

# AMBOR

STRUCTURES

## Gin Pole Tilt-up Installation Manual

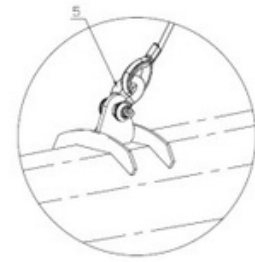
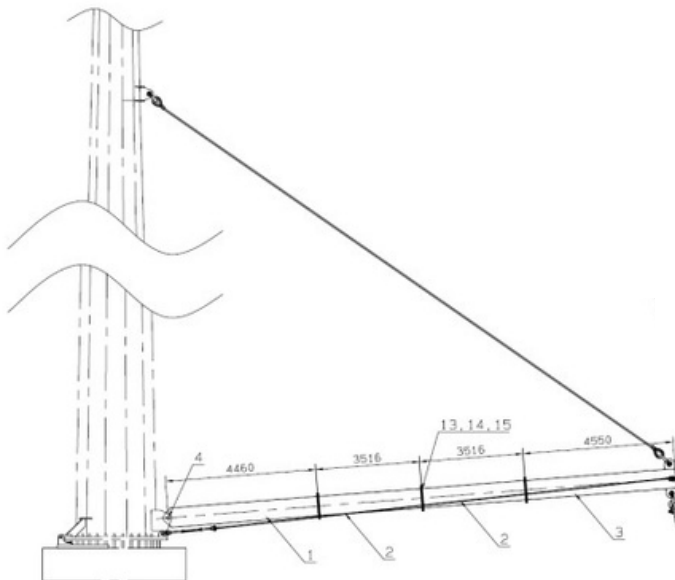
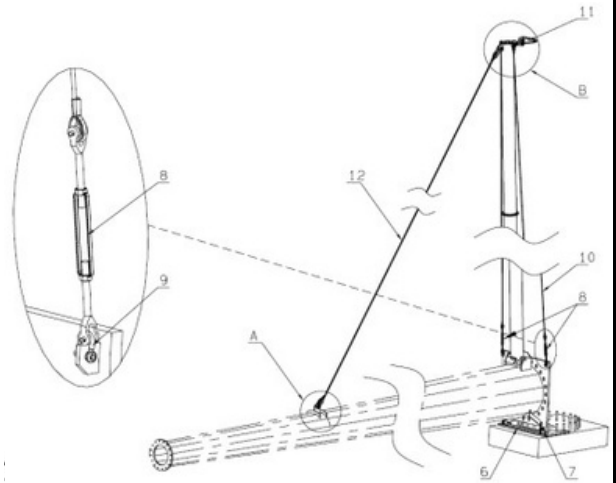


## Introduction & Safety Guidelines

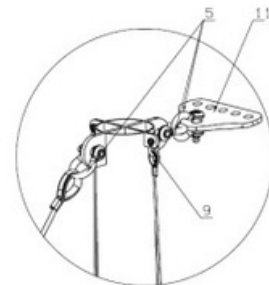
- o **WARNING:** Improper use may cause property damage, serious injury or death; therefore, it is highly recommended that trained professionals are installing the towers and operating the raising/lowering system.
- o All planning should take place prior to installation to determine the required clearance and ensure proper space for raising and lowering the tower.
- o Work area should be kept clean and free from trip hazards.
- o Products should be inspected for damage prior to use. If any damaged is noted, parts must be replaced or repaired immediately, per manufacturers recommendation.
- o When construction or erection of free-standing objects is planned, it must be in compliance with local ordinances and local design specifications (i.e. wind speed requirements)
- o Tower grounding must follow local ordinances. If no local ordinance is given, you may refer to the Ambor Pole Grounding Manual.
- o During tower installation, all operators must wear head protection and take adequate safety precaution.
- o NEVER stand or walk beneath a tower in the middle of the installation.
- o During installation, the operator must take note of any unusual sounds, vibrations or unnatural system behavior during operation. If anything is observed, operation should STOP IMMEDIATELY and the system must be assessed. Contact Ambor for assistance with any pole-related concerns. Your seller/manufacturer can be contacted for assistance with concerns about the foundation, hydraulic RAM cylinders, or other installed components.
- o Installation and/or assembly during severe weather conditions must be avoided, especially electrical storm activity (lightning).
- o Maximum allowable wind speed during installation or maintenance is 17m/s (38mph).
- o **SAFETY FIRST!** Caution and common sense must be used when installing/using this product.

