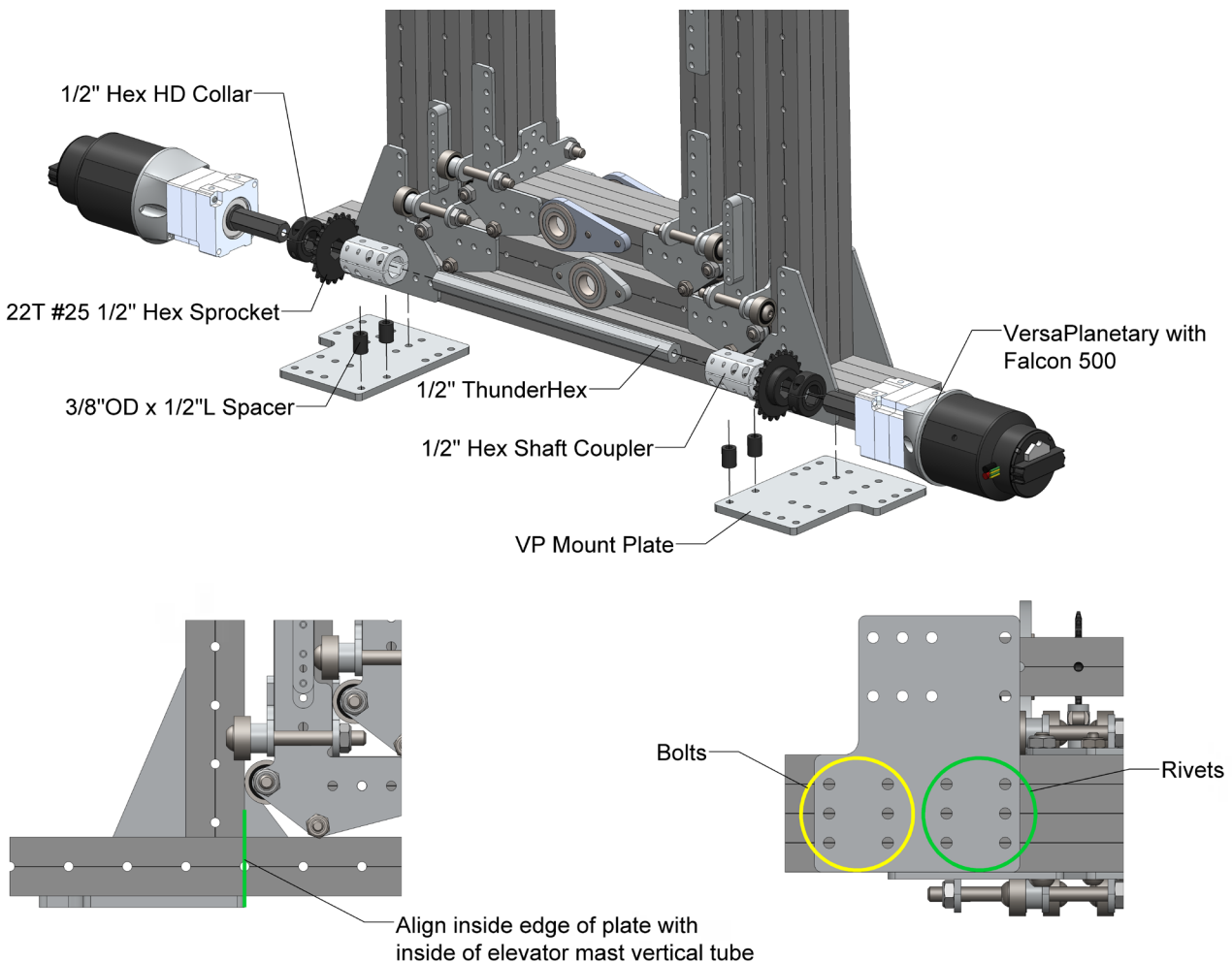
Step 26 - Falcon/CIM/MiniCIM Version

Before installing power transmission components, use the motor mount plate as a jig to drill the desired holes. Use lower to images as a reference as to where to place the motor mount plate. Use a half of the holes at a minimum.

Bolt the VersaPlanetaries onto the motor mount plate. These may be bolted on before the ThunderHex shaft, sprockets, and collars are installed.

Install the rest of the components.

Be sure to align the sprocket teeth with the center of the 1st stage vertical tube.





