

INSTALLATION MANUAL
for
Semi-Delta Antenna

SD214 100 W
SD214 500 W

Issue 1 February 1999

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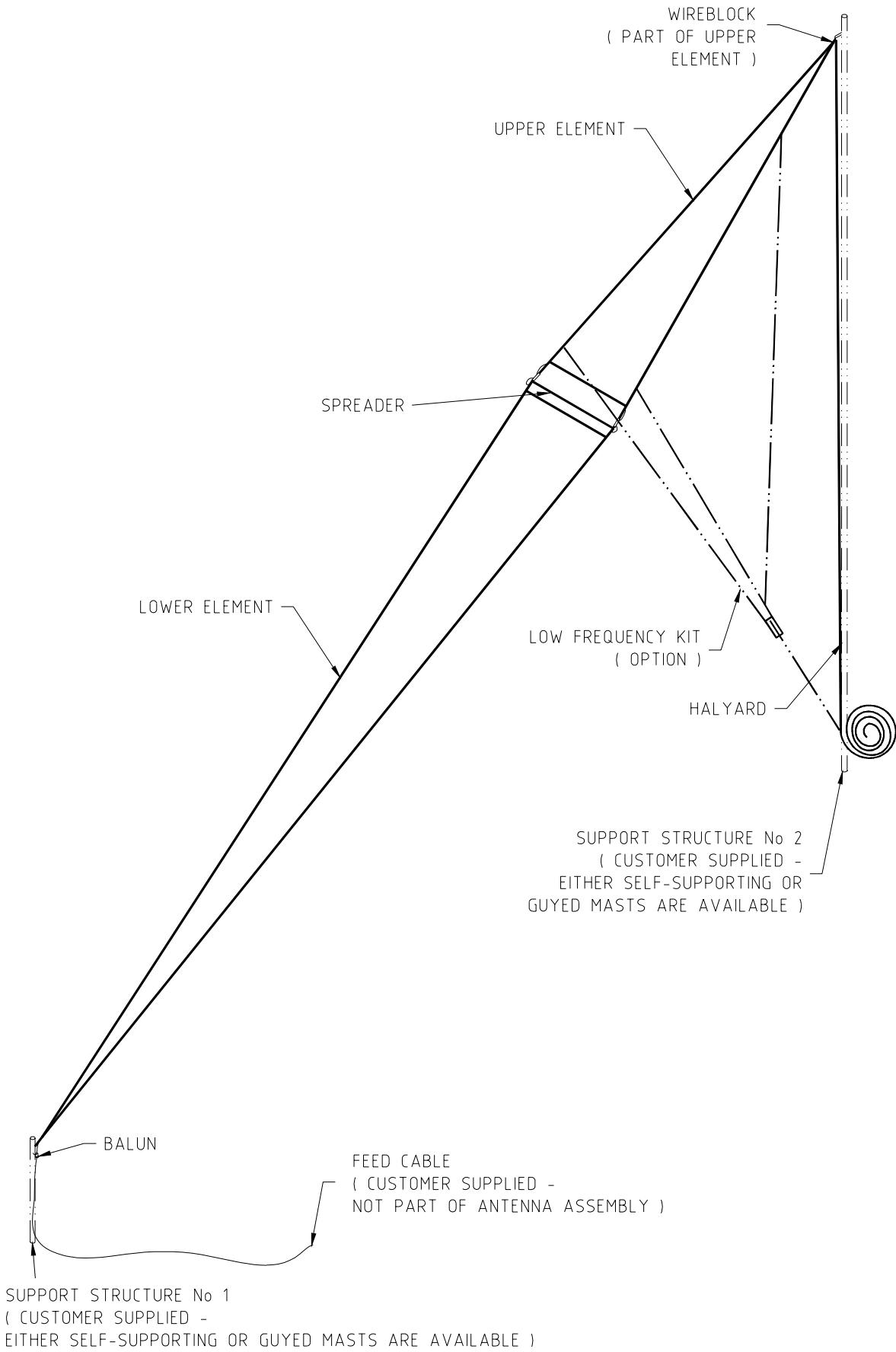


Figure 1 Semi-Delta Antenna

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SECTION 1 - INTRODUCTION

1.1 GENERAL

This is an omnidirectional broad band antenna, used for short to medium range communication applications.

The antenna may be used for either receiving or transmitting.

It consists of an upper and lower element, spreader, and halyard. A two part termination is an integral part of the upper element, and requires electrical connection to the lower element.

Power is fed to the antenna via a balun transformer mounted on support structure No 1.

These antennas are supplied broken down and packed in a number of related kits of sub-assemblies, and require assembly in accordance with the instruction in the relevant sections of this manual.

1.2 CONNECTIONS

The coaxial input cable is fitted on the under side of the balun to an 'N' type socket.

Fly leads connect the lower element to the balun and to the upper element.

1.3 CONSTRUCTION

The upper and lower elements consist of copper strand wire and are joined together by a spreader tube, to form a kite shaped antenna.

The outer ends of each element are supported from two support structures. A halyard enables the hoisting of the antenna at one end.

The halyard (which is part of the upper element) passes over a wireblock (pulley) mounted from the support structure attachment point. The other end of the halyard rope is attached near the base of the support structure.

The low frequency kit is an option. It is designed to improve the low frequency performance of the antenna under poor ground conditions.