## Bill of Materials: Gin Pole

No.	Part No.	Description	Unit Weight (kg)	QTY
1	C507024	Support Shaft 1	318	1
2	C507025	Support Shaft 2	245	2
3	C507026	Support Shaft 3	328	1
4	C749143	Pivot Axis	8.9	1
5	C910544	Shackle G-209 1-3/8	/	6
6	C507134	Hinge Plate	295	1
7	C751875	Pivot Axis	1.4	2
8	C910545	Turnbuckle 7/8x12	/	2
9	C910543	Shackle G-209 5/8	/	4
10	C910542	Ø12 Steel Rope - 15m	28	2
11	C749614	Link Plate	/	1
12	C910541	Ø24 Steel Rope - 15m	/	1
13	C900099	Bolt M16x75x45	/	18
14	C900117	Nut M16	/	18
15	C900409	Washer 16	/	36
	C931798	Stop Pin Ø8x125	/	3

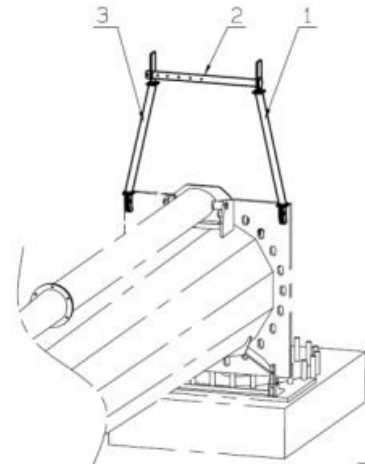
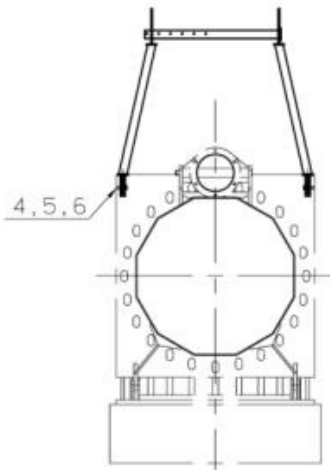


Detail A

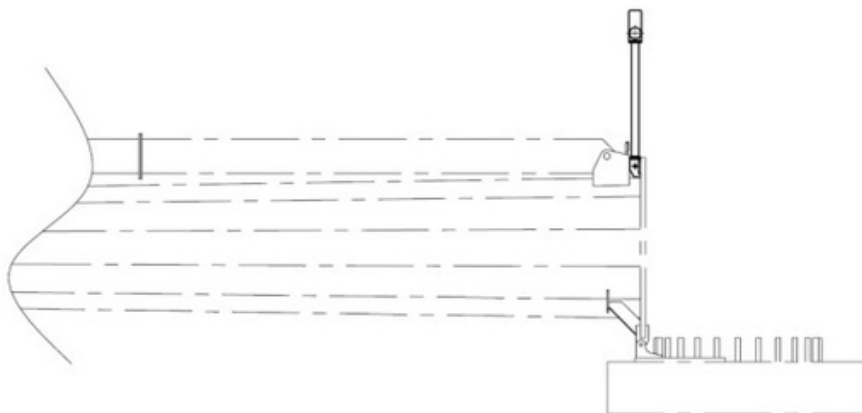


Detail B

## Bill of Materials: Gin Pole Bracket



No.	Part No.	Description	Unit Weight (kg)	QTY
1	C507136	Support Arm 1	38	1
2	C507135	Link Shaft	8.3	1
3	C507137	Support Arm 2	38	1
4	C900592	Bolt M24x70x45	/	2
5	C900574	Nut M24	/	2
6	C900221	Washer 24	/	4
	C900008	Bolt M10x90	/	1
	C900103	Nut M10	/	1



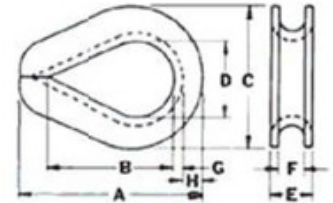
## Bill of Materials: Gin Pole Pulley System

