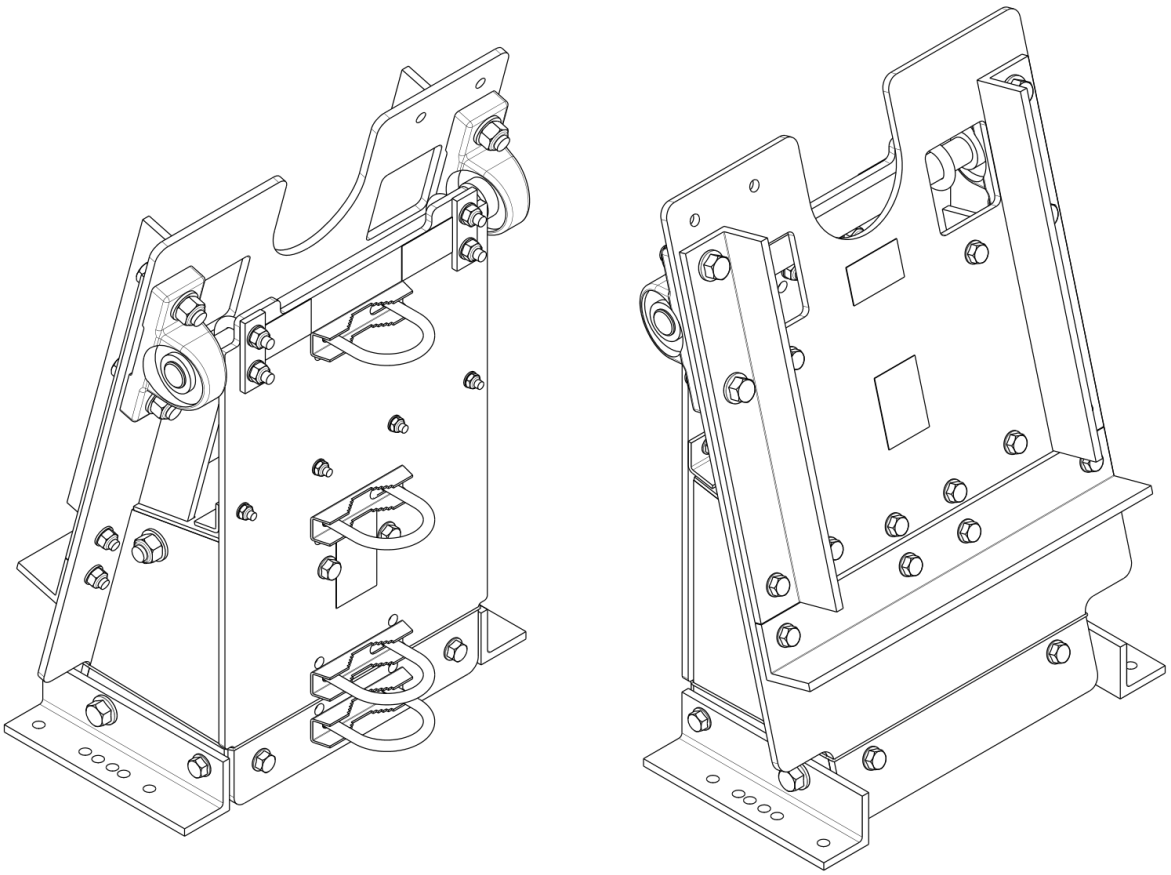
TowerMate® TILT-OVER DEVICE

INSTRUCTION MANUAL AND SAFETY INSTRUCTIONS

! READ BEFORE FITTING TO YOUR INSTALLATION !

! READ BEFORE BREAKING THE COPPER-WIRE SAFETY TIE !



08/01/17 Issue 1

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Introduction:

Thank you for purchasing your new Tilt-Over device from TowerMate®.

We have developed this product to provide you with a strong and reliable method of attaching an antenna to your Tilt-Over tower so that the antenna can remain horizontal during the raising and lowering of your tower.

This functionality means that you do not need to dismantle your antenna in order to lower your tower, there is no need to enlist the help of friends and family to service your installation and balancing on ladders will be a thing of the past!

Your TowerMate® Tilt-Over device is designed to automatically lock when the tower is raised to the vertical position.

Your TowerMate® Tilt-Over device is designed to automatically unlock as you begin to lower the tower.

Please take some time to read this manual and to familiarise yourself with the functionality of your new Tilt-Over device before installing it.

For safety reasons please DO NOT cut the copper wire safety tie which is fitted to your TowerMate® Tilt-Over device until you have fitted the device to your stub mast.

Important Safety Instructions:

1. Any installation above ground is potentially lethal, NEVER allow anyone to stand underneath whilst you are raising or lowering your tower.
2. Remember YOU are solely responsible for any outcome whilst raising, lowering and operating your antenna installation.
3. Check that all parts of your installation are in good condition, correctly assembled and will not be over-loaded. If you are unsure, STOP and get advice from the relevant equipment supplier.
4. TowerMate® is designed to make raising and lowering your installation as convenient and safe as possible, but it too must be correctly assembled, in good condition and must not be over-loaded, if you are unsure STOP, and get advice from www.towermate.co.uk
5. Always keep your hands clear of the TowerMate® main hinge.
6. Check that the U-bolt fasteners are correctly tightened (23Nm). DO NOT OVER-TIGHTEN FASTENERS as this is likely to damage your TowerMate® unit and could cause the U-bolts to fail under high loads. You must include washers and use only nylock nuts for attaching your antenna to the Towermate® unit
7. Make sure that your luffing mechanism is capable of safely raising the total mass of your antenna plus the additional 14.5kg for each TowerMate® Tilt-Over Device.
8. Do not attempt to raise or lower your installation in high winds.
9. Make sure that your stub-mast is in good condition and it is as short as possible, especially when stacking using TowerMate®.
10. Although TowerMate® is designed to withstand high wind loading, it is recommended that you lower your tower when not in use to eliminate the risk of damaging your equipment. This precaution is to protect your valuable investment in antennas that might be damaged by high winds when raised.
11. Although TowerMate® is designed to withstand high wind loading, YOU must make sure that the rest of your equipment is strong enough for your installation, if you are unsure STOP, and get advice from the relevant equipment supplier.

Thank you for reading these safety points, we hope you enjoy using your TowerMate® tilt-over device. For additional technical support please visit us at www.towermate.co.uk

Unit layout and description of major features:

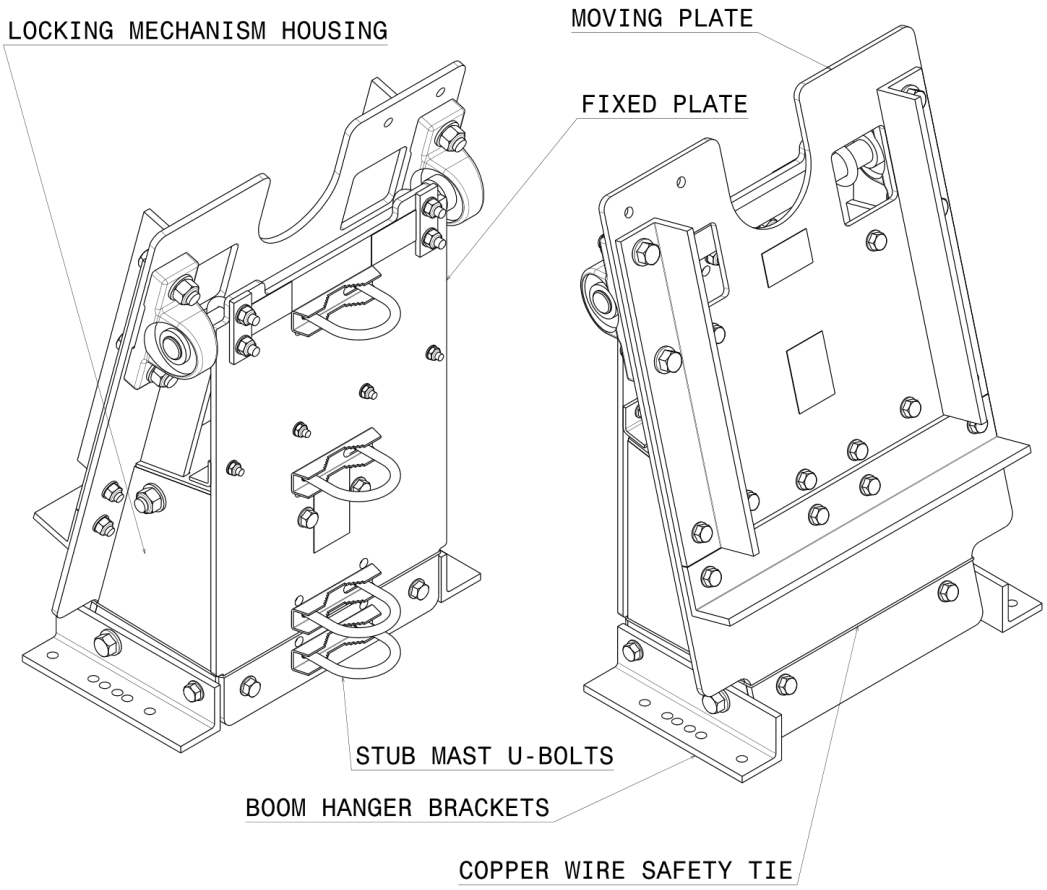

Fig. 1 Showing the standard Towermate® unit as it is shipped.

U-bolts are fitted for a 2” diameter stub mast.

Holes are also provided to suit a 60-65mm diameter stub mast (2 ½” diameter) should your installation require a stronger stub mast.

The additional U-bolt holes are plugged so that rain and dirt are kept out of the locking mechanism housing. These plugs are easily popped out and placed into the redundant holes if you need to use a larger stub mast.