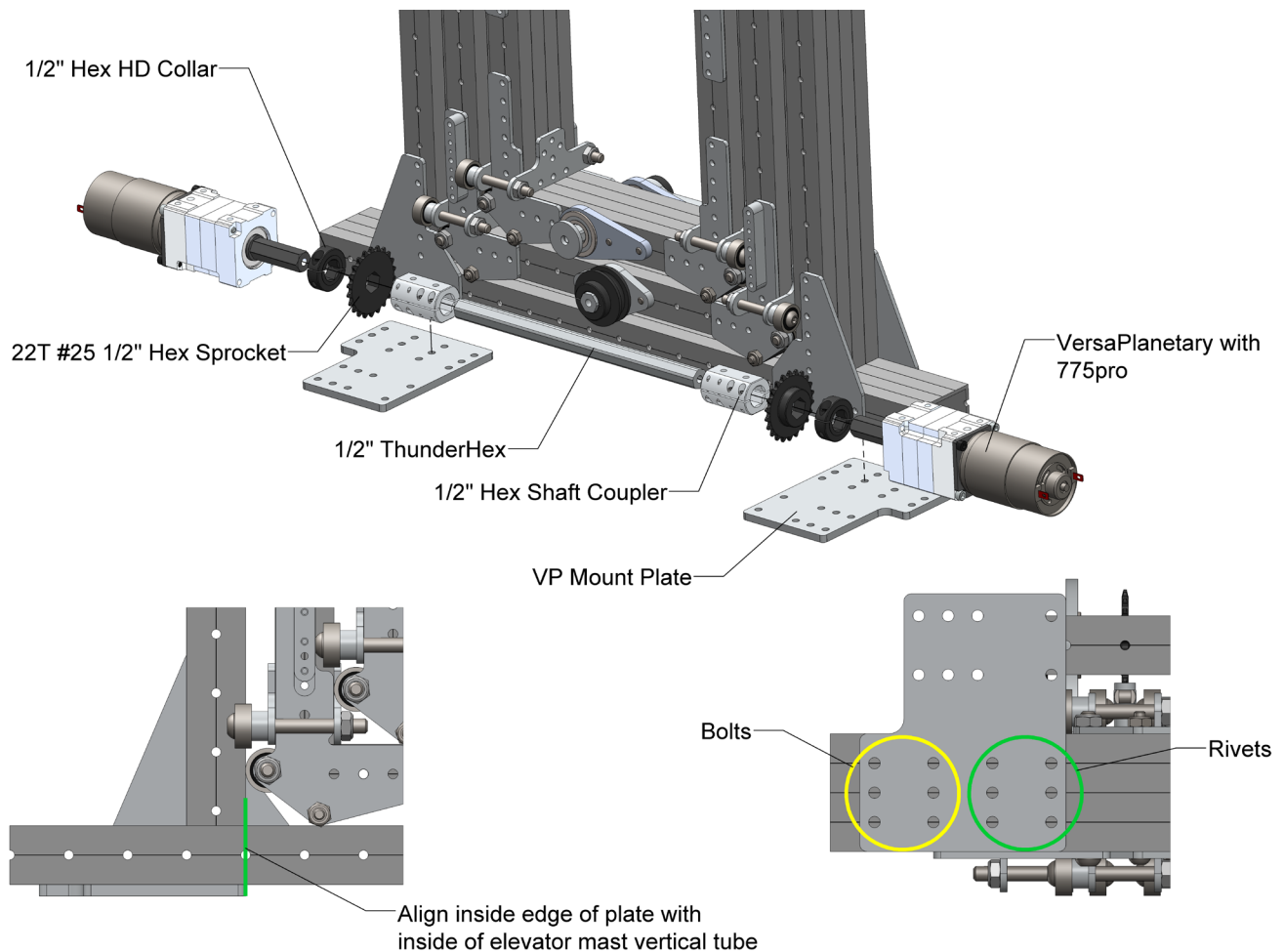
Step 26 - 775pro Version

Before installing power transmission components, use the motor mount plate as a jig to drill the desired holes. Use lower to images as a reference as to where to place the motor mount plate. Use a half of the holes at a minimum.

Bolt the VersaPlanetaries onto the motor mount plate. These may be bolted on before the ThunderHex shaft, sprockets, and collars are installed.

Install the rest of the components.

Be sure to align the sprocket teeth with the center of the 1st stage vertical tube.





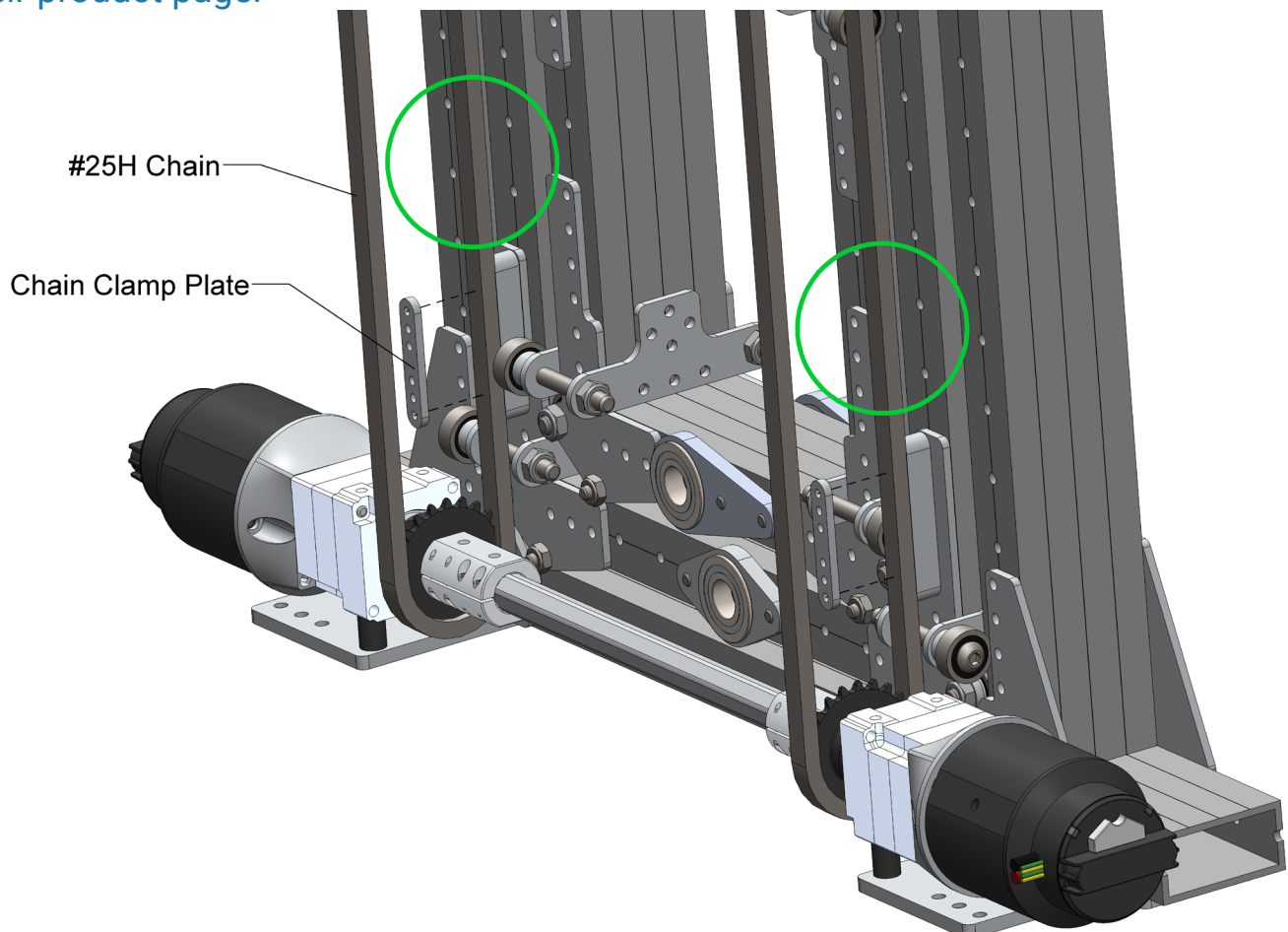
Step 27

Install the #25H chain and chain tensioner. Either the Spartan #25 Chain Tensioner (WCP-0051) or the #25 Chain Turnbuckle (WCP-0247) are compatible with this setup.

The recommended spot for the tensioner is within the green circles. Other locations may be used as well.

After both tensioners have been added and aligned with each other, use the chain clamp plate and four #4-40 bolts per side to attach chain to the chain mounting block. Two additional 1/8" roll pins may be added per side as well. This addition will help reduce the load on the #4-40 bolts.

Note: For information on how to install the chain tensioners, refer to the manual on their product page.