1.4 GENERAL TECHNICAL DATA

For procedures and details relative to the erection of the support structures please refer to manufacturers specification / instructions.

The support structure should be selected based on the requirements indicated in *Table 1-1*.

Table 1-1 Support Structure Requirements

Height (m) - Support Structure No 1 (nominal) To antenna attachment point	2
Height (m) - Support Structure No 2 (nominal) To antenna attachment point	15
Spacing (m) (between antenna attachment points)	20
Horizontal force (kN) (160 km/hr wind loading)	1.6
Vertical force (kN) (160 km/hr wind loading)	1.1

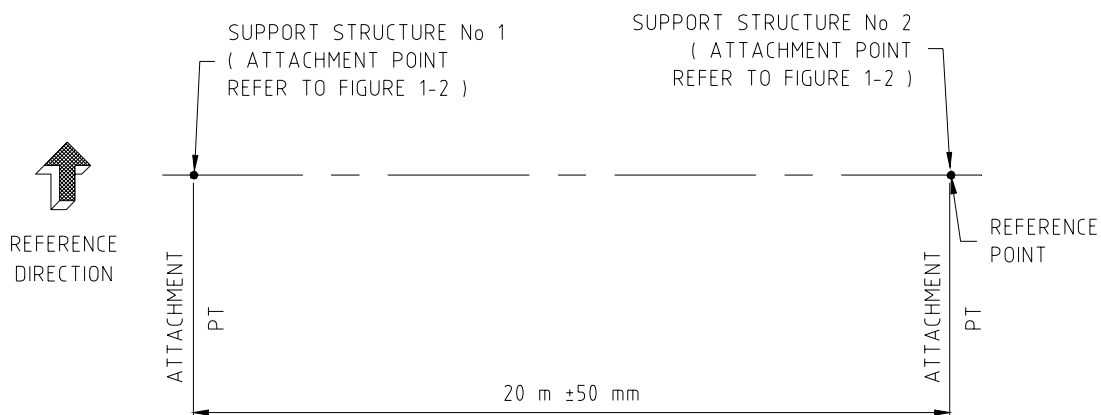
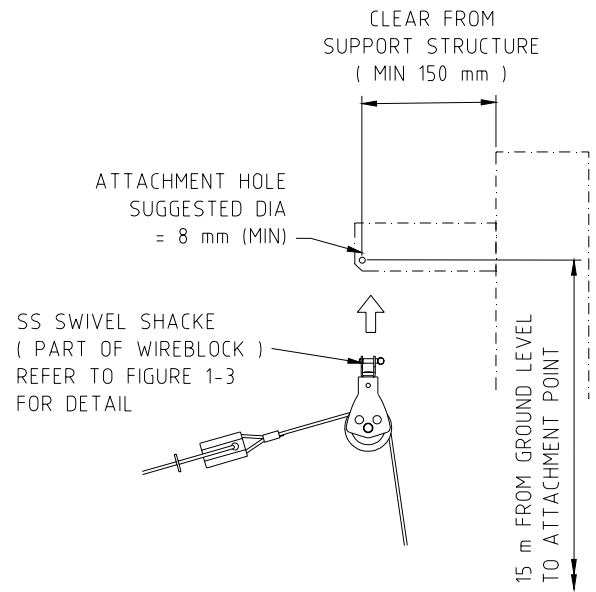