Total Pulling Force	# of Pulleys	Cable lengths	Force of Every Cable	Recommended Cable Diameter	Required Drive Force of Pulling Truck	Required Holding Force of Fixed Truck
100KN	3	4	25KN	8mm	At Least 32KN	AtLeast 128KN
	5	6	17KN	8mm	At Least 20KN	At Least 120KN
	7	8	12.5KN	6mm	At Least 15KN	At Least 120KN
Note: The Min. breaking strength of the cable is 1670MPa						

# of Pulleys	Length of Pulling Cable	Shackle	Single Pulley	Wipe rope clip - Cable	Thimble-Cable
3	110m	7/8 (7 pieces)	5T (3 pieces)	8 (6 pieces)	5/16 (2 pieces)
5	160m	3/4 (11 pieces)	3.5T (5 pieces)	8 (6 pieces)	5/16 (2 pieces)
7	210m	5/8 (15 pieces)	2.5T 7 pieces)	6 (6 pieces)	1/4 (2 pieces)

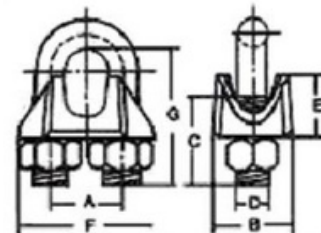
### Thimble

Rope Dia.	Weight per 100 (lbs.)	Dimensions (in.)							
		A	B	C	D	E	F	G	H
1/4"	6.5	2.19	1.63	1.5	0.88	0.44	0.28	0.06	0.23
5/16"	11.8	2.5	1.88	1.81	1.06	0.55	0.34	0.08	0.28



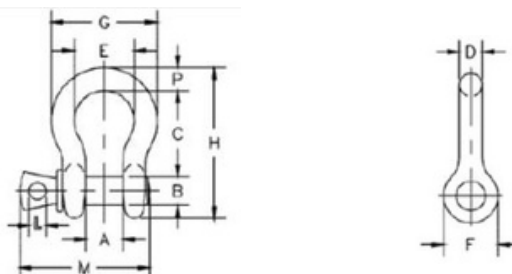
### Drop Forged Wire Rope Clips

Size	Dimensions						
	A (mm)	B (mm)	C (mm)	D (in)	E (mm)	F (mm)	G (mm)
5/16"	22	33	19	3/8"	18	43	35
1/4"	19	30	15	5/16"	16	36	26



### Shackle

Nominal Size	Working Load Limit (t)*	Weight Each (lbs.)	Dimension (in.)												Tolerance +/-	
			A	B	C	D	E	F	G	H	L	M	P	C	A	
7/8"	6 1/2	3.62	1.44	1	3.31	0.88	2.28	2.09	4.03	5.83	0.5	4.5	0.97	0.25	0.06	
3/4"	4 3/4	2.35	1.25	0.88	2.81	0.75	2	1.81	3.5	4.97	0.5	3.97	0.25	0.25	0.06	
5/8"	3 1/4	1.37	1.06	0.75	2.38	0.63	1.69	1.5	2.94	4.19	0.44	3.34	0.69	0.25	0.06	



## Hinge Plate Assembly Instructions

1. Set the hinge plate on the anchor bolts. The plate should be on the foundation opposite of the truck (see Figure 1.3). Place a washer and nut on top of the hinge plate and tighten it down. Make sure the nuts meet the recommended bolt requirements. Add a washer to the top of the nuts that are being used by the hinge plate.
2. Measure the bolts from the concrete and set each of the leveling nuts 120mm above the concrete (see Figure 1.1). Adjust each of the leveling nuts to create a level surface for the tower. (Figure 1.2)
3. Place a washer on each of the leveling nuts.