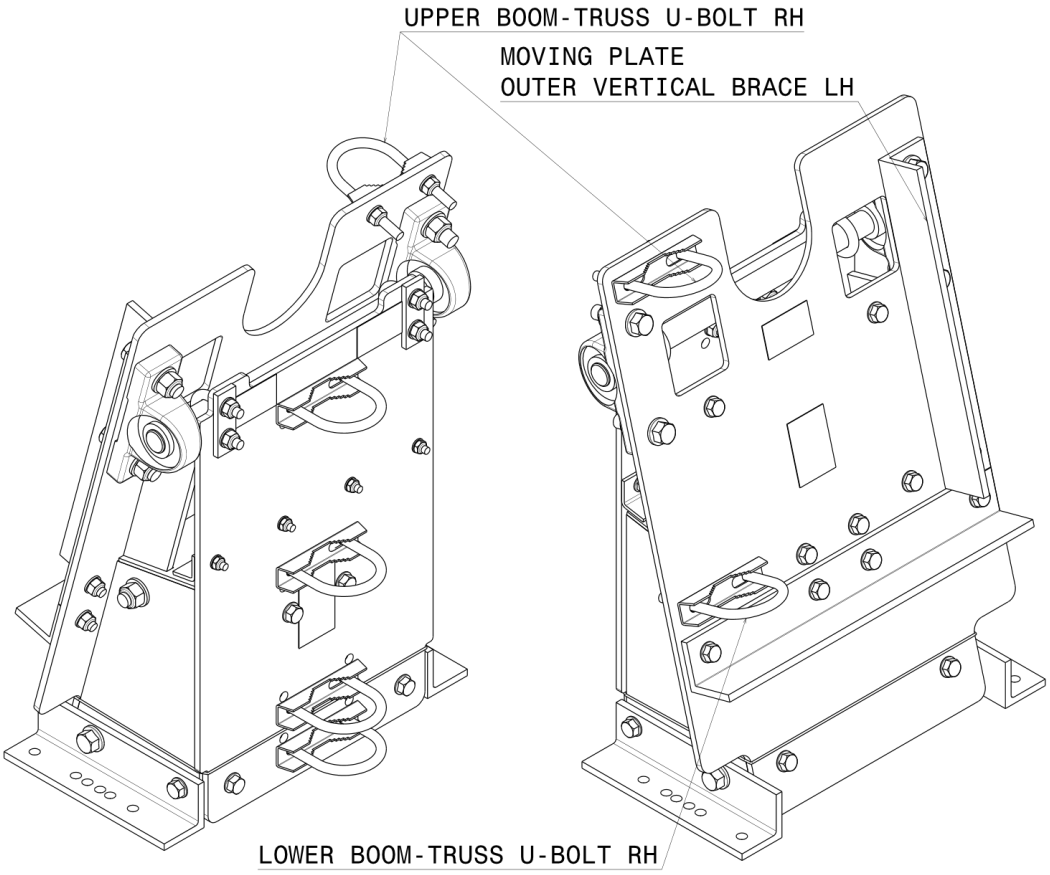

Fig. 2 Showing the Towermate® Tilt-Over device configured for a Right Hand 2" diameter boom truss tube for larger antenna installations

The unit shown in **Fig. 2** is built for a right-hand truss tube but if you require the truss tube fittings on the left-hand side please just let us know when you place your order and we will build it accordingly.

We will ship your unit with the correct fasteners and the appropriate OUTER VERTICAL BRACE packaged in the box in case you decide to convert your unit back to the standard configuration.

The boom truss tube provides strength and stiffness to the moving plate in the absence of the OUTER VERTICAL BRACE. IT IS ESSENTIAL THAT A SUITABLE BOOM TRUSS TUBE BE FITTED TO YOUR UNIT IF IT IS CONFIGURED WITH THE OUTER VERTICAL BRACE REMOVED.

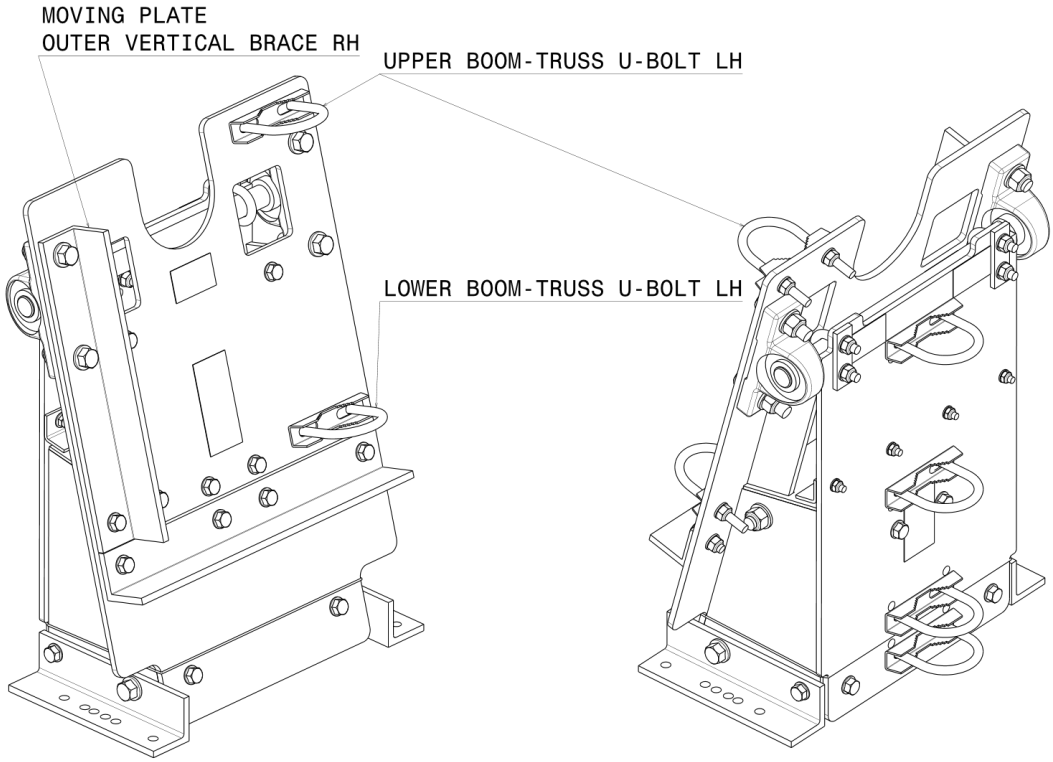

Fig. 3 Showing the Towermate® Tilt-Over device configured for a Left Hand 2" diameter boom truss tube for larger antenna installations

Installation of a Standard TowerMate® unit to your stub mast:

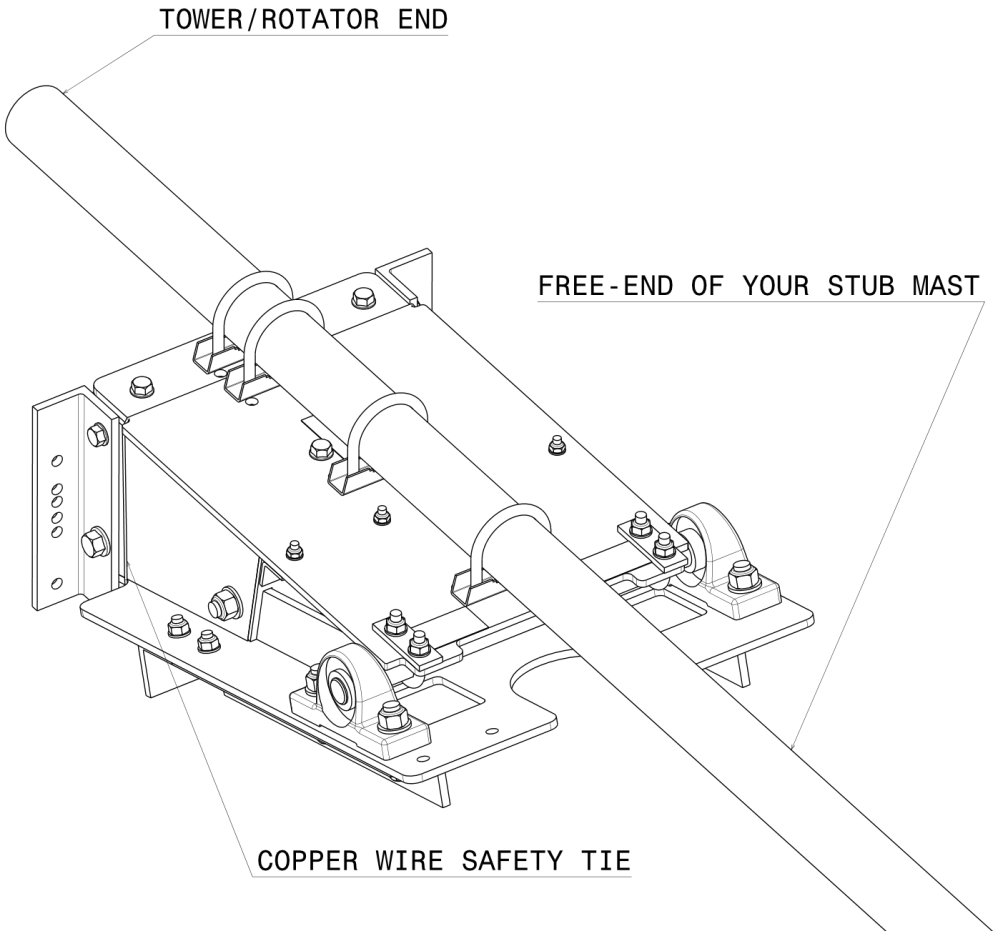

Fig. 4 Showing the standard Towermate® Tilt-Over device fitted to your stub mast

The first stage of installing your TowerMate® Tilt-Over device is to lift it into position on your lowered (horizontal) stub mast as shown in **Fig. 4** and **Fig. 5**. The unit weighs approximately 14.5kg, which is safe for a single person lift, however if you feel that you cannot lift it safely on your own then please ask someone to assist you.

Carefully lift each of the four U-bolts in turn as you slide the unit onto your stub mast (take care not to pinch your fingers).

The U-bolts will still be loose at this stage.

The TowerMate® unit should be sufficiently stable on your horizontal stub mast to allow the copper wire safety tie to be cut. Use some side cutters to cut the copper wire whilst at the same time taking the weight of the moving plate from underneath to control the swing of the moving plate when the wire is cut.

Safely dispose of the safety wire.