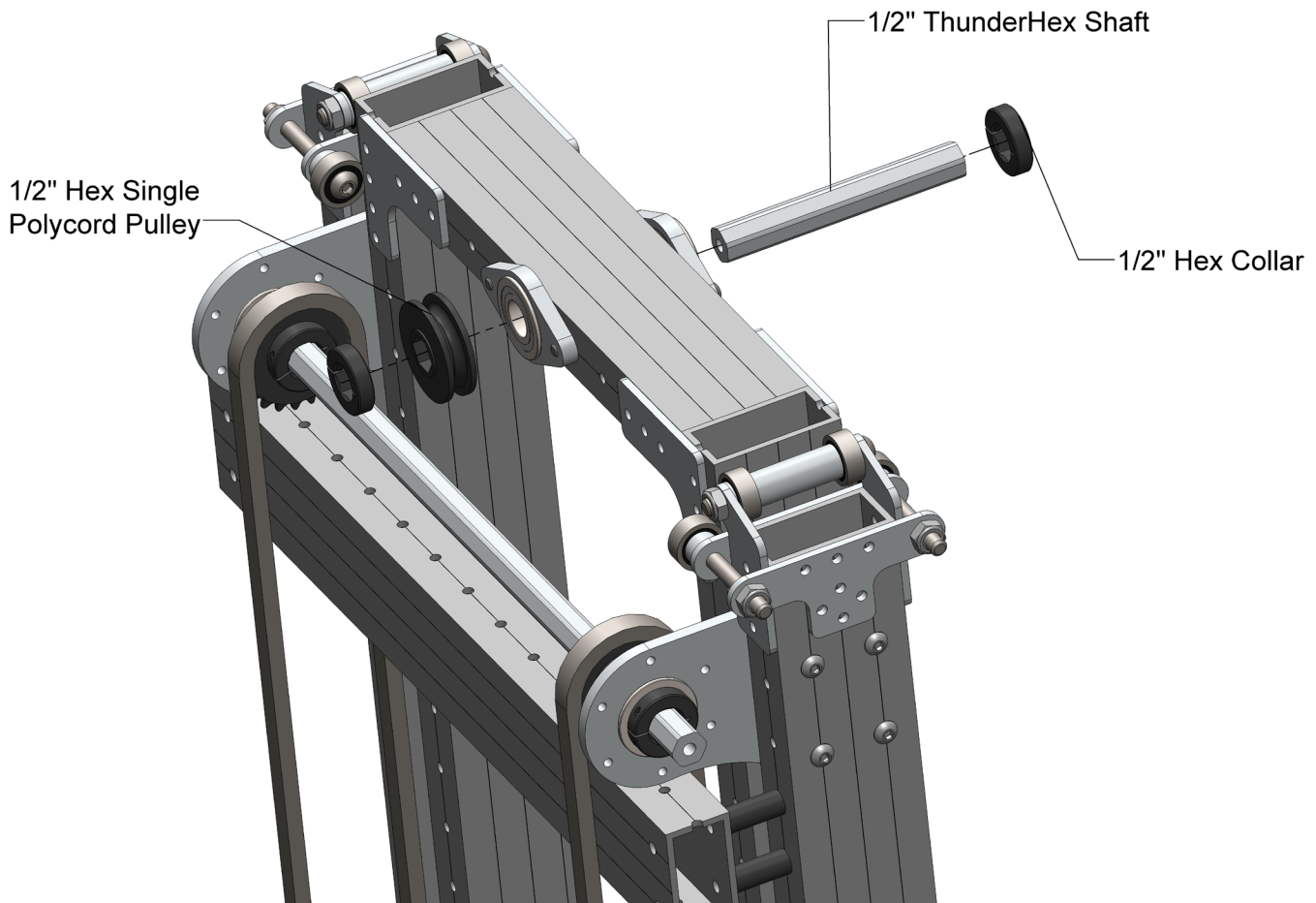




Step 28

Install Thunderhex shaft and polycord pulley. Constrain components with two 1/2" hex collars.

Repeat this same setup in the other set of bearings on the bottom of the 1st stage of the elevator.





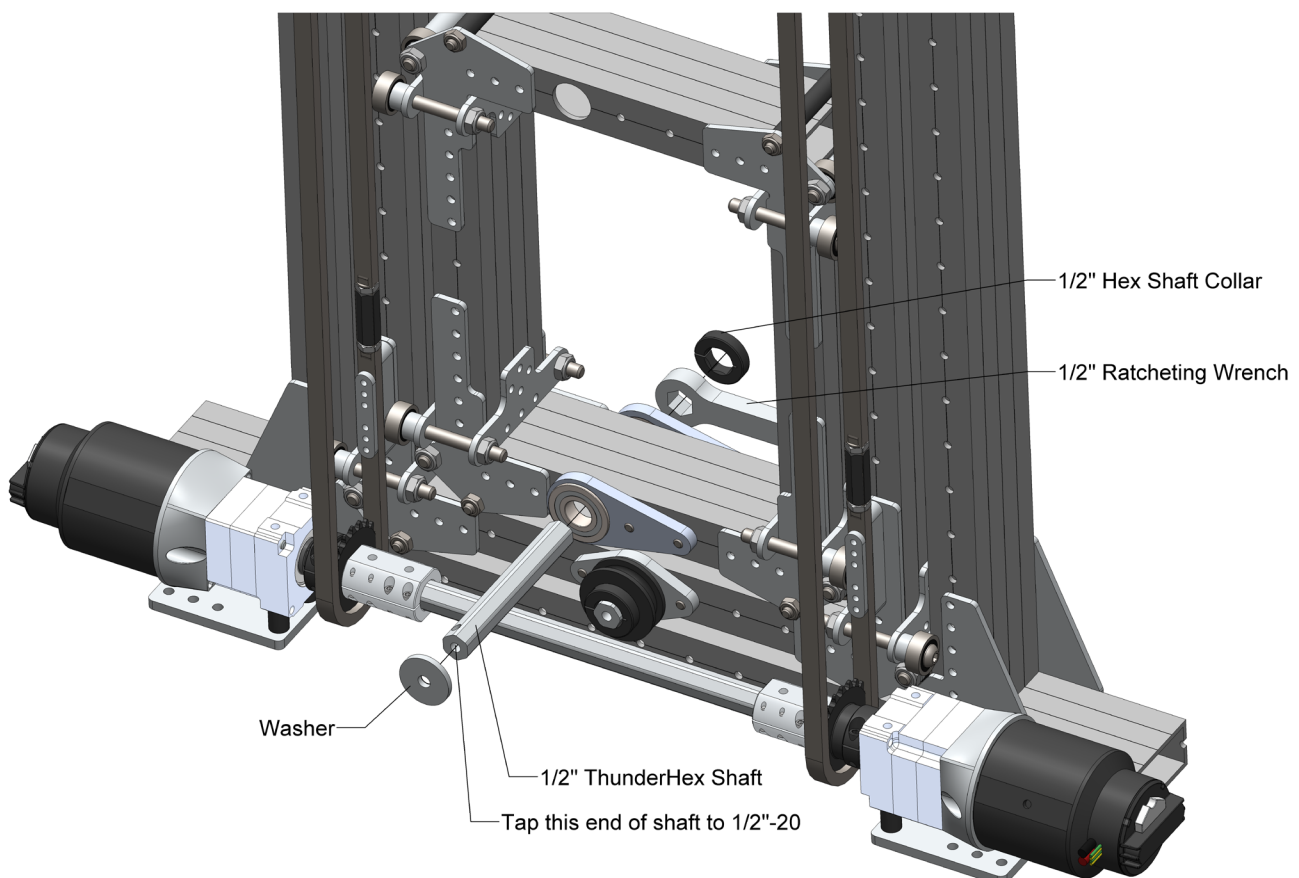
Step 29

Install hex shaft with the cross drilled hole on the same side as the other polycord pulleys.