Figure 1.1



Figure 1.2

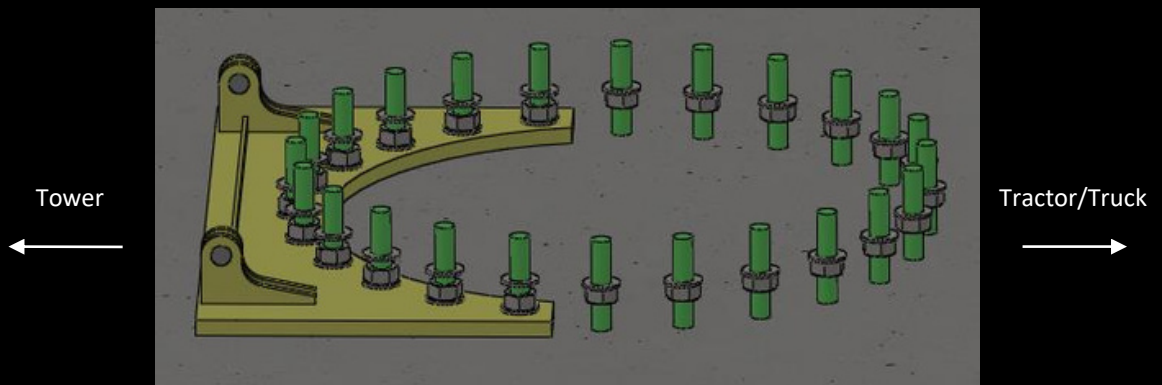


Figure 1.3

Once the nuts on the foundation are level, you can begin to arrange and assemble the tower sections/ladder near the foundation. See tower assembly manual for detailed instructions on nesting the tower sections.

## Gin Pole Assembly Instructions

Once the tower and ladder system are assembled, you can begin attaching it to the foundation and begin the gin pole assembly.

1. Place the tabs of the baseplate on the tabs from the hinge plate. Insert the pivot axis pins and stop pins in both tabs.
2. Take the support shaft # 1 and set it on the bracket that is welded to the tower. Insert the pivot axis pin and stop pin.
3. Assemble the sections of the gin pole according to Figure 4.2 below. Flanges between the sections must be bolted together with the M16 bolts as shown in Figure 4.3 to meet the recommended torque 161N-m.

Note: Make sure the larger tabs on the very top section are pointing perpendicular to the tower.

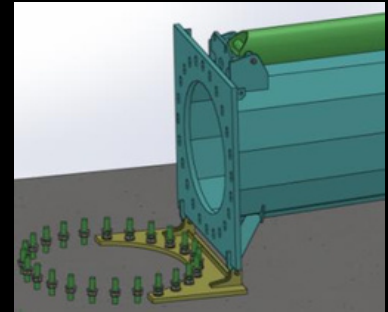


Figure 4.1

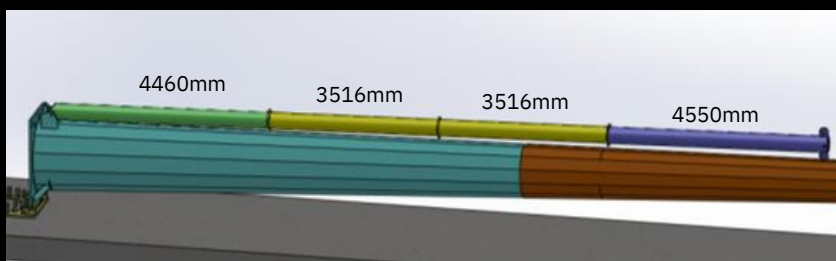


Figure 4.2

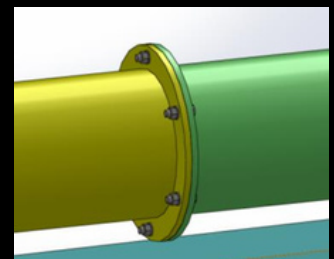


Figure 4.3



The next step is configuring cables and pulley system.

## Cable Configuration Instructions

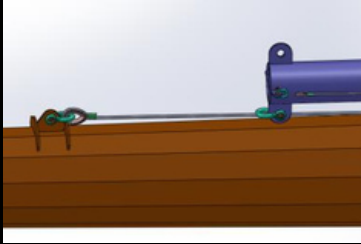


Figure 5.1

1. Take the 22.5m Ø24 Steel Rope and connect it to the tower with a 1-3/8 shackle. (See Figure 5.1)
2. Extend the cable and attach the other end with a 1-3/8 shackle to the tab at top of the gin pole that is facing the tower.