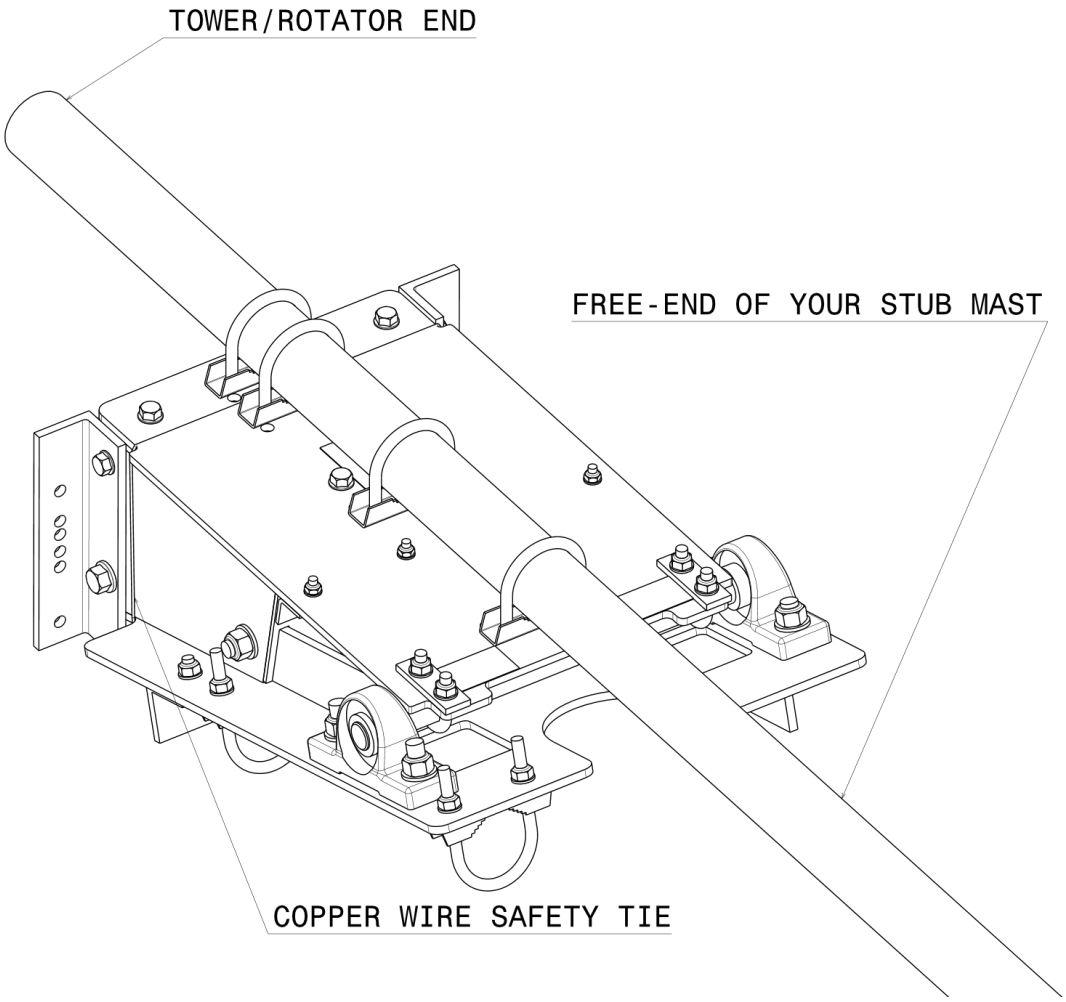

Fig. 5 Showing the Towermate® Tilt-Over device (configured for the boom truss tube) fitted to your stub mast

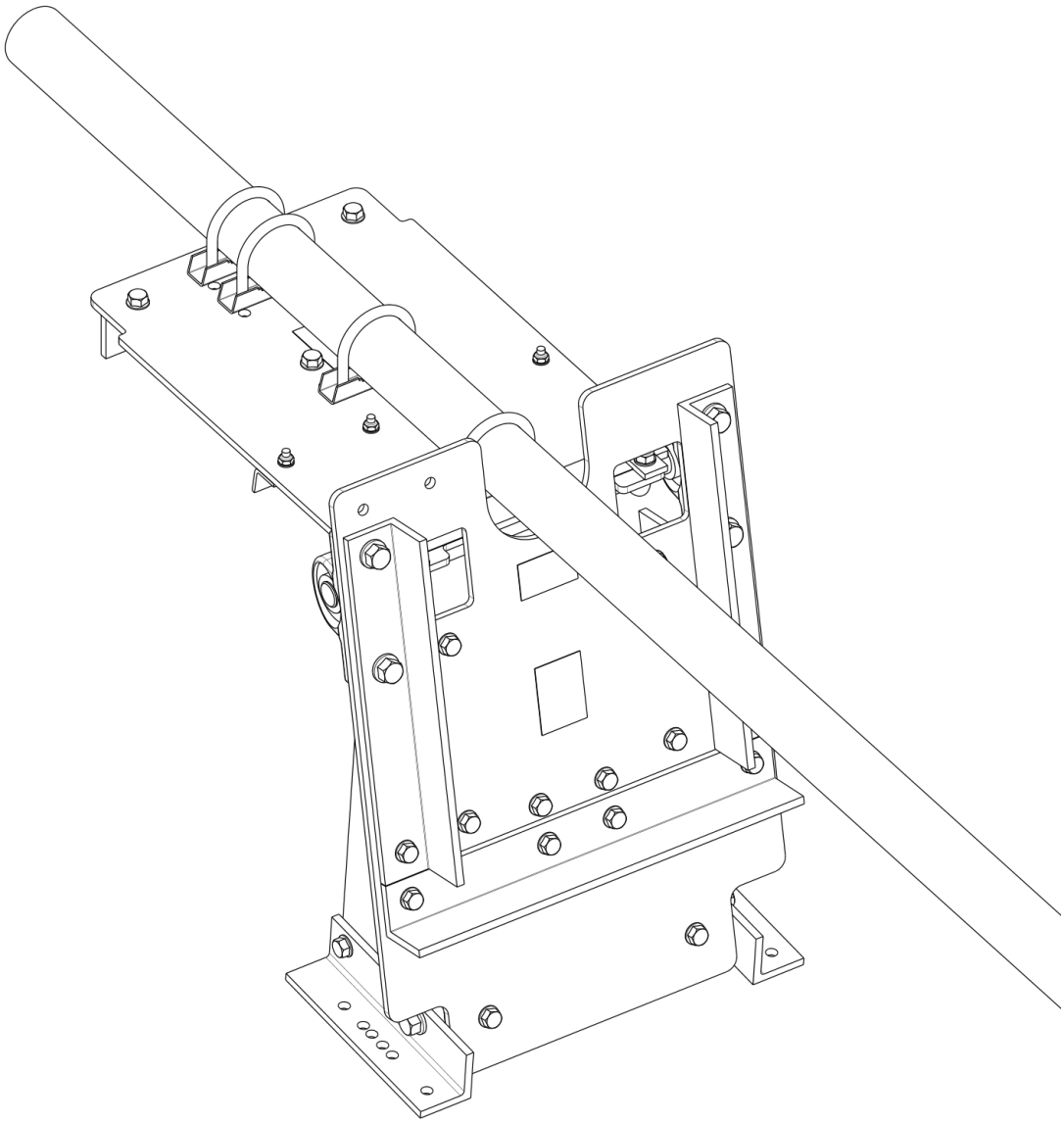

Fig. 6 Showing the standard Towermate® unit opened after cutting the copper wire.

With the unit opened as shown if **Figs. 6-8** it is possible to access the M8 Nylock nuts which will now require tightening to the correct torque to secure the unit to your stub mast, and the boom truss tube to the unit (if fitted). Please refer to **Fig. 9**.

Installation of a TowerMate® unit configured for a boom truss to your stub mast

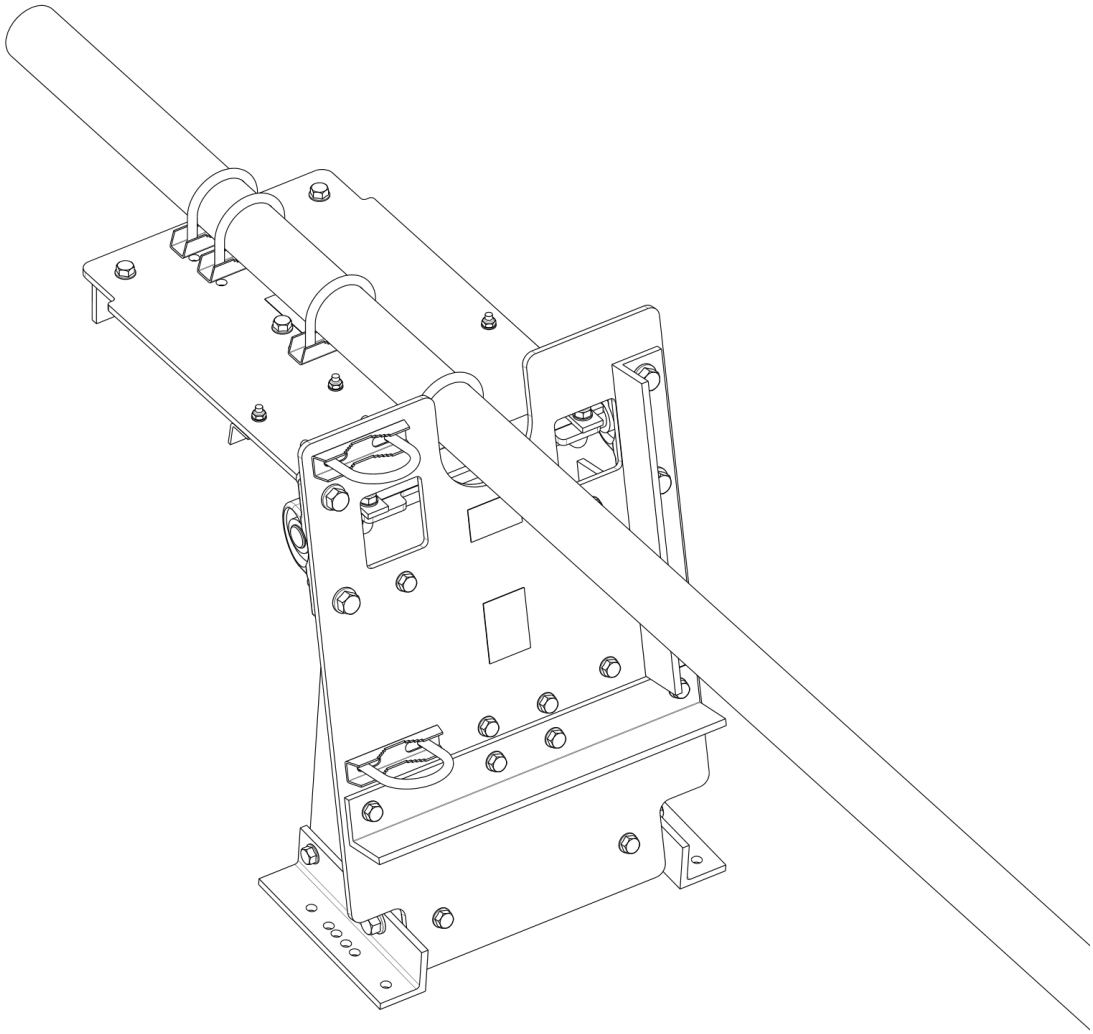

Fig. 7 Showing the Towermate® Tilt-Over device (configured for a RH boom truss tube) opened after cutting the copper wire