Install the 1/2" ratcheting wrench on the opposite side and constrain with a shaft collar. When installing the wrench ensure, that when the shaft is turned counter-clockwise from the wrench side, the wrench does not spin but ratchets. To prevent the wrench from spinning, a hole may be drilled into the wrench to bolt it to the carriage. Alternately, a bolt and spacer can be used for the wrench to rest against. Use a zip-tie to constrain wrench.

Install a washer on the side with the cross drilled hole. Use a 1/4"-20 x 0.25"L bolt to hold the washer on.

Note: Hex wrench and washer are NOT included. Recommended washer size is 1"OD or larger.





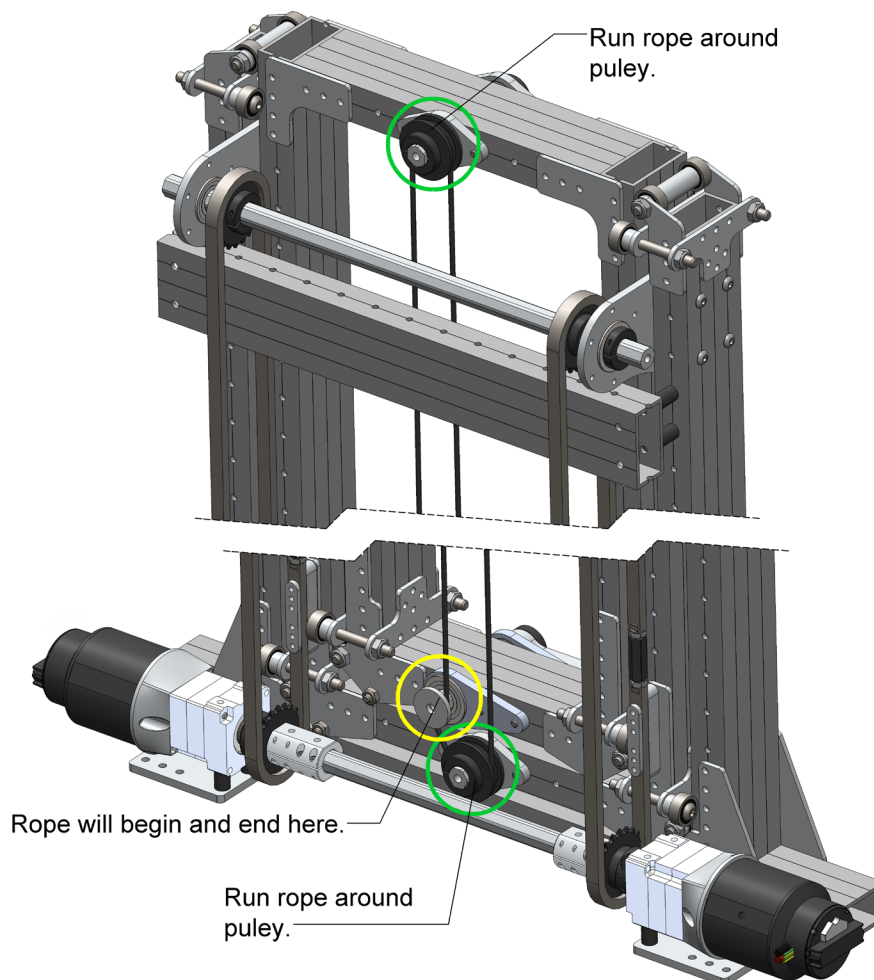
Step 30

Follow the diagram below for running the rope.

The beginning of the rope can be looped around the shaft with the hex wrench but the end must be ran through the drilled hole. This ensures that only one end is being wound up.

A few wraps of string are recommended before the string begins to get tight. Tension string to desired level.

Note: String may need to be retensioned after the elevator has been powered. This is due to the string stretching due to the knot fully tightening after having a load applied.