Figure 1-1 Separation of Support Structures

SUPPORT STRUCTURE No 2



SUPPORT STRUCTURE No 1

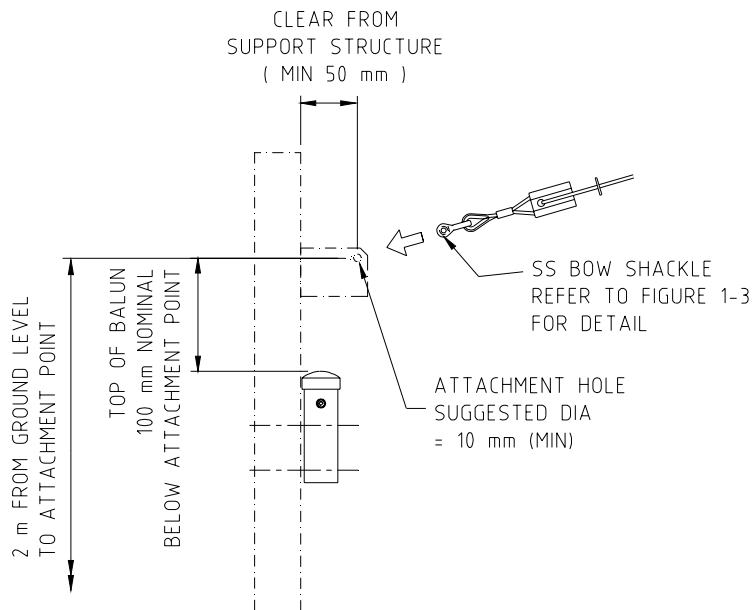


Figure 1-2 Attachment Point on Support Structures

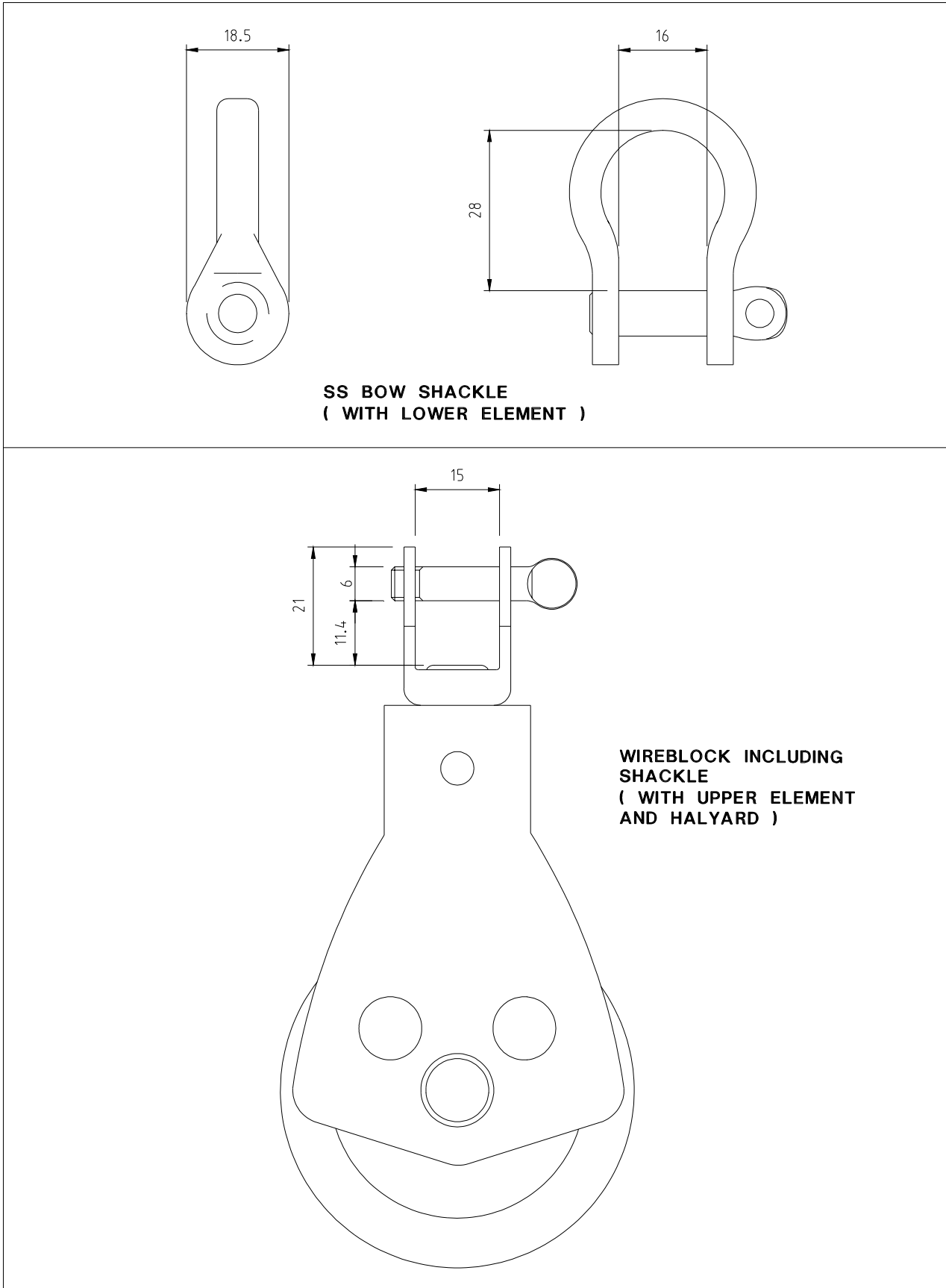


Figure 1-3 Shackles for Support Structure Attachment – Details (approximate to full size)