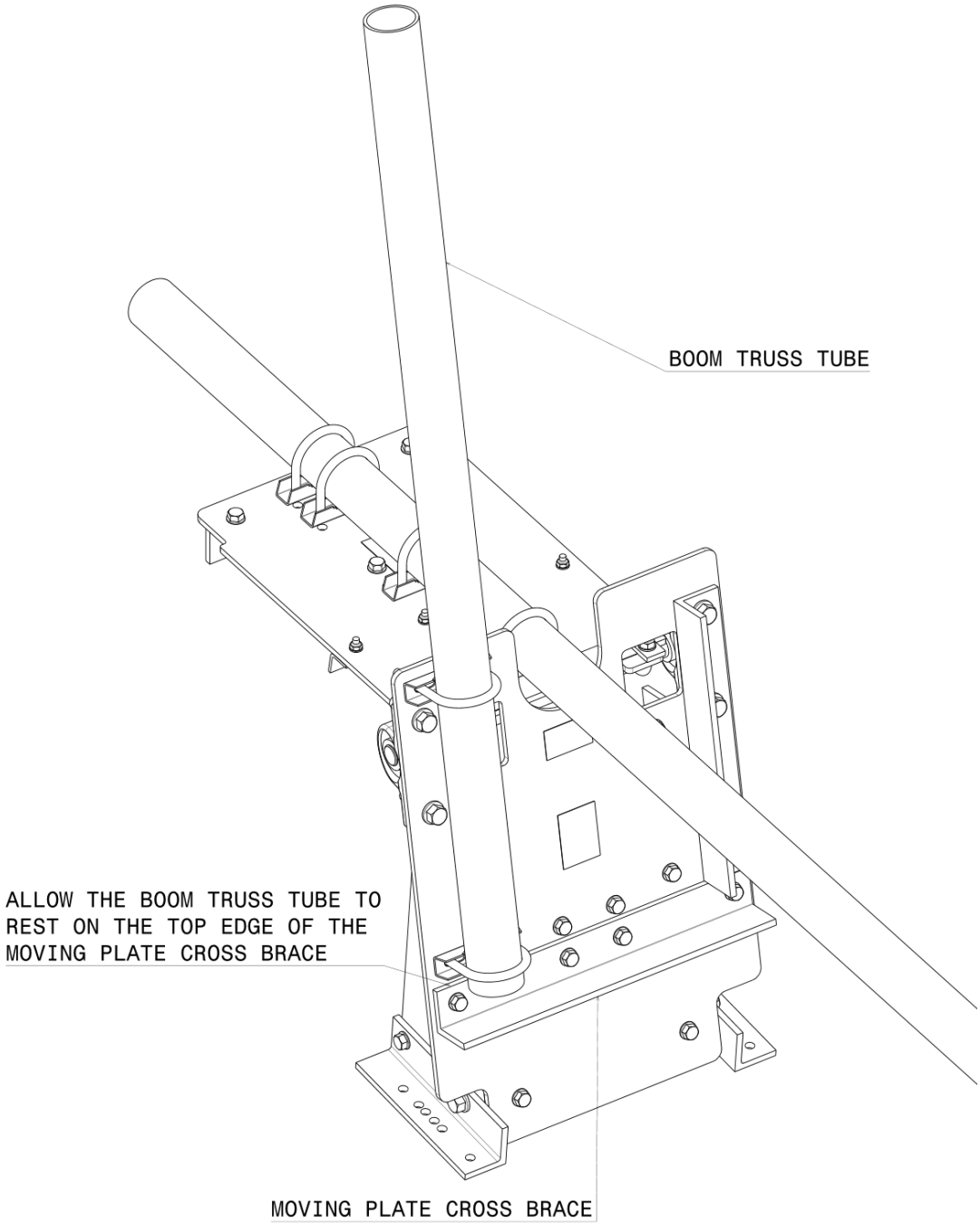

Fig. 8 Showing a 2" diameter boom truss is fitted to the Towermate® U-bolts

We recommend that you use an aluminium boom truss tube to both minimise mass and to avoid raising the centre of mass of the moving assembly. It is also important that the boom truss tube is at least 1000mm long (to clear the stub mast) but conversely no longer than necessary for your installation (please refer to your antenna instructions). This also ensures that the centre of mass of the moving assembly is kept as low as possible.

We have designed the boom truss to be at 15-degrees to the vertical so that the top of the boom truss is always on the correct side of the stub mast (Ref. **Fig. 16**). This ensures that there can be no clashes between the boom truss cables and the stub mast when the mast is lowered or raised.

The 15-degree inclination of the boom truss tube to vertical once installed will have minimal influence on the lateral deflection of your boom. We have calculated this to be typically around 1% of the boom half-span in lateral deflection for each boom half-span. So, for a 6.4m half-span we would expect around 64mm of lateral deflection. This will not affect the accurate operation of your antenna and is a key enabler for the convenient operation of the TowerMate® Tilt-Over device for larger antenna installations requiring truss support.

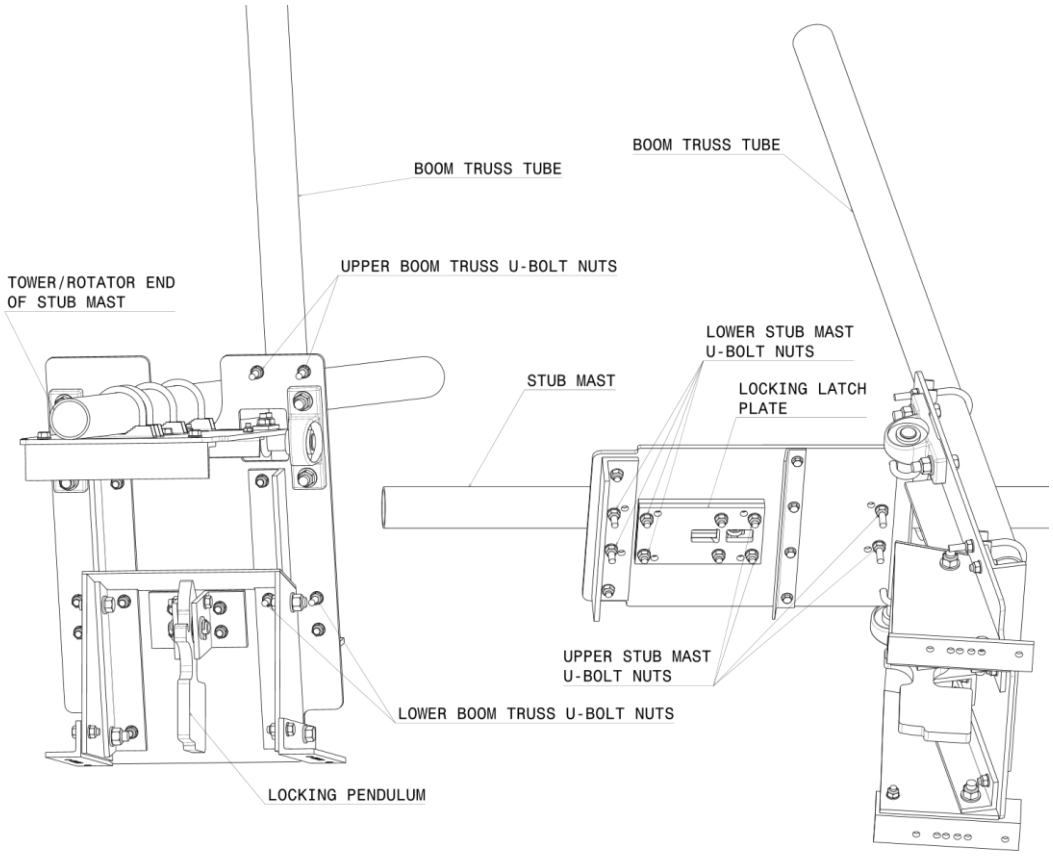

Fig. 9 Showing the four M8 boom truss U-bolt nuts and the eight stub mast U-bolt nuts which now require torque tightening to 23Nm

The unit is now loosely fitted to the stub mast and the boom truss tube is fitted (please refer to **Fig. 8** to set the bottom of the boom truss tube onto the tope edge of the MOVING PLATE CROSS-BRACE).

Proceed to torque tighten the U-bolt fasteners to 23Nm. Take care to tighten the U-bolt nuts evenly and once the clearance is taken up then use a torque wrench to achieve the correct tightening torque.

We always fit Nylock nuts to our U-bolts so there is no risk of the fasteners working loose over time.

DO NOT OVER-TIGHTEN THE FASTENERS, FAILURE TO DO SO IS LIKELY TO DAMAGE YOUR TOWERMATE UNIT AND MAY CAUSE FAILURE OF THE U-BOLT UNDER MAXIMUM LOADING.

We recommend that you use a permanent marker pen or a paint pen to mark the nuts once you are satisfied that they are correctly torque tightened.

Once you are satisfied that all the M8 Nylock nuts are correctly torque tightened you can proceed to mounting your antenna boom to the boom hanger brackets.

Fitting your antenna boom to the TowerMate® unit

Your TowerMate® has boom hanger brackets which are pre-drilled for several common boom dimensions as shown in **Fig. 10** below.

Please note that the hole which is closest to the moving plate should always be used to attach your boom. This is important as it ensures that the centre of mass of the moving assembly is as far away from the fixed plate as possible. This ensures that the locking/unlocking function of your TowerMate® unit will work reliably.