3. Next take the two 15m Ø12 Steel Ropes and connect them to the 5/8 shackles at the top of the gin pole as in Figures 5.2 and 5.4.
4. Attach the other end of the cables each to a turnbuckle. (Figure 5.3)
5. Rest the cable alongside the gin pole. Each turnbuckle will eventually need to be attached to the baseplate with a 5/8 shackle. (Shown in figure 5.3)

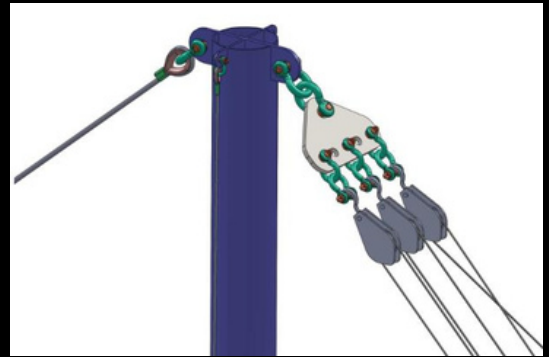


Figure 5.2

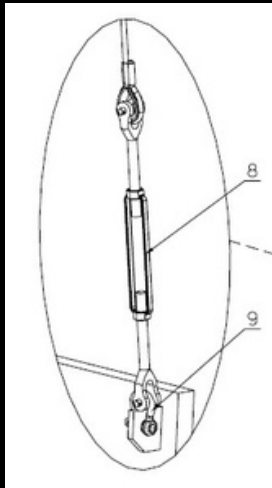


Figure 5.3

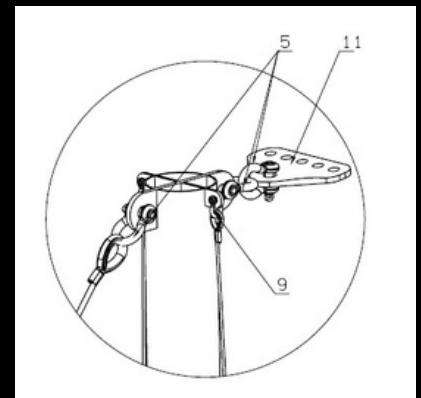
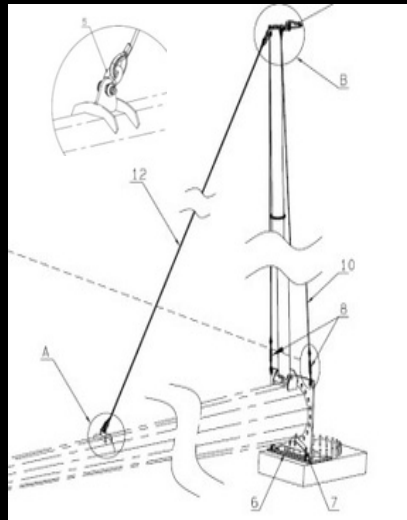


Figure 5.4

6. Finally, take the link plate and connect that to the remaining tab on the gin pole with a 1-3/8 shackle as shown in figure 5.2 and 5.4. The link plate will be used to connect the pulling cables to the truck.

# Cable Configuration Instructions Cont.

7. Assemble the gin pole bracket by attaching the Support Arm 1 and 2 to the Link Shaft with the M10 bolts. Tighten the bolts to 37 N-m. Next attach the bracket to the baseplate with the M24 bolts and tighten to 541 N.m. This system is used to guide the pulling cables as you raise the gin pole. Once it is assembled, rest the pulling cable on the cross-bar.