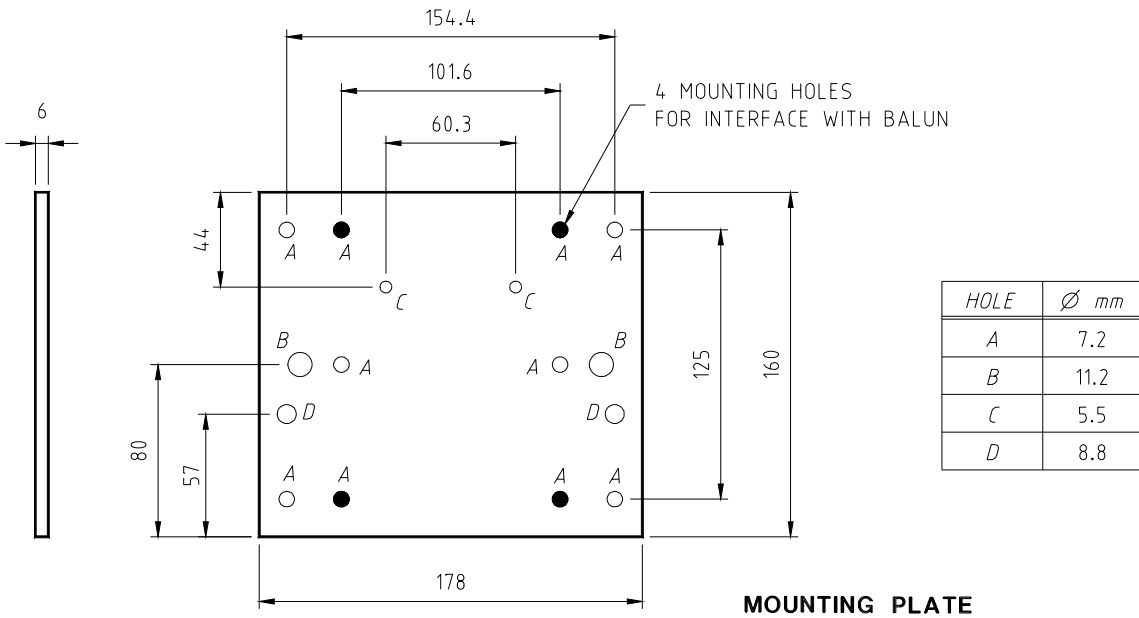
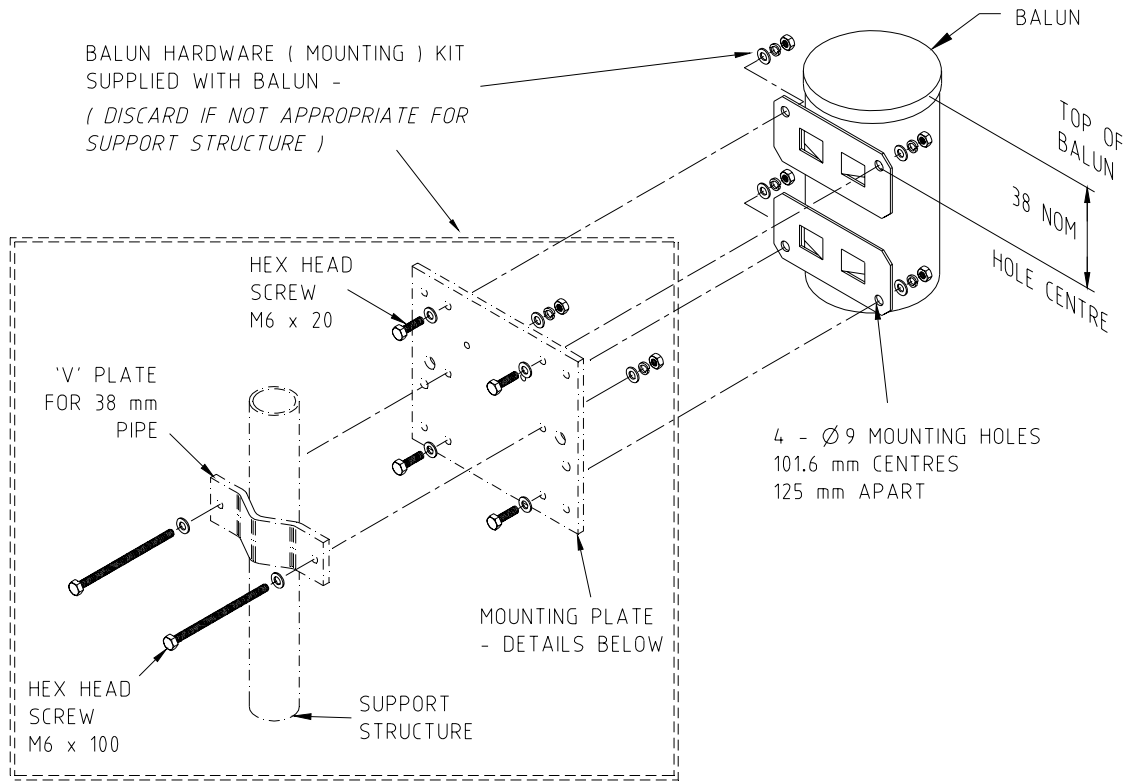


Figure 1-4 Balun Mounting for 500 W Model - Details

1.5 SITE CONDITIONS

The antenna should be installed on a site which is reasonably flat. It is recommended that a slope of 1 in 50 should not be exceeded.

The site should also be generally cleared over the area of antenna. Where the assembly is to take place, loose rock and other objects which could damage the antenna components, or impede the installation should be removed.

1.6 MAXIMUM WIND SPEED

The 'Survival Wind Rating' is the wind speed at which the most highly stressed member becomes equivalent to the minimum material yield strength.

The 'Design Wind Speed' is derived from the survival rating, and is set such that the antenna components are stressed to within allowable or permissible material stress limits.

The Design Wind Speed for the SD214 100 W and SD214 500 W antennas is 160 km/hr.

1.7 UNPACKING AND HANDLING

Care should be taken in the unpacking of the components of this antenna. In particular, insulators are prone to chipping or cracking by knocking against each other, or inadvertent dropping. The protective wrapping on the wire work insulators should be kept in place until the antenna is ready for raising to the support structure head. The copper wire components can be kinked if badly handled, even in the roll form as packed.

1.8 INSPECTION

Examine the equipment as soon as possible, and notify the supplier if any damage or discrepancy is evident (refer to *Section 2 - Items List*).

1.9 INSTALLATION

The installation shall be carried out by experienced personnel in a safe and efficient manner, to established procedures and practices.

Prior to installation, ensure all rules and regulations applicable to local requirements are reviewed and adhered to.

WARNING

Antenna installation should not be attempted in windy conditions, or when rain or lightning is imminent.

Personnel should never be directly underneath the antenna or close to the support structure during the installation of the antenna.

1.10 ELECTRICAL CONNECTIONS

The antenna requires the use of 'corrosion inhibiting and conducting paste' between any electrical and dissimilar metal surfaces.

The recommended electrical jointing compound is 'ALMINOX Grey', which is referred to throughout this manual as 'corrosion inhibiting and conducting paste'.