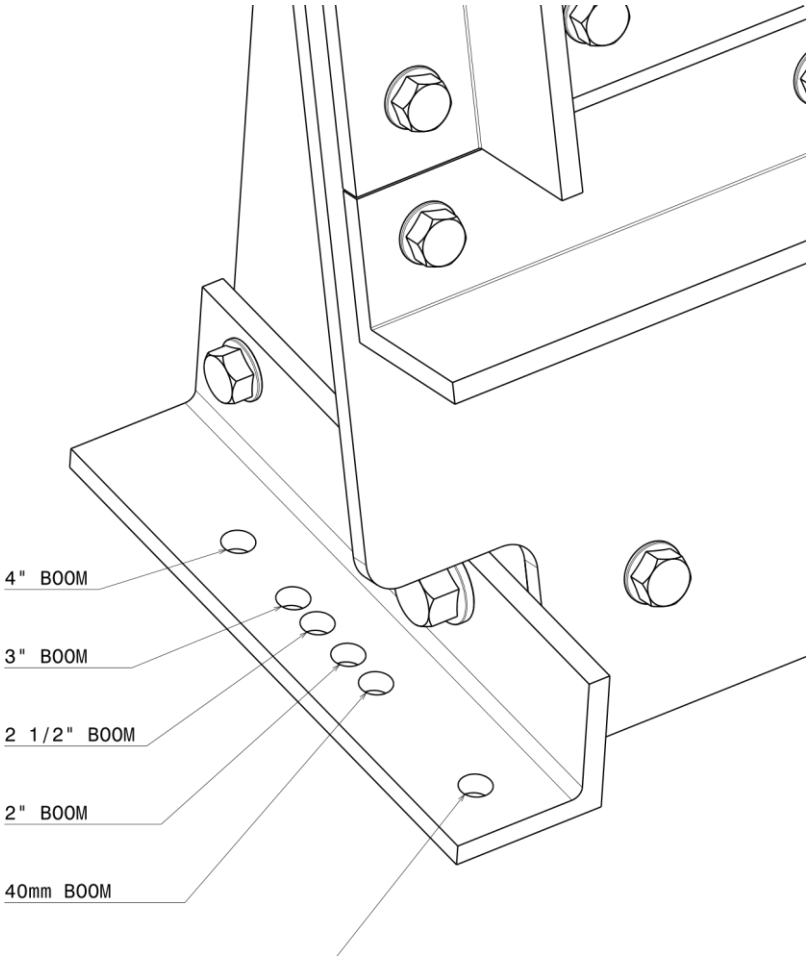

Fig. 10 Showing the pre-drilled boom hanger brackets on the TowerMate® Unit

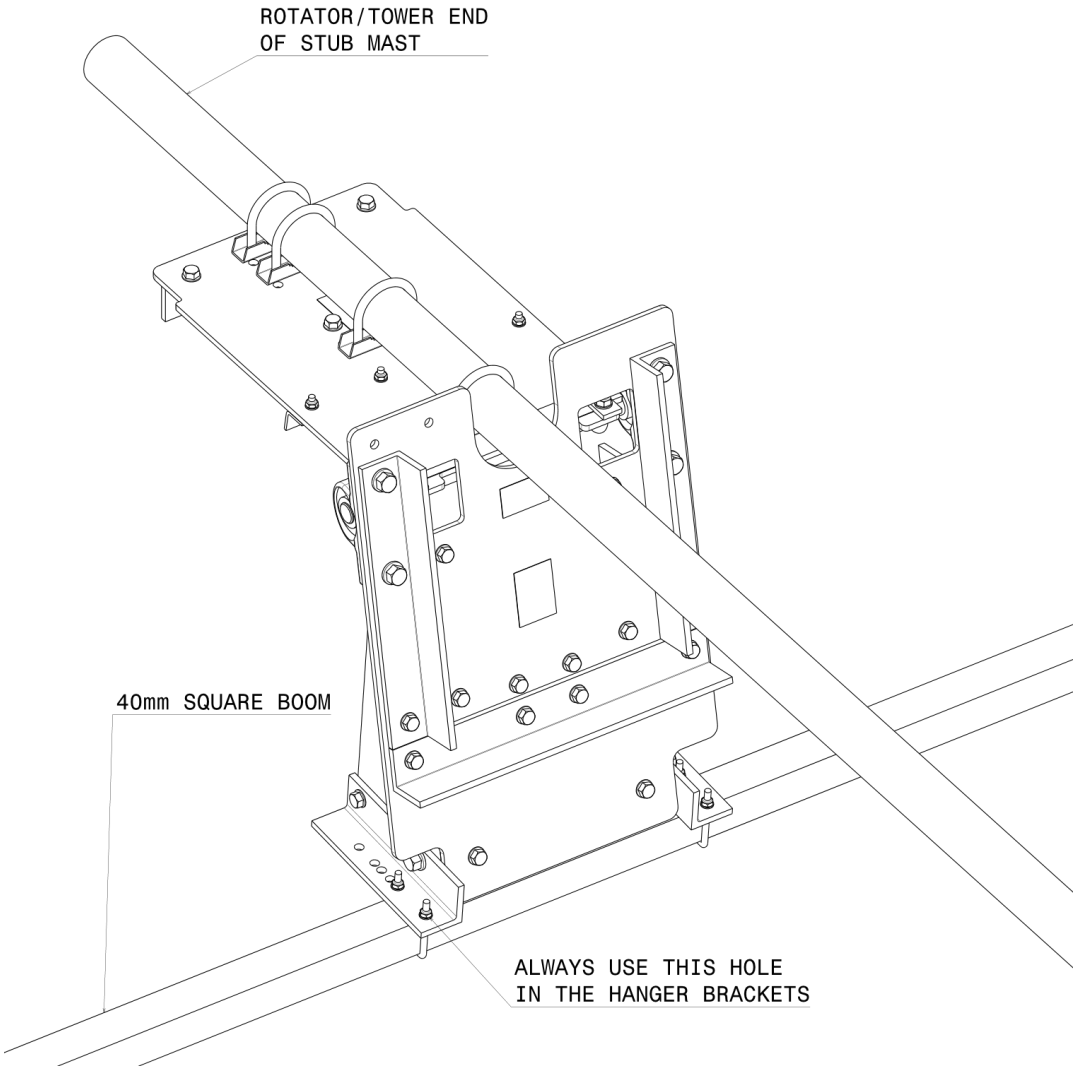

Fig. 11 Showing a 40mm square boom (Optibeam) fitted to the boom hanger plates on the standard TowerMate® unit.

The hanger plates are pre-drilled for this option (the holes are 9mm diameter but it is ok to use the standard M6 Optibeam fittings with some additional M8 washers under the standard M6 washers to spread the load into the HANGER BRACKETS).

We recommend using Nylock nuts on your boom U-bolts, torque tighten the nuts to the torque settings defined in your antenna instructions.

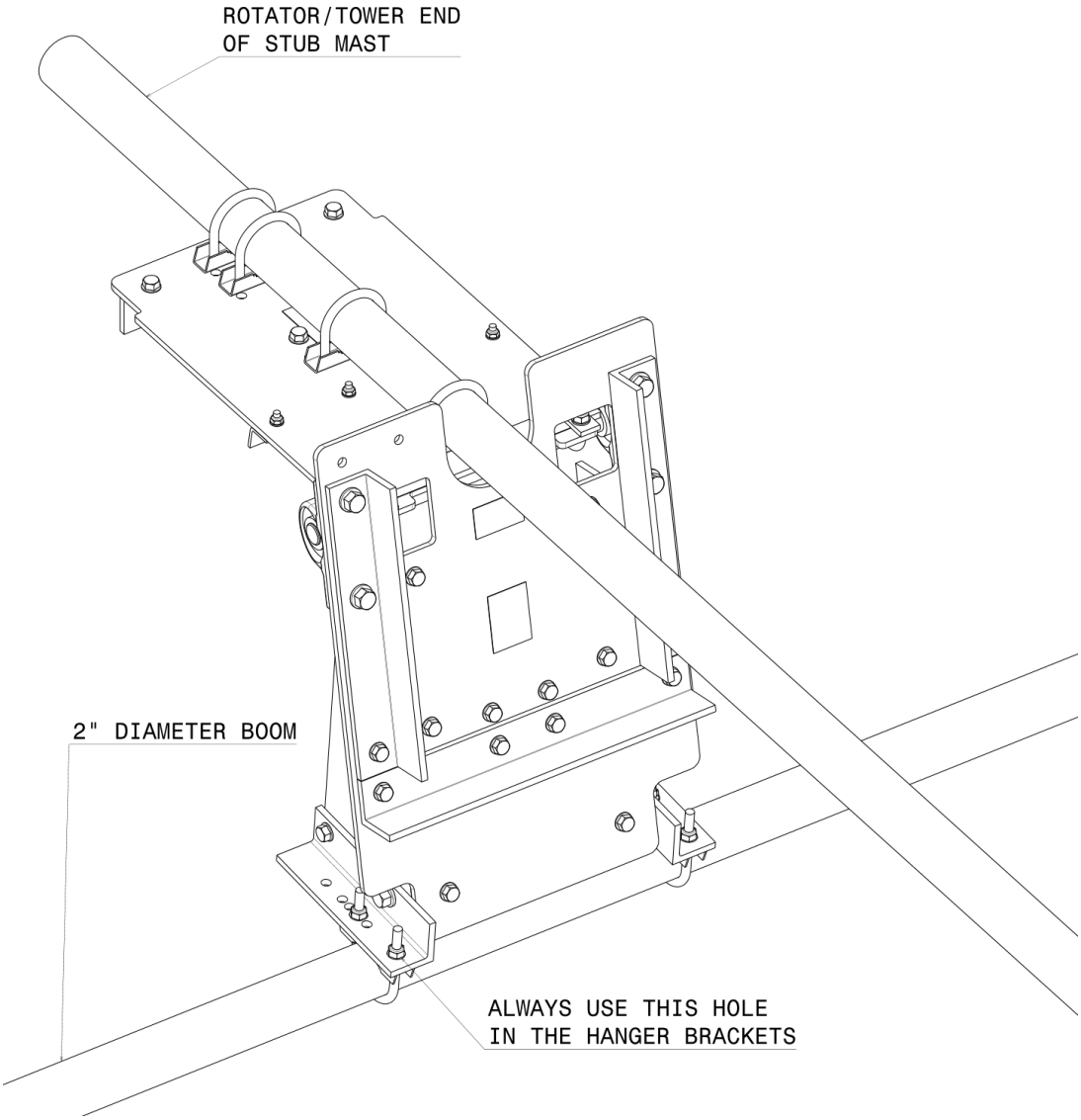

Fig. 12 Showing a 2” diameter boom fitted to the boom hanger plates on the standard TowerMate® unit.

The hanger plates are pre-drilled for this option with 9mm holes which are ideal for an M8 2” diameter U-bolt and saddle.

We recommend using Nylock nuts on your boom U-bolts, torque tighten the nuts to the torque settings defined in your antenna instructions.