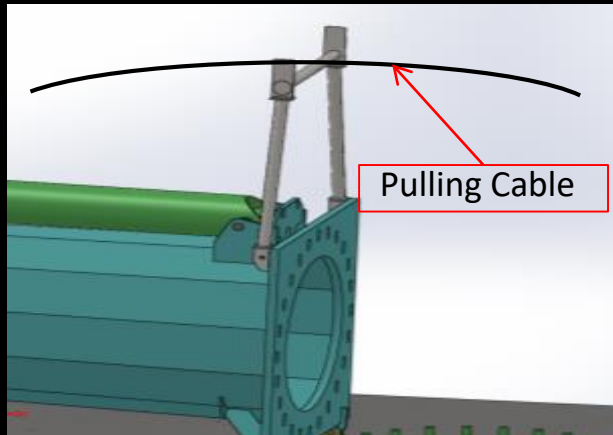


Figure 5.5

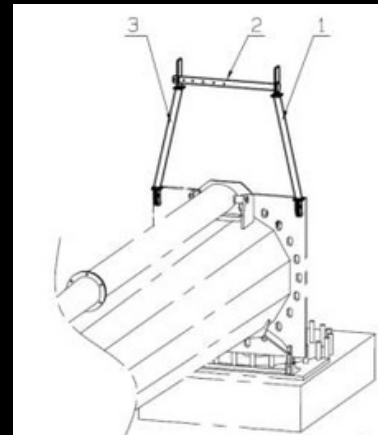


Figure 5.6

8. Next we will be assembling the pulling cable and pulley system that raise the tower.

### Notes Assembly of the Pulley System:

- The maximum pulling force of the Gaia 27m 11 kW tower is approximately 100 KN. To reduce the required drive force of the truck, you can utilize pulleys. The following table (Table 1.1) provides a few different configuration options for the pulling cable.
- When determining the length of the pulling cable required, make sure the distance between the truck and foundation must be greater than 18m. The total length of the pulling cable will depend on how many pulleys used in the system.
- The number of additional shackles and pulleys also depend on the type of configuration you choose. See Bill of Materials on page 8 for reference.

Table 1.1

Total Pulling Force	# of Pulleys	Cable lengths	Force of Every Cable	Recommended Cable Diameter	Required Drive Force of Truck	Required Holding Force of Fixed Truck
100KN	3	4	25KN	8mm	At Least 32KN	At Least 128KN
	5	6	17KN	8mm	At Least 20KN	At Least 120KN
	7	8	12.5KN	6mm	At Least 15KN	At Least 120KN

Note: The Min. breaking strength of the cable is 1670MPa

**Note: Ambor Structures does not provide the pulling cable, pulleys, extra shackles or trucks. The customer is responsible for sourcing these items.**

# Cable Configuration Instructions Cont.

9. If you are using the pulley system, two trucks are required for raising the tower. One truck is fixed while the other pulls the cable. Each truck must meet the required driving force specified in Table 1.1 on the previous page.
10. Park the fixed truck 18 meters away from the foundation of the tower.