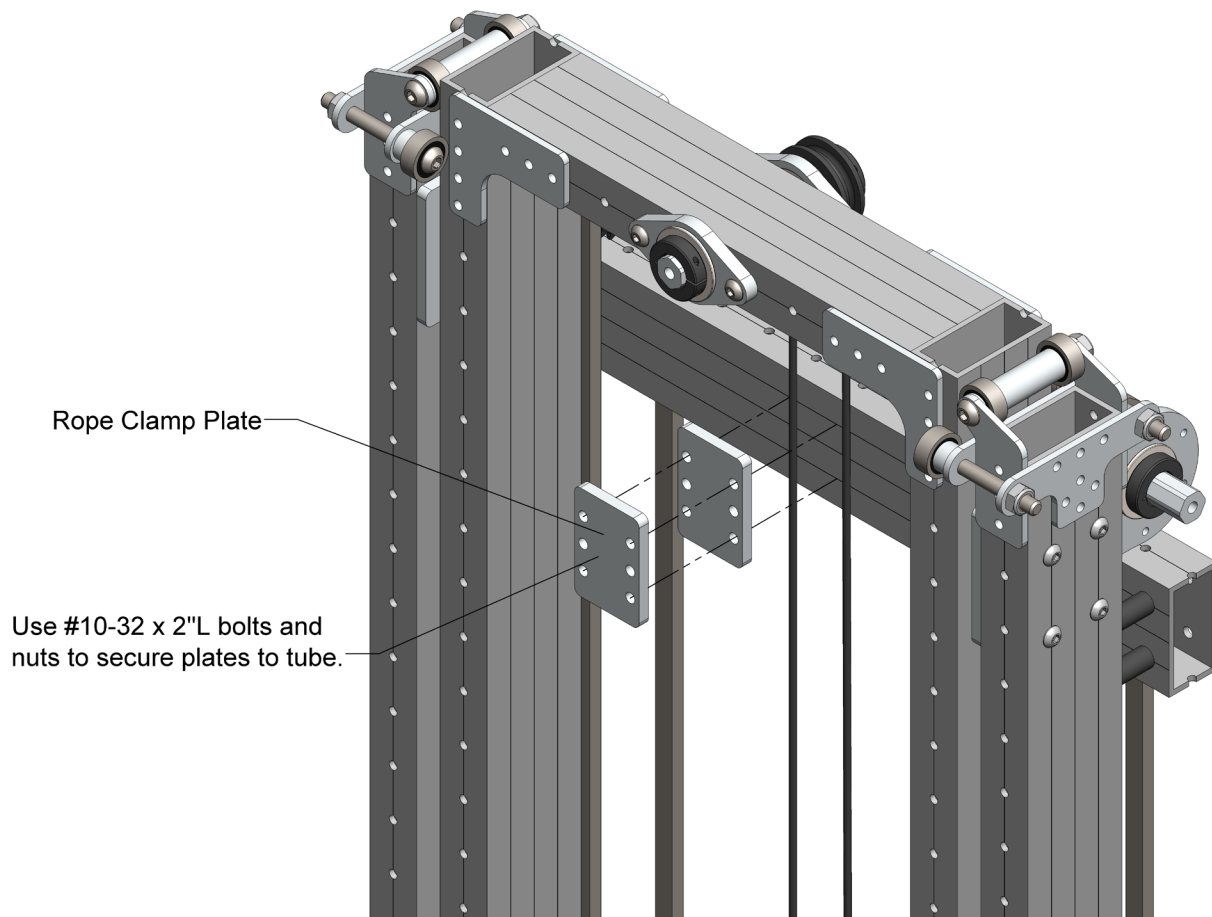


Step 31

Center the rope clamp blocks on the rope. Match drill the holes through the plates and into the elevator mast cross tube. When looking from the front of the elevator the clamp block goes on the left most rope.

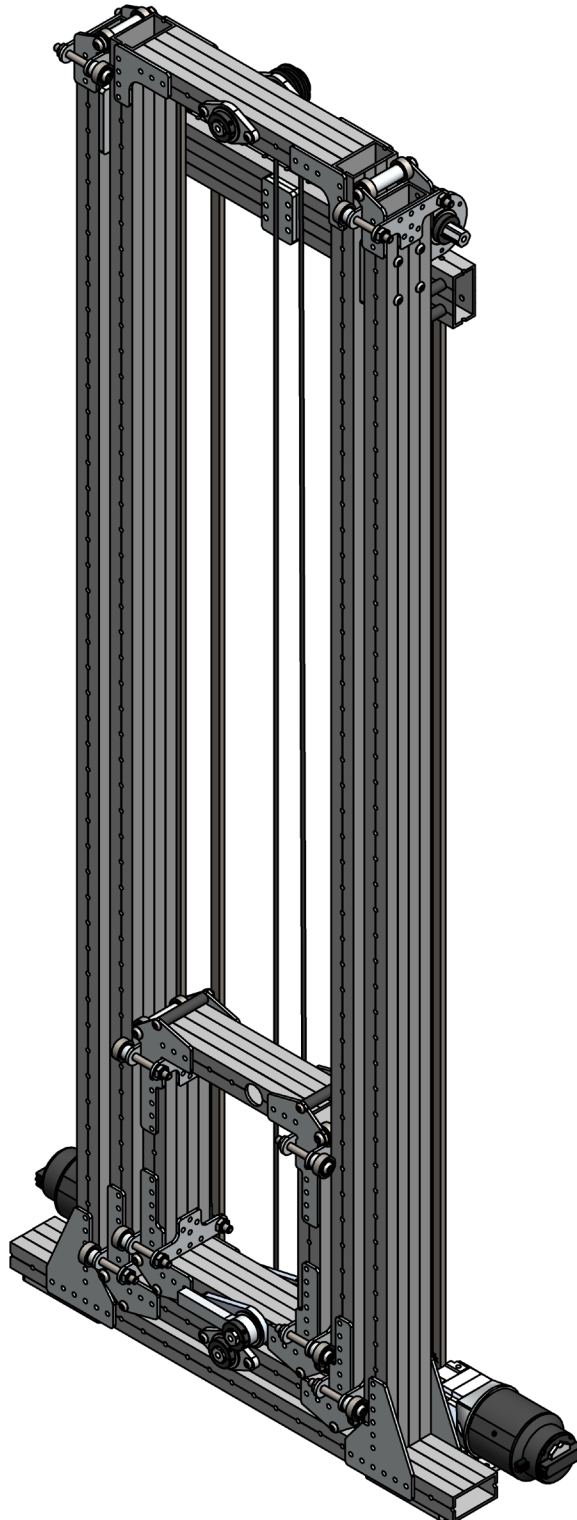
Install one block behind the rope and one in front of the rope. Use a minimum of 4 #10-32 bolts to clamp the rope to the cross tube. Before tightening the blocks ensure that all stages of the elevator are at the bottom.

Note: Heavily chamfer the edge of the blocks that the rope passes through so as to not damage the rope. Failure to do so will cause a rip in the rope, be aggressive with the chamfer.



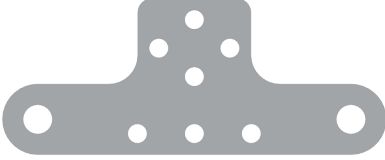
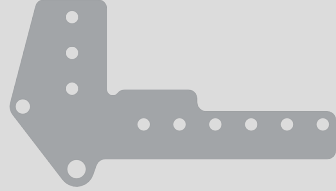


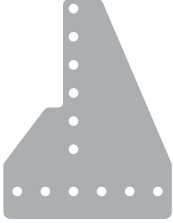


Completed Elevator



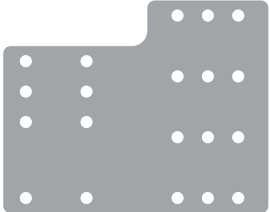
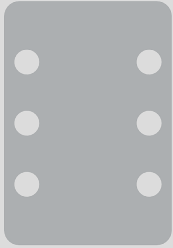
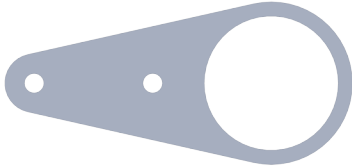






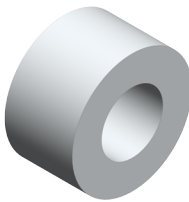

Kit Contents

Picture	Name	QTY	Kit
	Front/Back Bearing Plate	16	Base Kit
	Side Bearing Gusset	12	Base Kit
	Top Bearing Plate	4	Base Kit
	1st Stage Top Gusset	4	Base Kit
	Base Gusset	4	Base Kit