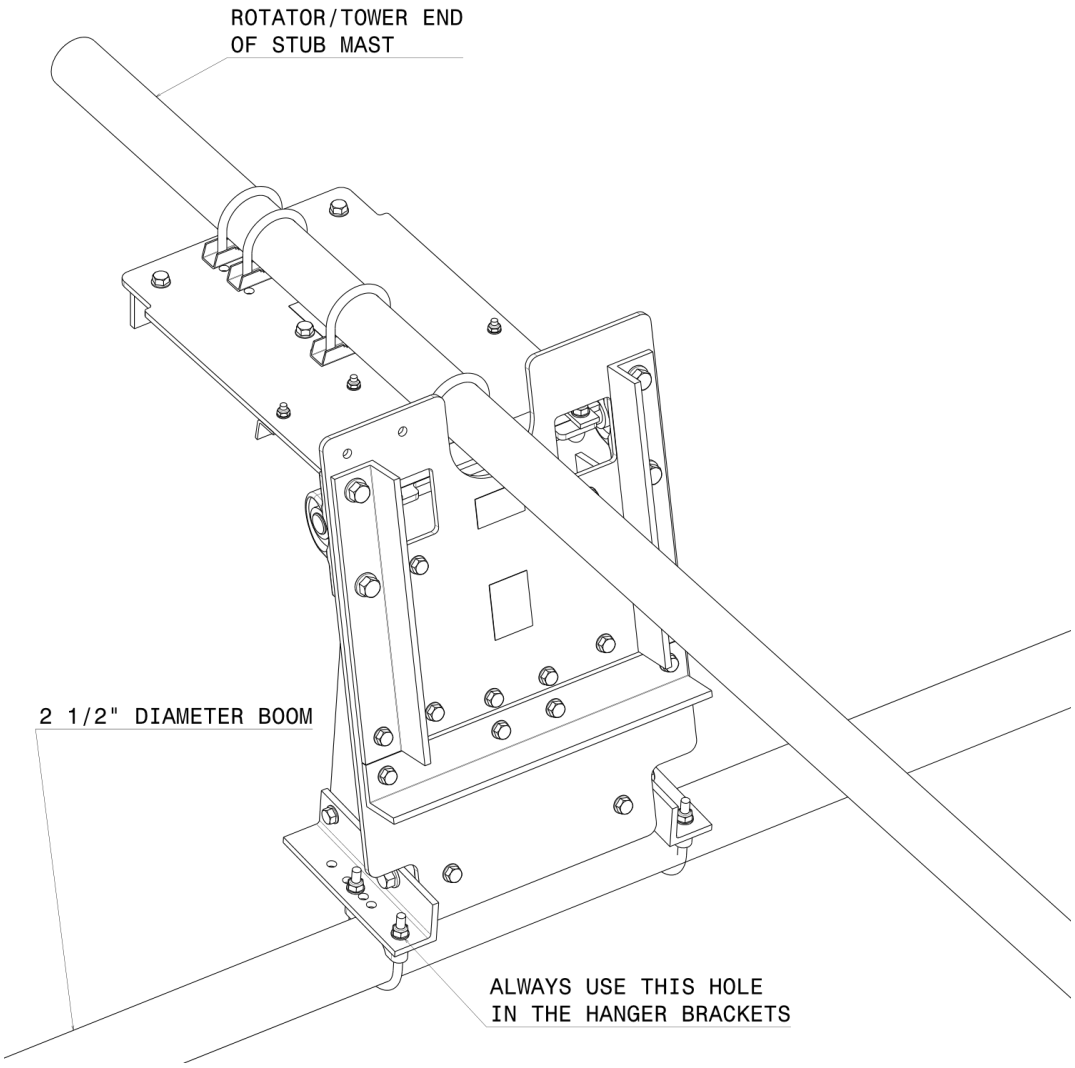

Fig.13 Showing a 2.5” diameter boom fitted to the boom hanger plates on the standard TowerMate® unit.

The hanger plates are pre-drilled for this option with 9mm holes which are ideal for an M8 2 ½” diameter U-bolt and saddle.

We recommend using Nylock nuts on your boom U-bolts, torque tighten the nuts to the torque settings defined in your antenna instructions.

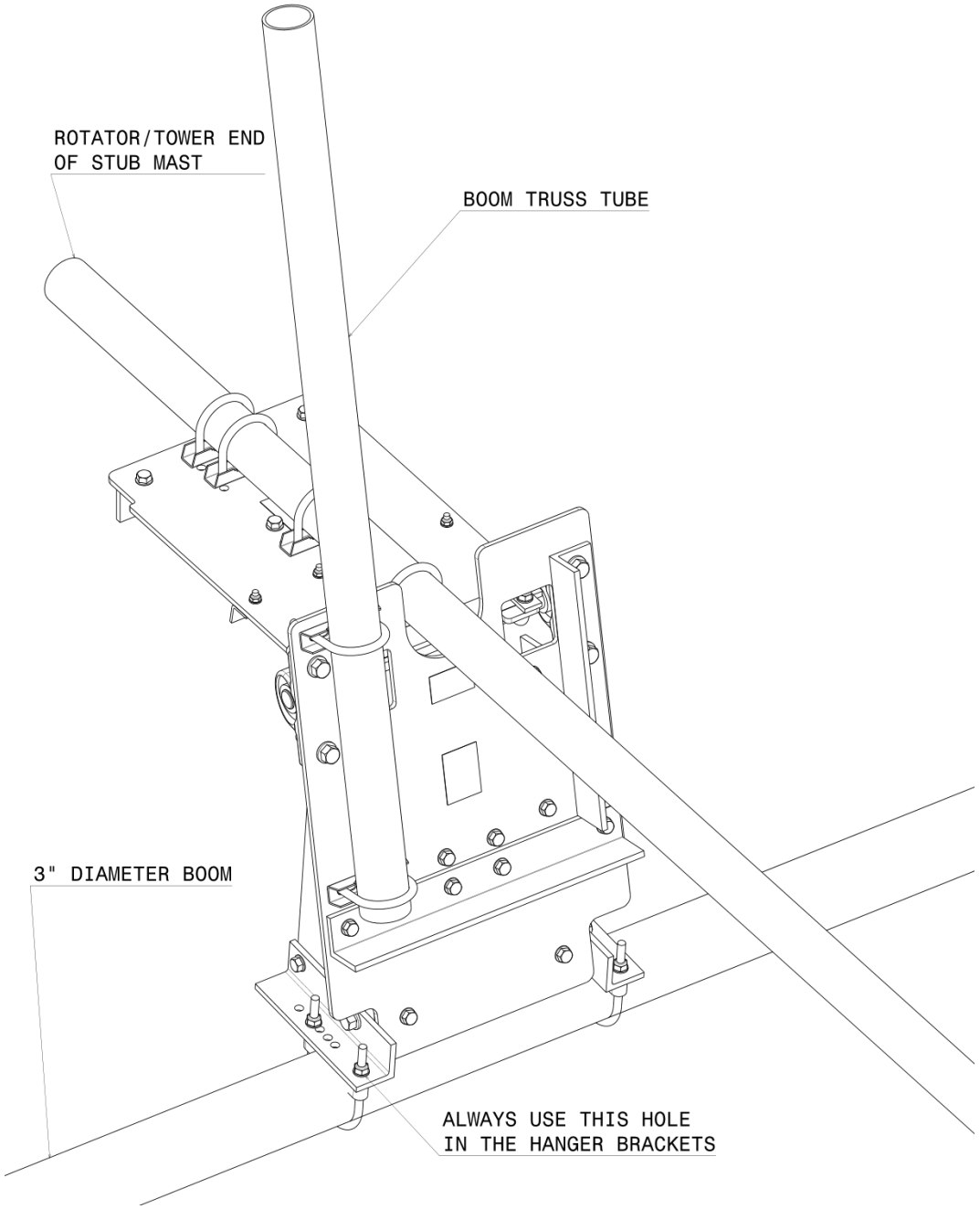

Fig. 14 Showing a 3” diameter boom fitted to the boom hanger plates on a TowerMate® unit configured with a LH boom truss tube.

The hanger plates are pre-drilled for this option with 9mm holes which are ideal for an M8 3” diameter U-bolt and saddle.

We recommend using Nylock nuts on your boom U-bolts, torque tighten the nuts to the torque settings defined in your antenna instructions.

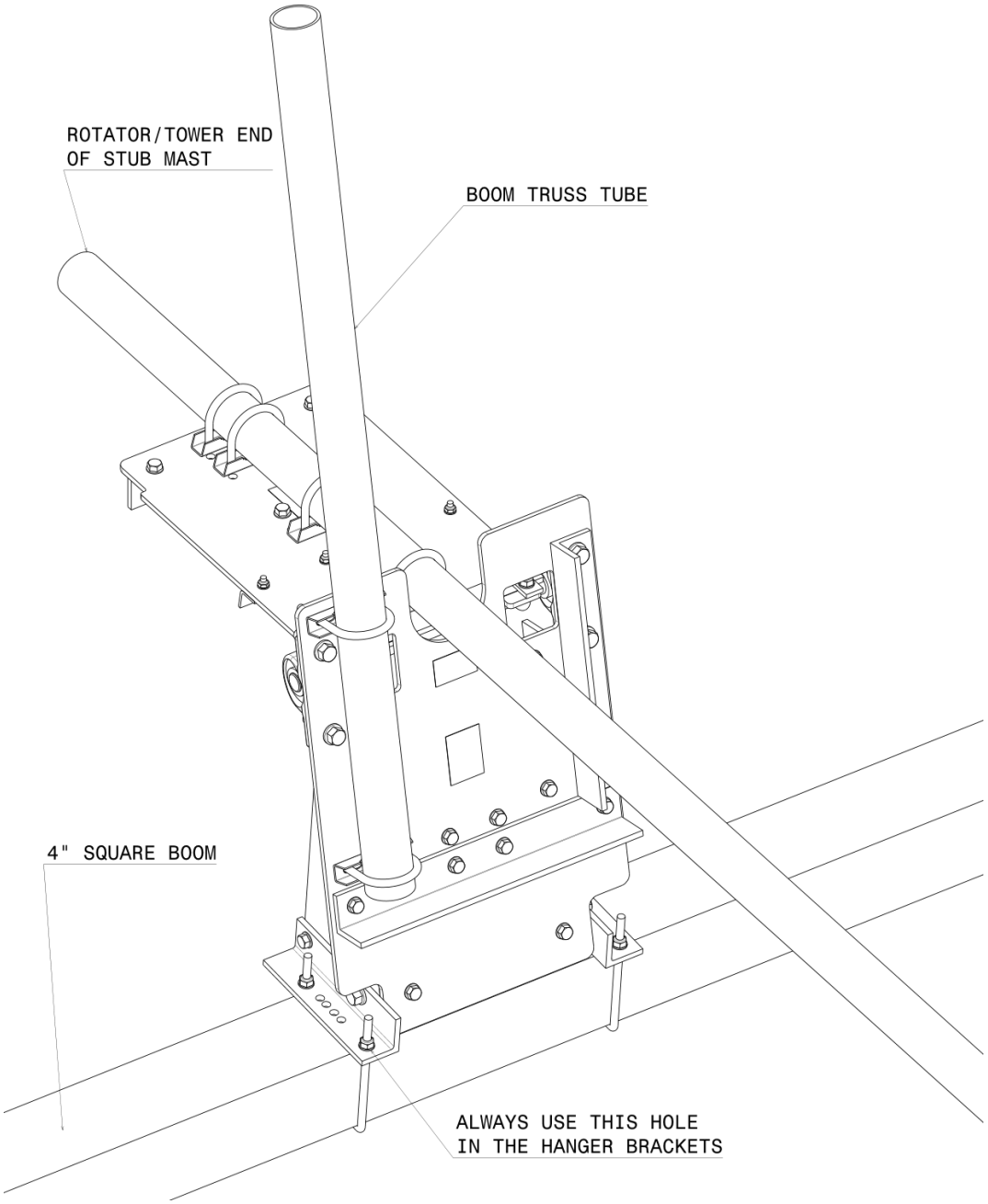

Fig. 15 Showing a 4” square boom (Optibeam) fitted to the boom hanger plates on a TowerMate® unit configured with a LH boom truss tube.