1.11 EARTHING OF SUPPORT STRUCTURES

Support Structure No 1 (where the balun is mounted), must be earthed for the antenna to operate.

SECTION 2 - ITEMS LIST

This antenna is supplied un-assembled into a number of kits as listed below.

The quantity stated are those actually required. Hardware kits may include spares for some components.

The dots shown in the parts list indicate the kit level for each item.

Table 2-1 Items List for Model **SD214 100W**

Item No	Part No	Description	Kit level in descending order				Qty per higher kit level
			1 Symbol used	2 (no dot)	3 •	4 •• •••	
1	25512.001	ANTENNA KIT – SD214 100W					1
1-1	15980.001	• Upper element					1
1-2	15979.001	• Lower element					1
1-3	15981.001	• Spreader Kit					1
1-3-1	23085.000	• • Spreader tube centre					1
1-3-2	23084.000	• • Spreader tube ends					2
1-3-3	25515.002	• • Spreader hardware kit					1
1-3-3-1	702.20554	• • • Swivel shackle body					4
1-3-3-2	702.20033	• • • Swivel shackle pin					4
1-3-3-3	527.06035	• • • Bolt hex hd M6 x 35, SS					2
1-3-3-4	636.01006	• • • Washer flat M6, SS					2
1-3-3-5	637.02006	• • • Washer spring M6, SS					2
1-3-3-6	607.01006	• • • Nut hex M6, SS					2
1-3-3-7	550.05035	• • • Screw pan SL M5 x 35, SS					2
1-3-3-8	636.01005	• • • Washer flat M5, SS					2
1-3-3-9	637.02005	• • • Washer spring M5, SS					2
1-3-3-10	607.01005	• • • Nut hex M5, SS					2
2	15994.000	BALUN KIT – TBU250-530					1
2-1		• Balun TBU250-530					1
2-2	767.01005	• Cable tie LK-5 black					2
3	18744.000	LOW FREQUENCY EXTENSION KIT (Option)					1
3-1		• Extension kit rope assembly					1
3-2	25519.001	• Hardware kit					1
3-2-1	767.04022	• • Line tap, brass B22					3
3-2-2	23698.222	• • Wire rope grip 4 mm, SS					2

Table 2-2 Items List for Model **SD214 500W**

Item No	Part No	Description	Kit level in descending order				Qty per higher kit level
			1 Symbol used	2 (no dot)	3 •	4 •• •••	
1	25512.002	ANTENNA KIT – SD214 500W					1
1-1	15980.002	• Upper element					1
1-2	15979.001	• Lower element					1
1-3	15981.001	• Spreader Kit					1
1-3-1	23085.000	• • Spreader tube centre					1
1-3-2	23084.000	• • Spreader tube ends					2
1-3-3	25515.001	• • Spreader hardware kit					1
1-3-3-1	702.20554	• • • Swivel shackle body					4
1-3-3-2	702.20033	• • • Swivel shackle pin					4
1-3-3-3	527.06035	• • • Bolt hex hd M6 x 35, SS					2
1-3-3-4	636.01006	• • • Washer flat M6, SS.....					2
1-3-3-5	637.02006	• • • Washer spring M6, SS.....					2
1-3-3-6	607.01006	• • • Nut hex M6, SS.....					2
1-3-3-7	550.05035	• • • Screw pan SL M5 x 35, SS.....					2
1-3-3-8	636.01005	• • • Washer flat M5, SS.....					2
1-3-3-9	637.02005	• • • Washer spring M5, SS.....					2
1-3-3-10	607.01005	• • • Nut hex M5, SS.....					2
2	22015.000	BALUN KIT – T1000-530					1
2-1	25516.001	• Balun TU1000-530.....					1
2-2	25516.001	• Balun hardware kit					
2-2-1	09091.000	• • Mounting plate					1
2-2-2	06973.000	• • 'V' plate for 38 mm tube, Al.....					1
2-2-3	526.42990	• • Screw hex hd M6 x 100, SS					2
2-2-4	526.06020	• • Screw hex hd M6 x 20, SS					4
2-2-5	636.01006	• • Washer flat M6, SS.....					12
2-2-6	637.02006	• • Washer spring M6, SS.....					6
2-2-7	607.01006	• • Nut hex M6, SS.....					6
2-2-8	20745.001	• • Earth lead.....					1

Table 2-2 Items List for Model **SD214 500W** (continued)

Item No	Part No	Description	Kit level in descending order				Qty per higher kit level
			1	2	3	4	
			(no dot)	•	••	•••	
3	18744.000	LOW FREQUENCY EXTENSION KIT (Option)					1
3-1		• Extension kit rope assembly.....					1
3-2	25519.001	• Hardware kit					1
3-2-1	767.04022	• • Line tap, brass B22.....					3
3-2-2	23698.222	• • Wire rope grip 4 mm, SS					2

SECTION 3 - ASSEMBLY

3.1 GENERAL

This section details the procedures required to assemble the antenna components (refer to *Figure 3-1*).

- Assembly of antenna
- Assembly of spreader tubes
- Fitting of elements to spreader tube
- Connections to termination
- Fitting of low frequency kit (option)

Section 4 details the procedure for raising and installing the antenna.

NOTE

Parts are identified by their item numbers enclosed in a balloon (0-0-0). Refer to *Section 2 (page 9)* for item number descriptions.