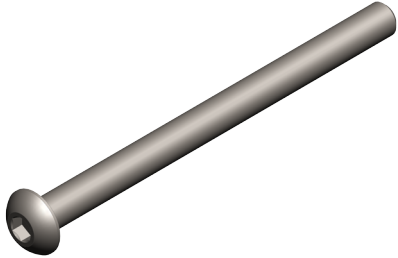
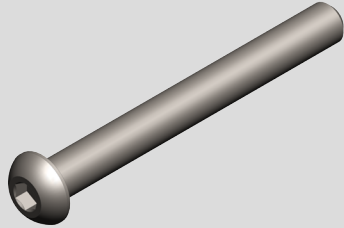
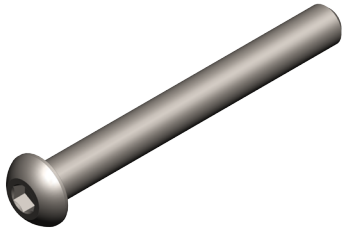
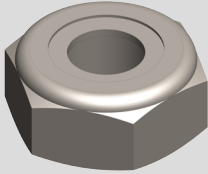
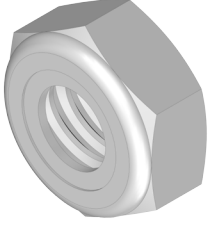


Picture	Name	QTY	Kit
	Centered Bearing Plate	4	Base Kit
	Top Sprocket Mount Plate	2	Base Kit
	VP Mount Plate	2	Base Kit
	Rope Clamp Plate	2	Base Kit
	Offset Bearing Plate	2	Base Kit



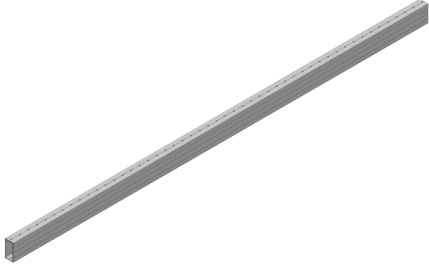
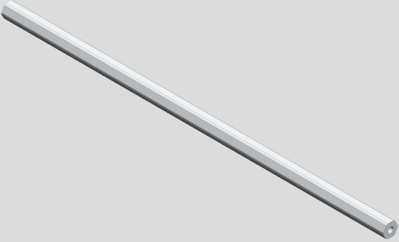

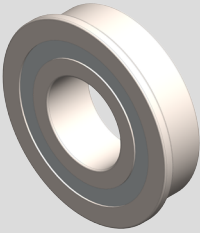

Picture	Name	QTY	Kit
	Chain Mounting Block	2	Base Kit
	Chain Clamp Plate	2	Base Kit
	1/4"ID x 1/2"OD x 9/32"L Spacer	16	Base Kit
	1mm Plastic Washer	16	Base Kit
	#10-32 x 1.25"L	8	Base Kit




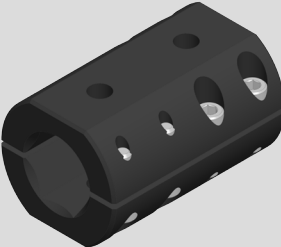

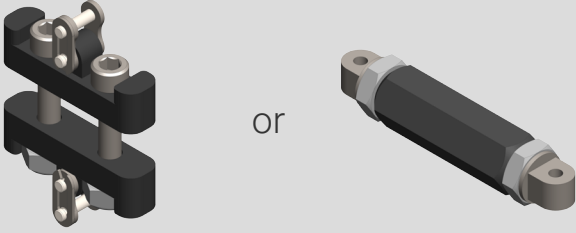

Picture	Name	QTY	Kit
	#10-32 x 2.5"L	12	Base Kit
	1/4"-20 x 2.25"L	16	Base Kit
	1/4"-20 x 2.5"L	8	Base Kit
	#10-32 Nut	6	Base Kit
	1/4"-20 Nut	24	Base Kit



Recommended Parts to Buy


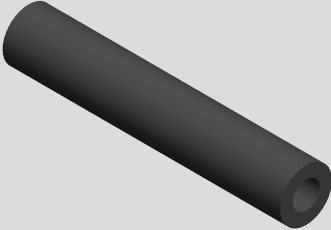
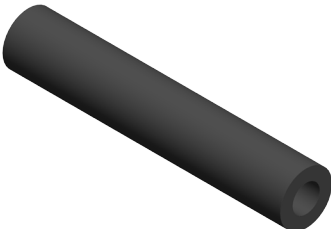

Picture	Name	QTY
	2" x 1" x 0.1" VersaFrame	6
	1/2" ThunderHex (36")	1
	1/4"ID x 3/4"OD Radial Bearing	32
	1/2" ThunderHex Bearing	8
	UHMWPE Rope	1



Picture	Name	QTY
	1/4" Single Polycord Pulley	2
	1/2" Hex Shaft Coupler	2
	1/2" Hex Collar (HD or regular)	11
	Spartan #25 Chain Tensioner or #25 Turnbuckle	2
	#25H Roller Chain	1


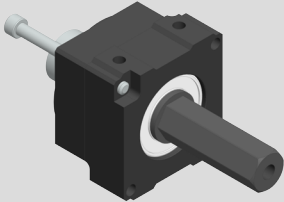
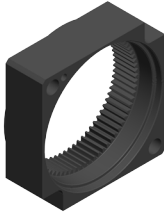
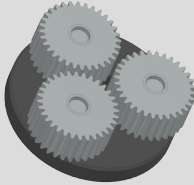
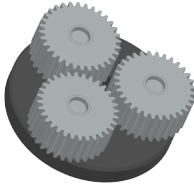
Greyt Universal Elevator v2- User Guide (Rev 1)




Picture	Name	QTY
	22t Aluminum Hub Sprocket (#25 Chain, 1/2" Hex Bore)	4
	Aluminum Spacers (.196" ID x 3/8" OD x 1" WD) (5-Pack)	1
	Aluminum Spacers (.196" ID x 3/8" OD x 2" WD) (5-Pack)	2
	1/2" Hex Ratcheting Wrench	1