The hanger plates are pre-drilled for this option with 9mm holes which are ideal for an M8 4” diameter U-bolt and saddle.

We recommend using Nylock nuts on your boom U-bolts, torque tighten the nuts to the torque settings defined in your antenna instructions.

Stacking multiple TowerMate® units on a common stub mast

Your TowerMate® unit is designed to be stacked so that, if required, additional units can be fitted to a common stub mast as shown in **Figs. 16-17**.

Depending on which antennas you wish to stack there will be an ideal vertical separation distance between the two antennas.

When stacking, it is ESSENTIAL that adequate stress calculations are performed to make sure that your installation will be safe under maximum wind loading. If you are unsure how to perform these calculations, please visit us at www.towermate.co.uk where we have free resources and guidelines available for you to check your installation. If you are still not confident to do the calculations yourself, please email us via www.towermate.co.uk with your requirements and we can do the calculations for you.

The maximum allowable height of two TowerMate® units with your chosen antennas may not achieve your ideal vertical separation without overloading a standard 2" diameter stub mast.

We have provided additional holes in the fixed plate assembly to allow a 60-65mm diameter stub mast to be fitted for stacking. This larger diameter stub mast can carry significantly more load than the standard 2" diameter but again it is possible to overload the larger mast diameter if you set the antennas too high.

At TowerMate® we strongly recommend the use of mild steel stub masts rather than aluminium or other materials such as titanium. The reason for this is that mild steel is a very ductile material and if it is over-loaded, it will deform but it is VERY unlikely to fracture. This 'soft' failure mode makes it the safest option over other higher strength but relatively 'brittle' materials.

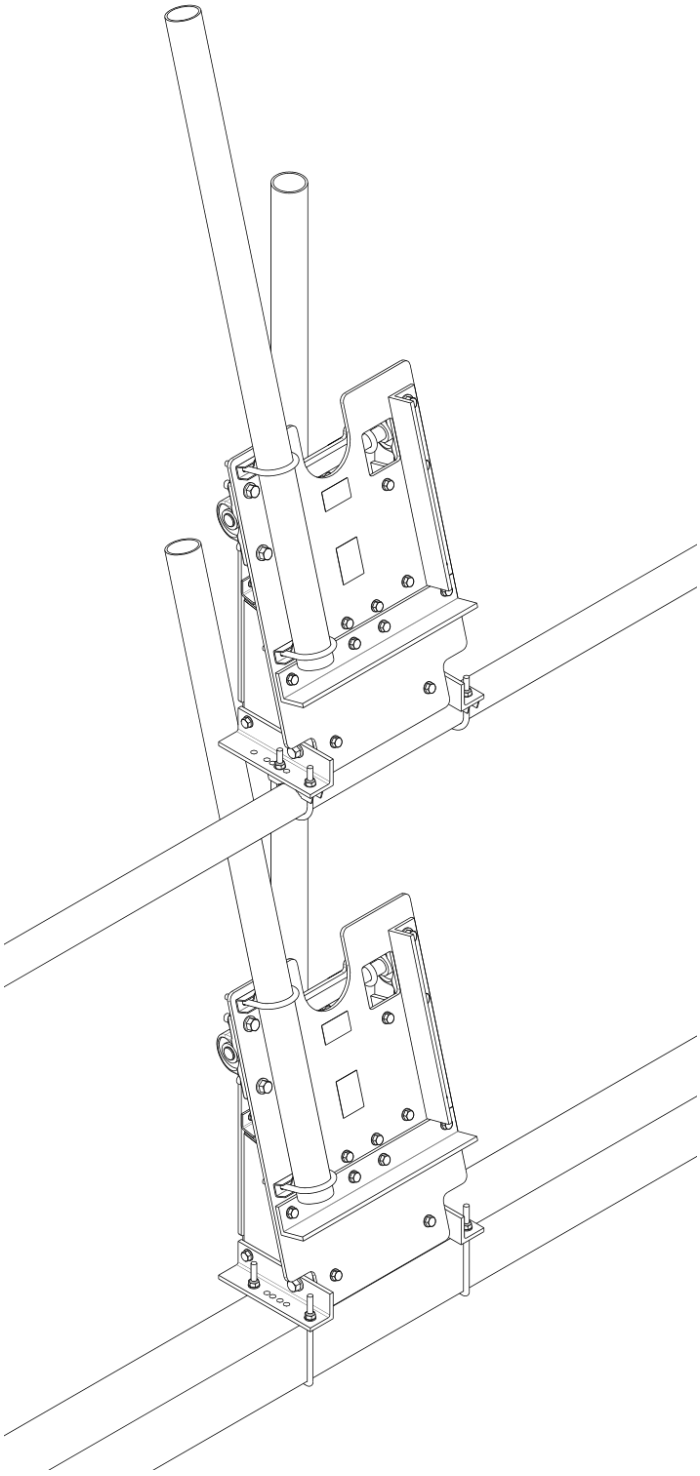

Fig. 16 Showing two TowerMate® units both configured with LH boom truss tubes in a typical stacking arrangement.

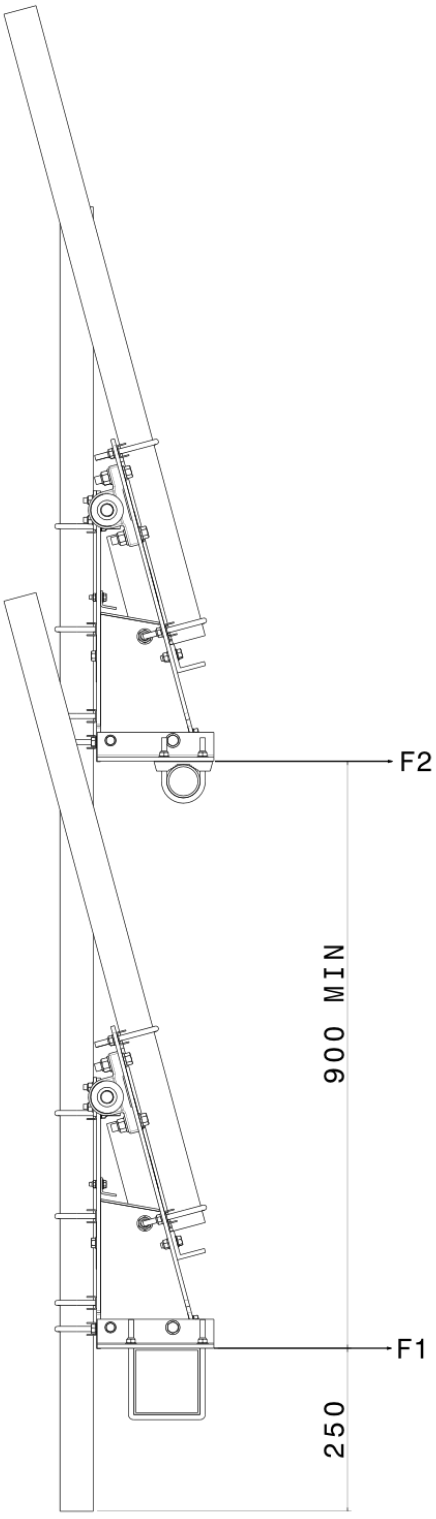

Fig. 17 Showing two TowerMate® units from the right side both configured with boom truss tubes in a typical stacking arrangement.

Note that the boom truss tubes must extend beyond the stub mast tube otherwise it will not be possible for the Towermate units to open when the mast is lowered. To achieve this the boom truss tubes must be at least 1000mm long but should be minimised in length beyond this (please consult the instructions for your antenna).

The upper Towermate unit in a stacked arrangement must be at least 900mm above the lower unit as shown on the image above. It is recommended that the lower unit be fitted as close as possible to the rotator in your installation. Here we show 250mm between the top of the rotator and the base of the lower Towermate unit.

From **Fig. 16** there are two loads defined (F1 and F2) one for each of the antennas to be mounted to the stub mast.

To calculate if the stub mast will be safe with your chosen antennas stacked together you need to calculate the maximum BENDING MOMENT applied to the base of the stub mast from the antennas under maximum allowable wind loading. This is easier to do than it sounds, first you need the values of F1 and F2 for your antennas which will be provided in the instructions for your antennas under the maximum allowable wind loading.

We strongly recommend that the largest of the two antennas be located at the bottom of the stack and as low as possible to clear your rotator.

Then you need to identify the ideal vertical separation for your two antennas.

The maximum bending moment is then calculated by multiplying the distance of each antenna above the rotator (in metres) by the maximum wind force (in Newtons) and adding them together.

For example, from **Fig. 16** if F1=1500N and F2=800N we calculate the maximum bending moment at the base of the stub mast as follows:

M(max)=(1500x0.25) [Nm]+ (800x1.15) [Nm]

M(max)=1295Nm

Then check to see that the maximum bending moment is less than the values provided in the **Table 1** below.

If your calculated maximum bending moment is larger than the values provided in **Table 1** for your selected stub mast dimensions, then it is NOT safe and you will need to adjust either the heights of the antennas or choose a stronger stub mast design.

You will see that there are several different wall thicknesses for each stub mast diameter.