3.2 ASSEMBLY OF ANTENNA

Assembly of the antenna is carried out in the area between the two support structures as shown in *Figure 3-1*.

When laying out the wire work, whether copper or steel, always roll it out.



Care should be taken, especially with the copper wire work, that when laid out it is not kinked, or damaged in any way.

NOTE

Apply 'corrosion inhibiting and conducting paste' to all lug attachment points.

(a) Layout the upper element (which includes halyard), from support structure No 2 in line to support structure No 1 as shown in *Figure 3-1*.

(b) Layout the lower element from support structure No 1 to the upper element as shown in *Figure 3-1*.

(c) Layout the low frequency kit (if supplied) adjacent to the upper element, as shown in *Figure 3-1*

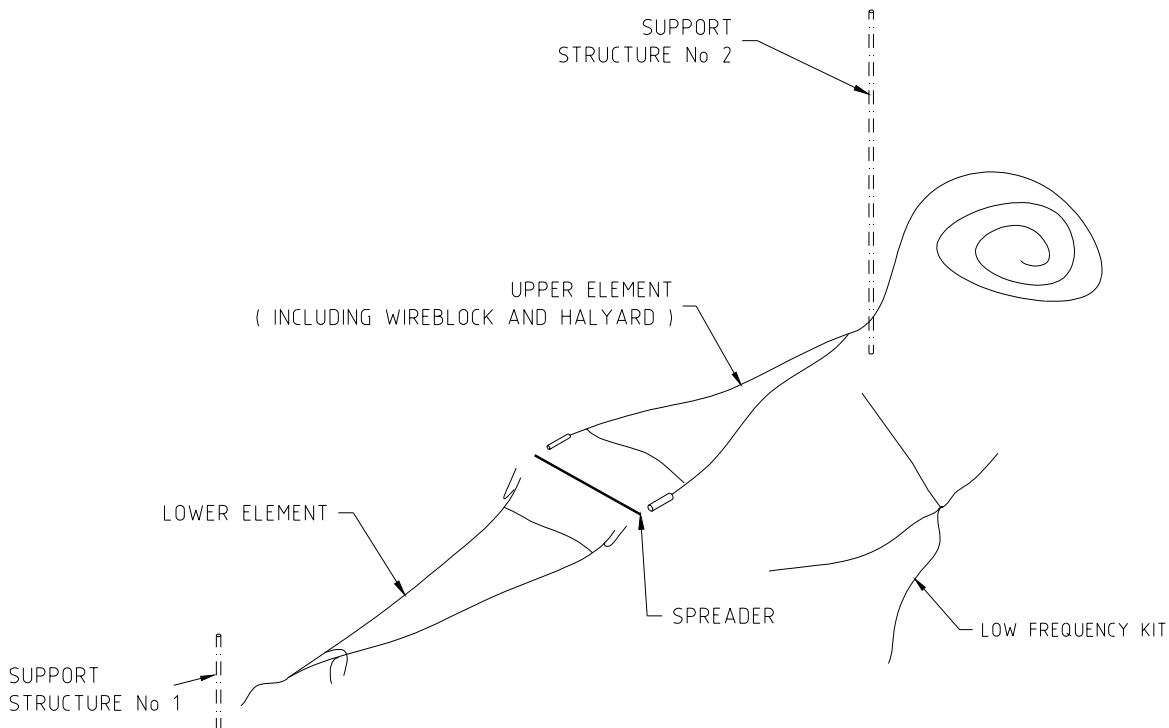


Figure 3-1 Antenna Layout

3.3 ASSEMBLY OF STREADER TUBES

(a) Fit the spreader tubes together using the M5 hardware as shown in *Figure 3-2*.