775pro Option

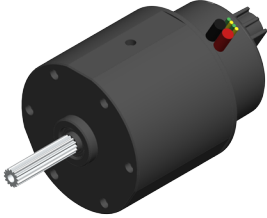
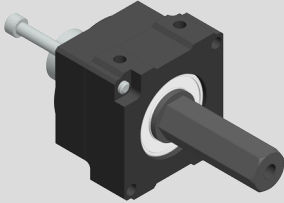
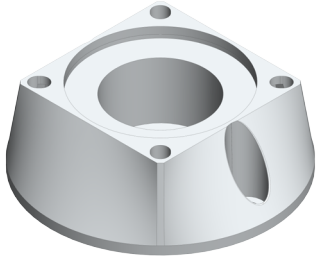
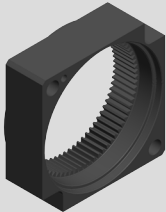
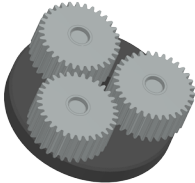
Picture	Name	QTY
	775pro	2
	VersaPlanetary v2 Base Kit, 1:1, 1/2" Hex Output	2
	VersaPlanetary Ring Gear	4
	VersaPlanetary 9:1 Gear Kit	2
	VersaPlanetary 7:1 Gear Kit	2



Picture	Name	QTY
	VersaPlanetary Integrated Encoder	1



Falcon500 Option

Picture	Name	QTY
	Falcon500	2
	VersaPlanetary v2 Base Kit, 1:1, 1/2" Hex Output	2
	VersaPlanetary v2 CIM Adapter	2
	VersaPlanetary Ring Gear	4
	VersaPlanetary 5:1 Gear Kit	2



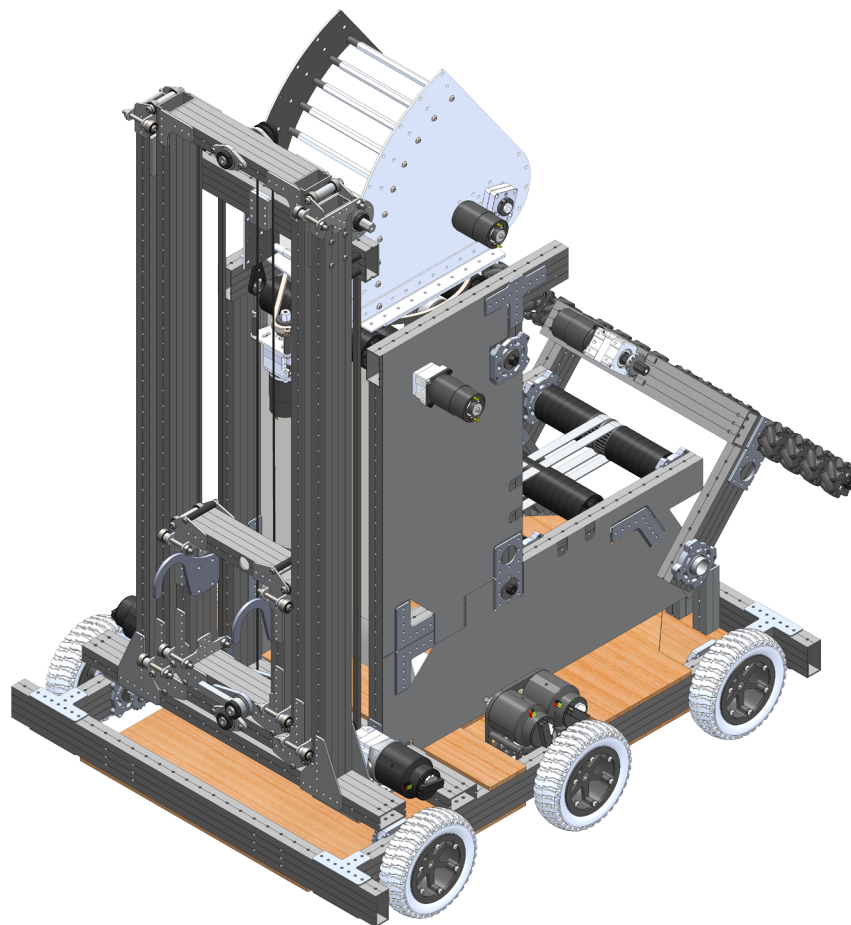
Picture	Name	QTY
	VersaPlanetary 4:1 Gear Kit	2
	VersaPlanetary Press On Motor Coupler (Falcon Motor)	2
	Falcon Motor Short Shaft	2
	Aluminum Spacers (.196" ID x 3/8" OD x 1/2" WD) (5-Pack)	1



Application Example - 2020 WCP CC

The 2020 WCP CC utilized the Greyt elevator to hang in the 2020 FRC game Infinite Recharge. This is a great example of the flexibility that comes from this system. The elevator utilized the Falcon 500 setup option.

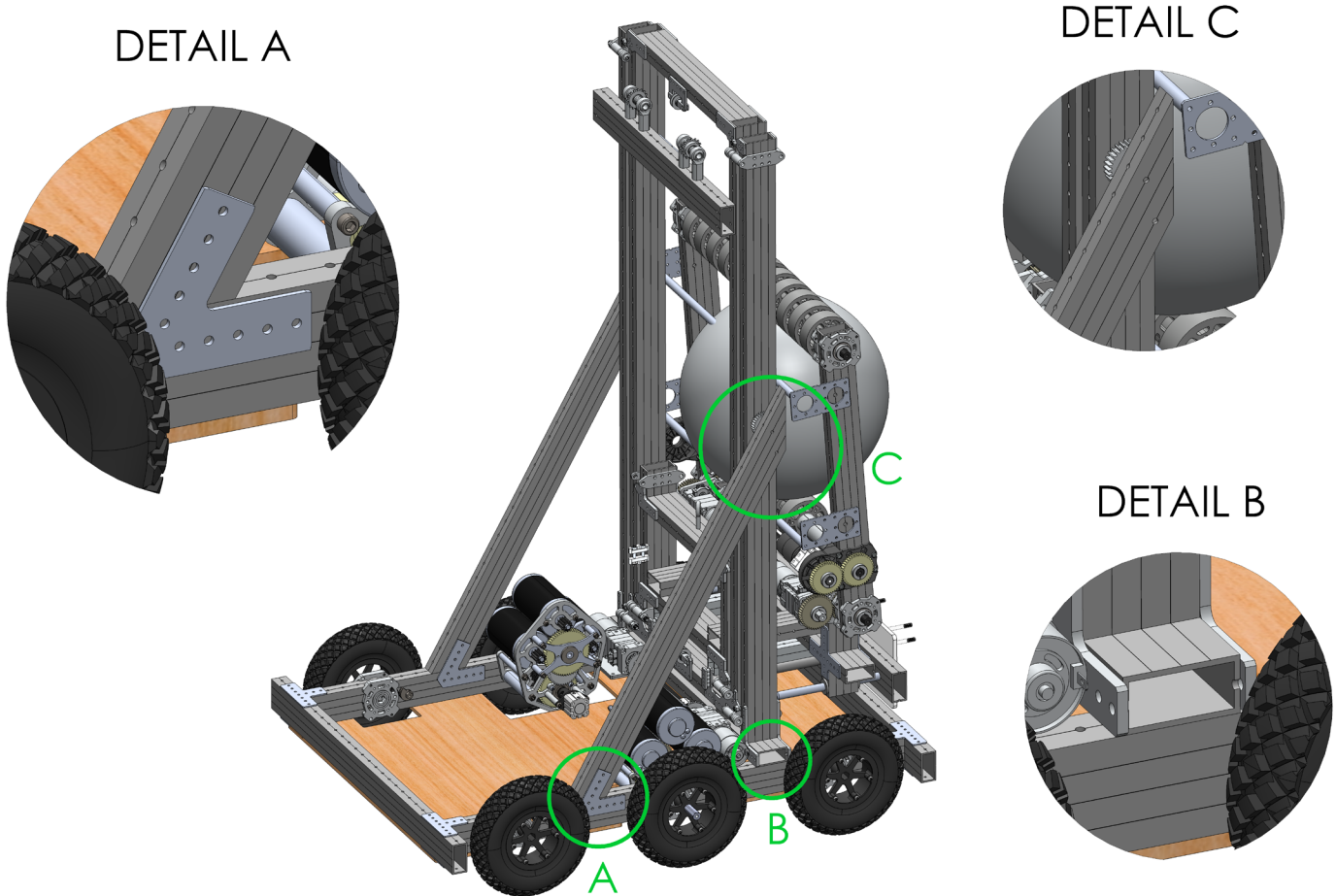
CAD and video of the 2020 WCP CC can be found here:
<https://www.wcproducts.com/cc/>