Max allowable bending moment (Nm)		wall thickness (mm)		
		3	4	5
Outer Diameter (mm)	48.3	3425	4289	5029
	60.3	5544	7030	8349

Table 1 **Maximum allowable bending moment (Nm) that can be applied to the base of typical stub mast diameters for various wall thicknesses (235MPa mild steel tube taken to 188MPa).**

Each TowerMate® unit can carry a maximum wind loading of 3000N. This is sufficient for an antenna with a wind area of 3.9m^2 in a 130kph maximum wind gust. This is sufficient to safely carry some of the largest antennas available on the amateur market.

Please make sure that you take the time to assess the maximum wind loading your antennas will place on your installation before committing to building and using the installation.

If you are unsure how to proceed please email us via www.towermate.co.uk and we will be happy to provide you with the technical support you need to build a safe and functional installation.

Exploded view of TowerMate® showing component parts

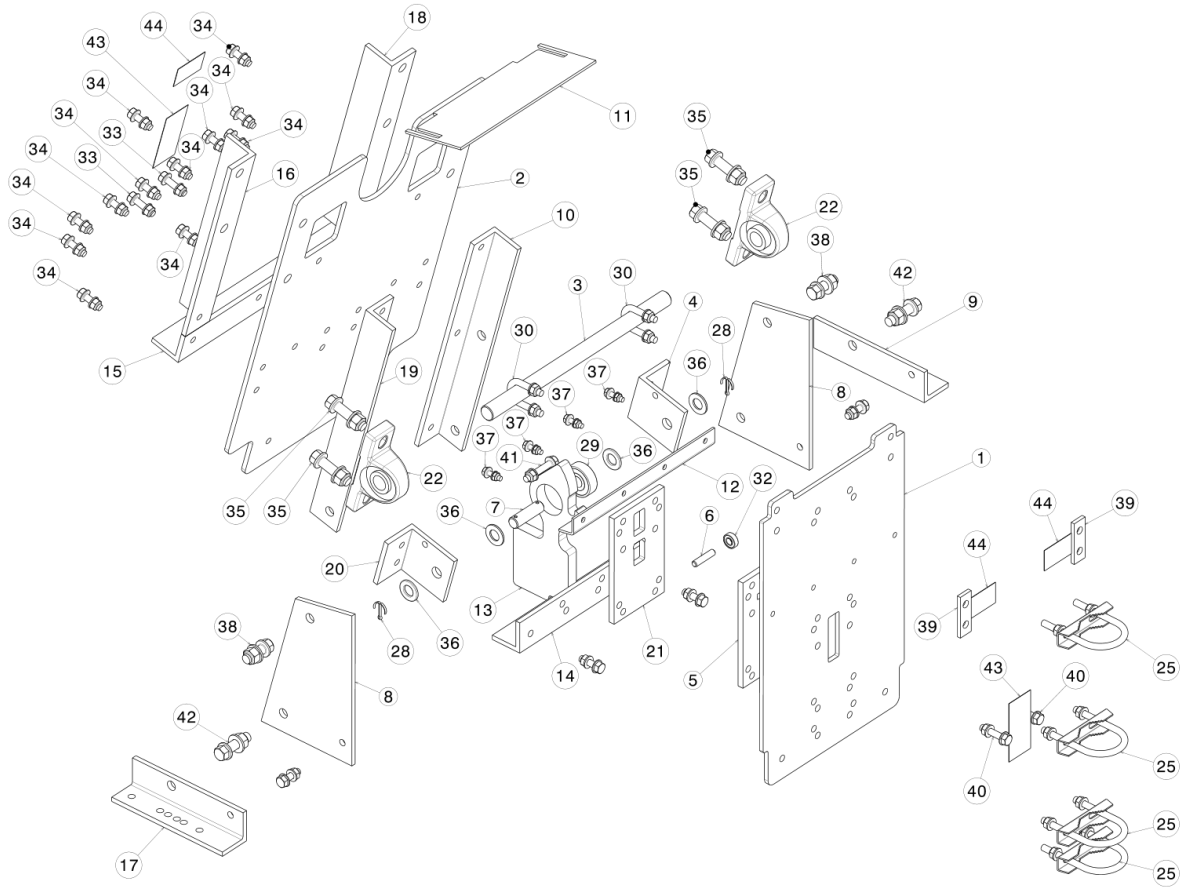

Fig. 18 Showing an exploded view of the standard TowerMate® unit

REF	PART NO.	REV	DESCRIPTION	QTY
1	AAS0001	05A	FIXED PLATE	1
2	AAS0002	05A	MOVING PLATE	1
3	AAS0003	02A	MAIN BEARING SHAFT	1
4	AAS0007	03A	LOCKING PIVOT BRACKET RH	1
5	AAS0011	04A	CAM BEARING PIVOT SUPPORT PLATE	1
6	AAS0012	01A	CAM BEARING PIVOT SHAFT	1
7	AAS0013	01A	PENDULUM PIVOT PIN	1
8	AAS0014	04A	STOP PLATE	2
9	AAS0015	03A	ANGLE BOOM SUSPENSION RH	1
10	AAS0016	04A	ANGLE LONGERON LH	1
11	AAS0017	02A	PLATE ROOF LOCKING MECHANISM	1
12	AAS0018	02A	WEATHER STRIP	1
13	AAS0019	05A	LOCKING PENDULUM	1
14	AAS0020	02A	BRACE LOWER FIXED PLATE	1
15	AAS0021	02A	MOVING PLATE CROSS BRACE	1
16	AAS0023	02A	MOVING PLATE OUTER VERTICAL BRACE LH	1
17	AAS0024	02A	ANGLE BOOM SUSPENSION LH	1
18	AAS0026	01A	MOVING PLATE OUTER VERTICAL BRACE RH	1
19	AAS0027	02A	ANGLE LONGERON RH	1
20	AAS0028	01A	LOCKING PIVOT BRACKET LH	1
21	AAS0029	02A	LOCKING LATCH PLATE CHAMFERED	1
22	BIP0001	01A	BEARING PILLOW BLOCK	2
25	BIP0004	01A	U-CLAMP ASSEMBLY 2 INCH	4
28	BIP0006	01A	SPLIT PIN	2
29	BIP0007	01A	PENDULUM BEARING	1
30	BIP0010	01A	U-CLAMP M8 X 22MM DIA	2
32	BIP0012	01A	CAM FOLLOWER BEARING	1
33	BIP0013	01A	M8 X 30 HX HD BOLT WASHER AND NYLOC NUT	4
34	BIP0014	01A	M8 X 25 HX HD BOLT WASHER AND NYLOC NUT	16
35	BIP0015	01A	M12 X 45 BOLT WASHER AND NYLOC NUT	4
36	BIP0016	01A	WASHER M14	4
37	BIP0017	01A	M6 X 20 HX HD BOLT WASHER AND NYLOC NUT	4
38	BIP0018	01A	M12 X 30 BOLT WASHER AND NYLOC NUT	2
39	BIP0019	01A	BACKING PLATE	2
40	BIP0021	01A	M8 X 35 HX HD BOLT WASHER AND NYLOC NUT	2
41	BIP0022	01A	M8 X 45 HX HD BOLT WASHER AND NYLOC NUT	1
42	BIP0023	01A	M12 X 40 BOLT WASHER AND NYLOC NUT	2
43	AAS0031	01A	FOLLOW THE INSTRUCTIONS WARNING STICKER	2
44	AAS0032	01A	PINCH POINT WARNING STICKER	3

Table 2 Parts list for the standard TowerMate® unit

TowerMate® Tilt-Over Device specification

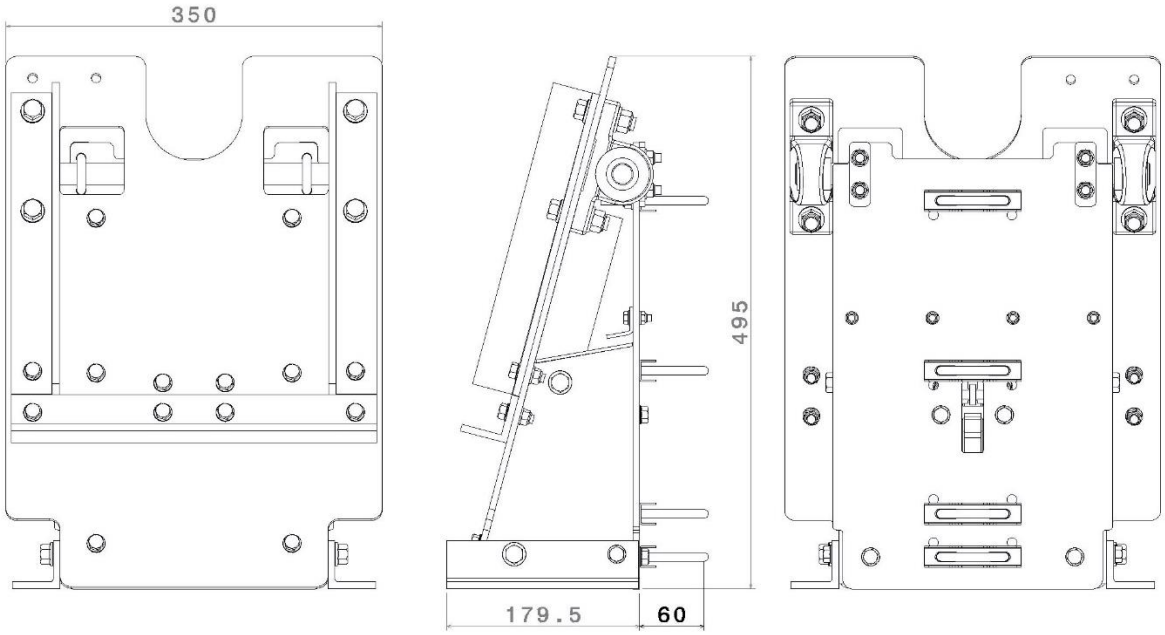

Fig. 19 Standard TowerMate Tilt-Over Device with key dimensions

Dimensions:
Max width 350mm
Max height 500 mm
Max depth 200mm

Weight:
All up weight shipped 14.5kg

Principle component materials:
Fixed & moving plates - high strength aluminium
Bearing shaft - BZP coated steel
Locking pendulum - BZP coated steel
Locking latch plate - BZP coated steel
Precision sealed rolling element bearings

Max weight of antenna to be supported:
150 kg

Maximum wind loading:
Maximum wind loading is 3000N assuming 130kph gusts onto a 3.9m^2 projected antenna area