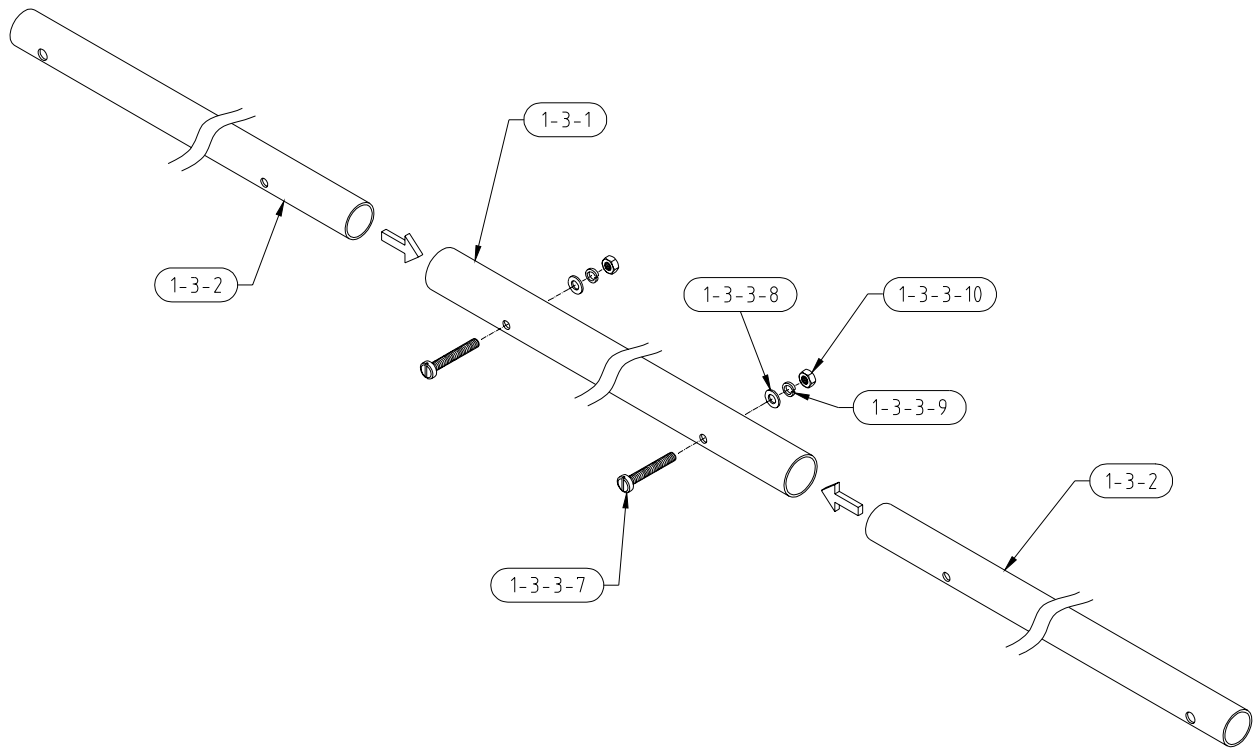


Figure 3-2 Assembly of Spreader Tubes

3.4 FITTING OF ELEMENTS TO SPREADER TUBE

(a) Fit the shackle bodies to the spreader tube using the M6 hardware as shown in *Figure 3-3*.

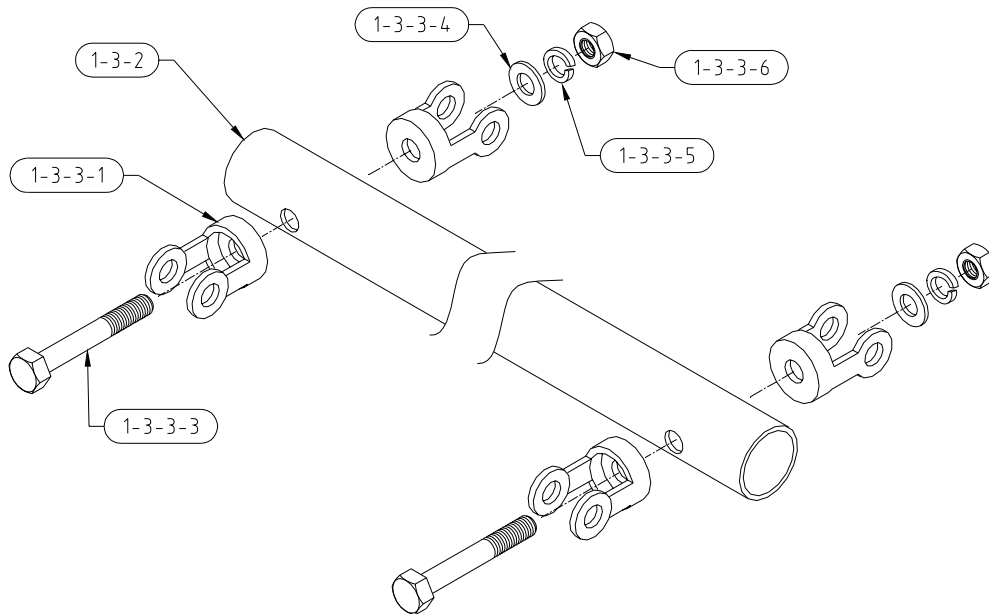


Figure 3-3 Fitting of Shackle Bodies to Spreader Tube

(b) Fit the upper and lower elements to the spreader shackle bodies using the shackle pins as shown in *Figure 3-4*.