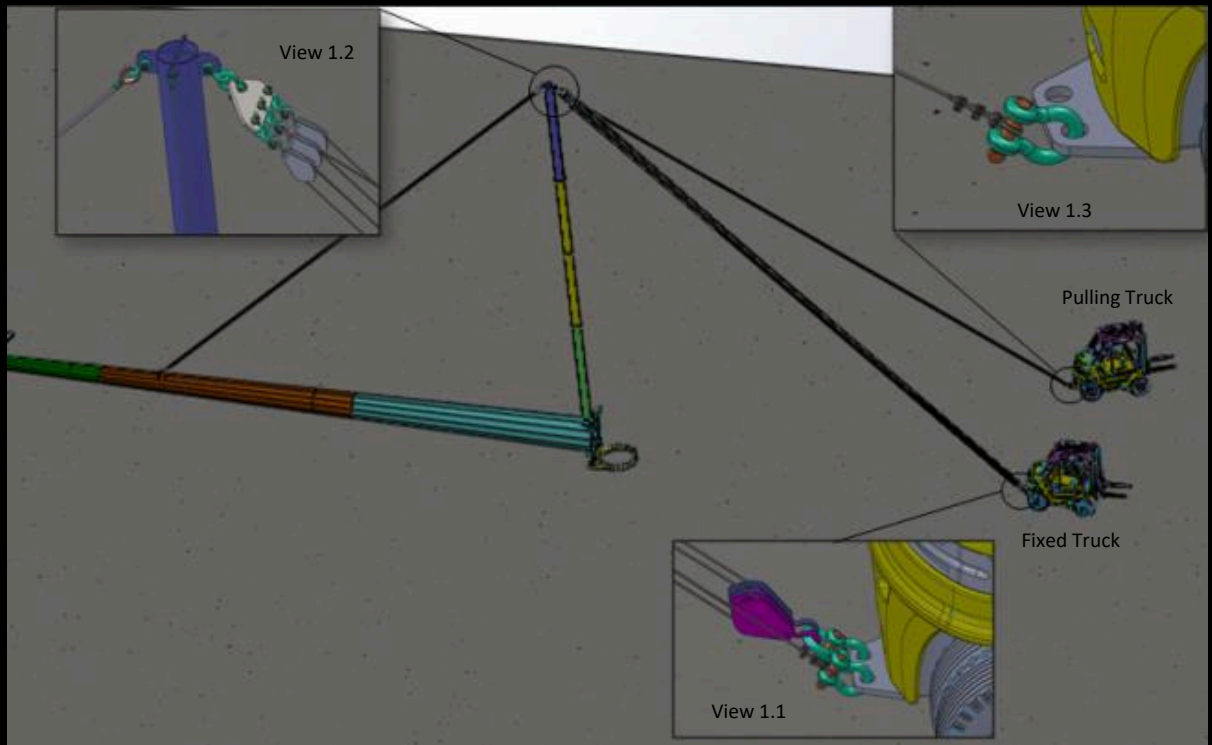


Figure 6.1

11. Attach one end of the pulling cable to the fixed truck using a shackle (see View 1.1).
12. Run the cable to the link plate, string it through the first pulley, and run it back toward the truck. String the cable through the second pulley and repeat this process until the cable is through all pulleys (see View 1.2).
13. Attach the other end of the pulling cable to the pulling truck with a shackle (see View 1.3).

Once this is all complete, you are ready to start raising the tower.

# Gin Pole Raising Instructions

1. Slowly raise the gin pole by driving the pulling truck away from the last pulley strung.

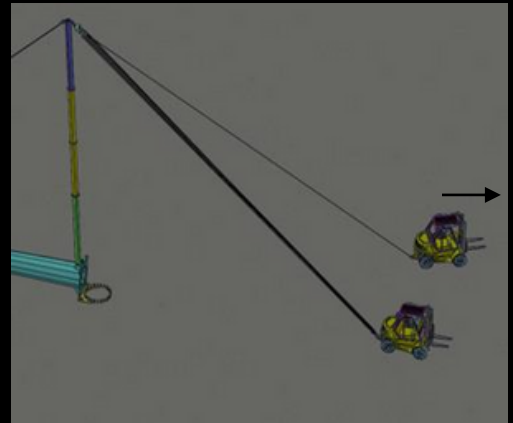


Figure 7.1

2. Once the gin pole is straight up in the air and the 22.5m support cable has some tension, remove the gin pole bracket.



Figure 7.2

3. Attach the bottom of the turnbuckles on the lateral cables to the baseplate. (see Figure 7.3).

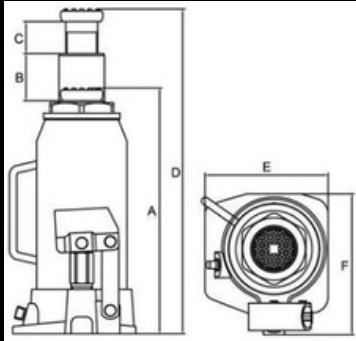


Figure 7.3

4. Tighten the turnbuckles until there is tension on the lateral cables. There is no specific tension required, but make sure they are tight.

## Tower Raising Instructions

1. Place two jacks just beneath where the baseplate should land. We recommend a capacity of 10T for each jack. (Figure 8.1)



A	B	C	D	ExF
230mm	150mm	80mm	457mm	110x123mm

Minimum Height (mm)	Lifting Height (mm)	Adjusting Height (mm)	N.W./G.W. (kg)	Package Size (mm)
230 (9-1/16")	150 (5-15/16")	80 (3-1/8")	6.6/6.9	265x290x280

2. Slowly and steadily drive the pulling truck further from the tower. This will begin to raise the pole. (Figures 8.3 and 8.4)



Figure 8.1



Figure 8.2



Figure 8.3



Figure 8.4

## Tower Raising Instructions (continued)

3. As the tower reaches its overturning moment, it will begin to fall. The fall will be caught by the two jacks that that were placed beneath the baseplate.
4. Once the tower is resting on the jacks, slowly loosen the jacks to lower the tower on to the leveling nuts (see Figure 10.1)
5. Remove the jacks. (see Figure 10.2)
6. Once the hydraulic jacks are removed, fasten the baseplate down using the nuts. (see Figure 10.3) Tighten the nuts to the recommended torque specifications.
7. To remove the hinge plate, loosen the nuts and pull it away from the foundation. Twist the nuts up to the baseplate so they are level with the other nuts. (Figure 10.3)
8. Remove the gin pole system (see Figure 10.4)