Elevator Mounting - 2019 WCP MCC+

The 2019 WCP MCC+ utilized the Greyt Elevator v1 but the mounting will be the same for the Greyt Elevator v2.





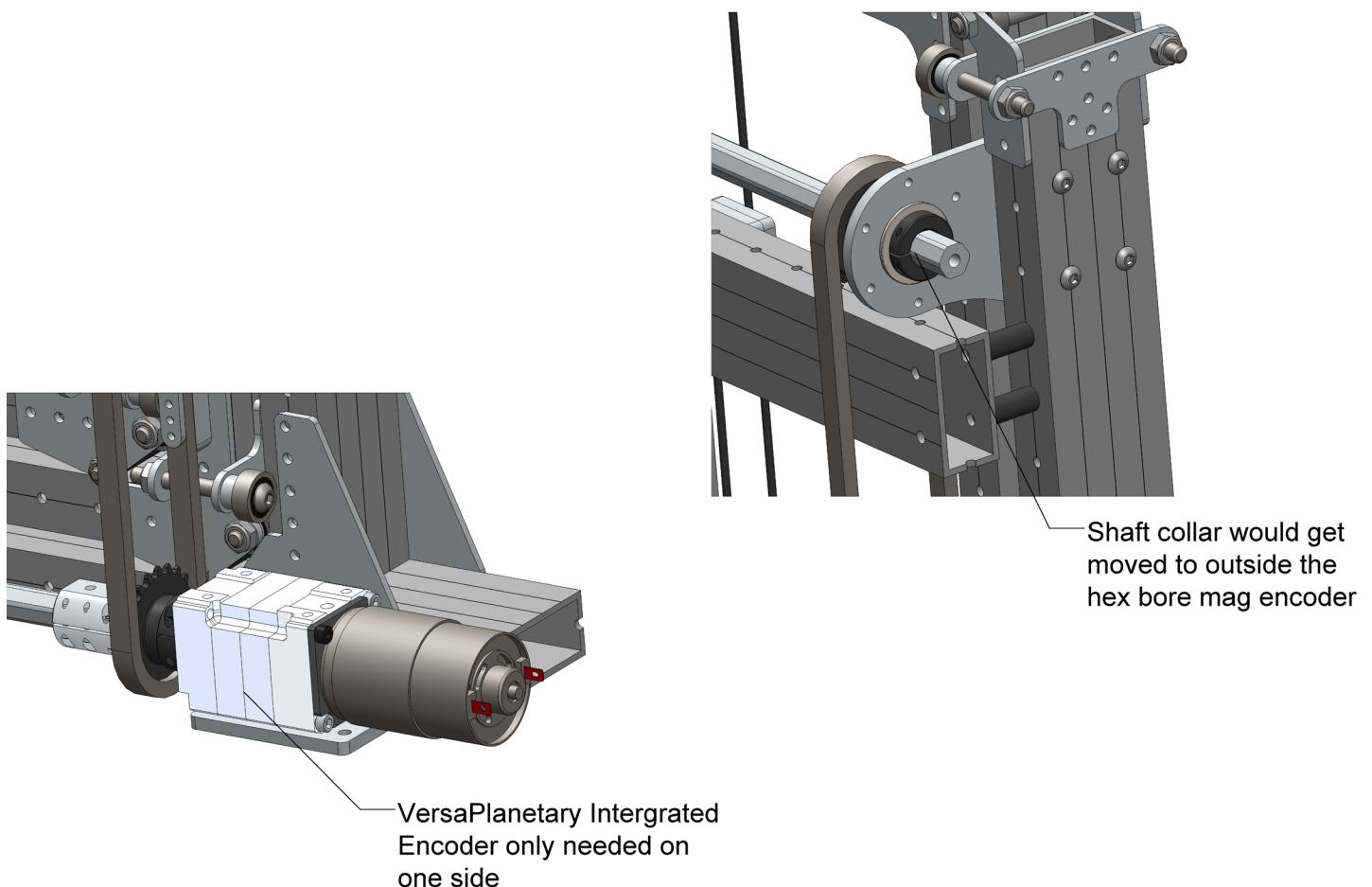
Encoder Mounting Options

If using the Falcon 500, the built in motor encoder will be sufficient for most needs. The VersaPlanetary Integrated Encoder can as be used in addition to this if desired.

If using the 775pro, the VersaPlanetary Integrated Encoder is recommended.

Additionally, the Hex Bore Mag Encoder can be used as well. There are holes added into the top sprocket mount plate to hold this encoder in place.

Any of these options will work or a combination of them can work together.





FAQ

Q: How tight should I tighten the bearing bolts?

A: The goal is to tighten them as tight as you can and they freely spin. The way 1323 does it is to tighten down and loosen $\frac{1}{4}$ to $\frac{1}{2}$ turn after.

Q: How square do the tubes need to be?

A: They don't need to be perfectly square, but we recommend making sure they are as SQUARE as possible. Use a chop saw or mill to cut these tubes.

Q: What is the recommended way to jig everything?

A: We recommend to drill one hole and then use Cleco's to hold the part in place as the rest are drilled and riveted.



Revision Table

Revision Date	Revision #	Description
4/6/2020	1.1	First revision created.