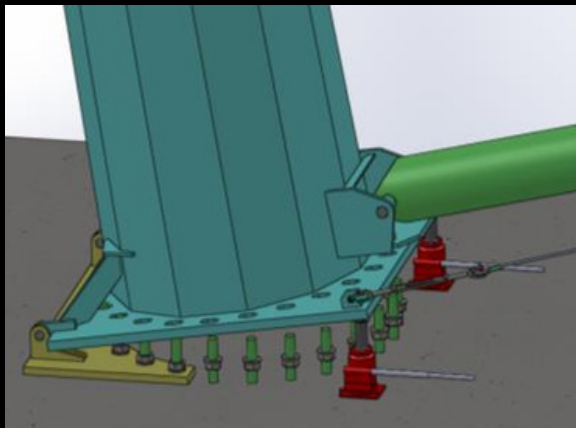


Figure 10.1



Figure 10.2



Figure 10.3

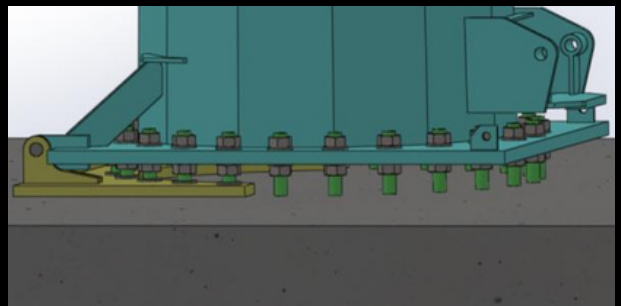


Figure 10.4

## Recommended Bolt Torque

Recommended Bolt Torque for Grade 8.8 Connection Bolts						
Bolt Size (mm)	Width Across Flats (mm)	Net Area (mm <sup>2</sup> )	Yield Stress (Mpa)	Tension Force (N)	Recommended Torque N*m	Pretension Force (N)
10	16	58	640 (8.8)	37120	37 (27 lb.ft.)	18560
12	18	84	641 (8.8)	53952	65 (48 lb.ft.)	26976
16	24	157	642 (8.8)	100480	161 (119 lb.ft.)	50240
20	30	245	643 (8.8)	156672	313 (231 lb.ft.)	78336
24	36	353	644 (8.8)	225600	541 (400 lb.ft.)	112800
27	41	459	645 (8.8)	294016	794 (586 lb.ft.)	147008
30	46	561	646 (8.8)	358784	1076 (795 lb.ft.)	1179392
33	50	694	647 (8.8)	444160	1466 (1083 lb.ft.)	222080
36	55	817	648 (8.8)	522688	1882 (1390 lb.ft.)	261344
42	65	1121	649 (8.8)	717440	3013 (2225 lb.ft.)	358720
48	75	1473	650 (8.8)	942720	4525 (3342 lb.ft.)	471360
56	85	2030	651 (8.8)	1299200	7276 (5373 lb.ft.)	469600
Recommended Bolt Torque for Anchor Bolts						
Bolt Size (mm)	Width Across Flats (mm)	Net Area (mm <sup>2</sup> )	Yield Stress (Mpa)	Tension Force (N)	Recommended Torque (N*m)	Pretension Force (N)
20	30	245	355 (45#)	86904	174 (128 lb.ft.)	43452
24	36	353	356 (45#)	125138	300 (222 lb.ft.)	62569
27	41	459	357 (45#)	163087	440 (325 lb.ft.)	81544
30	46	561	358 (45#)	199013	597 (441 lb.ft.)	99507
33	50	694	380 (GR55)	263720	870 (643 lb.ft.)	131860
36	55	817	358 (45#)	289929	1044 (777 lb.ft.)	144964
42	65	1121	359 (45#)	397955	1671 (1234 lb.ft.)	198978
48	75	1473	360 (45#)	522915	2510 (1854 lb.ft.)	261458
56	85	2030	361 (45#)	720650	4036 (2981 lb.ft.)	360325

### Notes:

1. In our experience, we would prefer to apply 50% of maximum tension of the bolt as pretension force.

2. Pretension Torque:  $T_c = k \cdot D \cdot P_c$

$K=0.2$  (According to the Machine Design Handbook)

$D$  -Bolt Diameter

$P_c$  -Pretension force