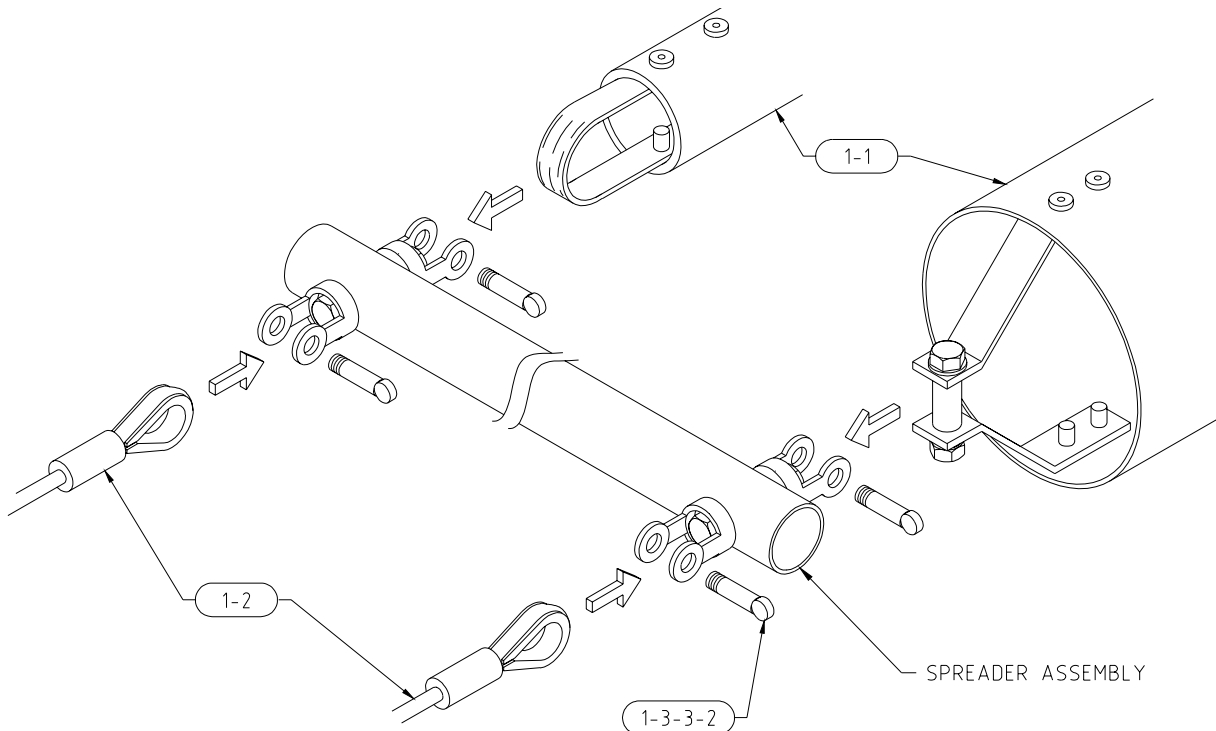


Figure 3-4 Fitting of Elements to Spreader Tube

3.5 CONNECTIONS TO TERMINATION

(a) Fit the fly leads of the lower element to the terminations of the upper element as shown in *Figure 3-5*.

NOTE

Apply 'corrosion inhibiting and conducting paste' at the lug attachment points.

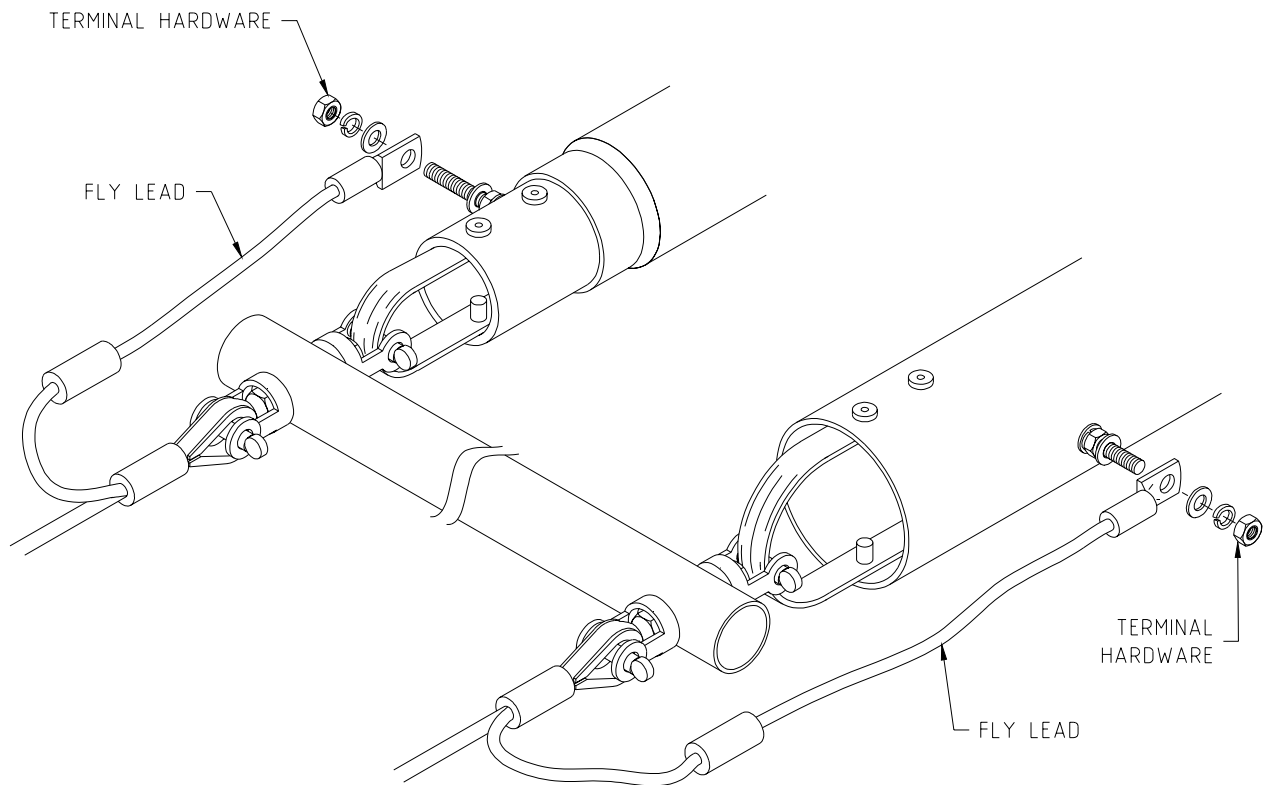


Figure 3-5 Fitting of Fly Leads to Terminations of Upper Elements

3.6 FITTING OF LOW FREQUENCY KIT (OPTION)

(a) Where a low frequency kit is supplied, attach the 3 copper wires to the upper element assembly using the line taps as shown in *Figure 3-6*.

(b) Tighten the line tapes.

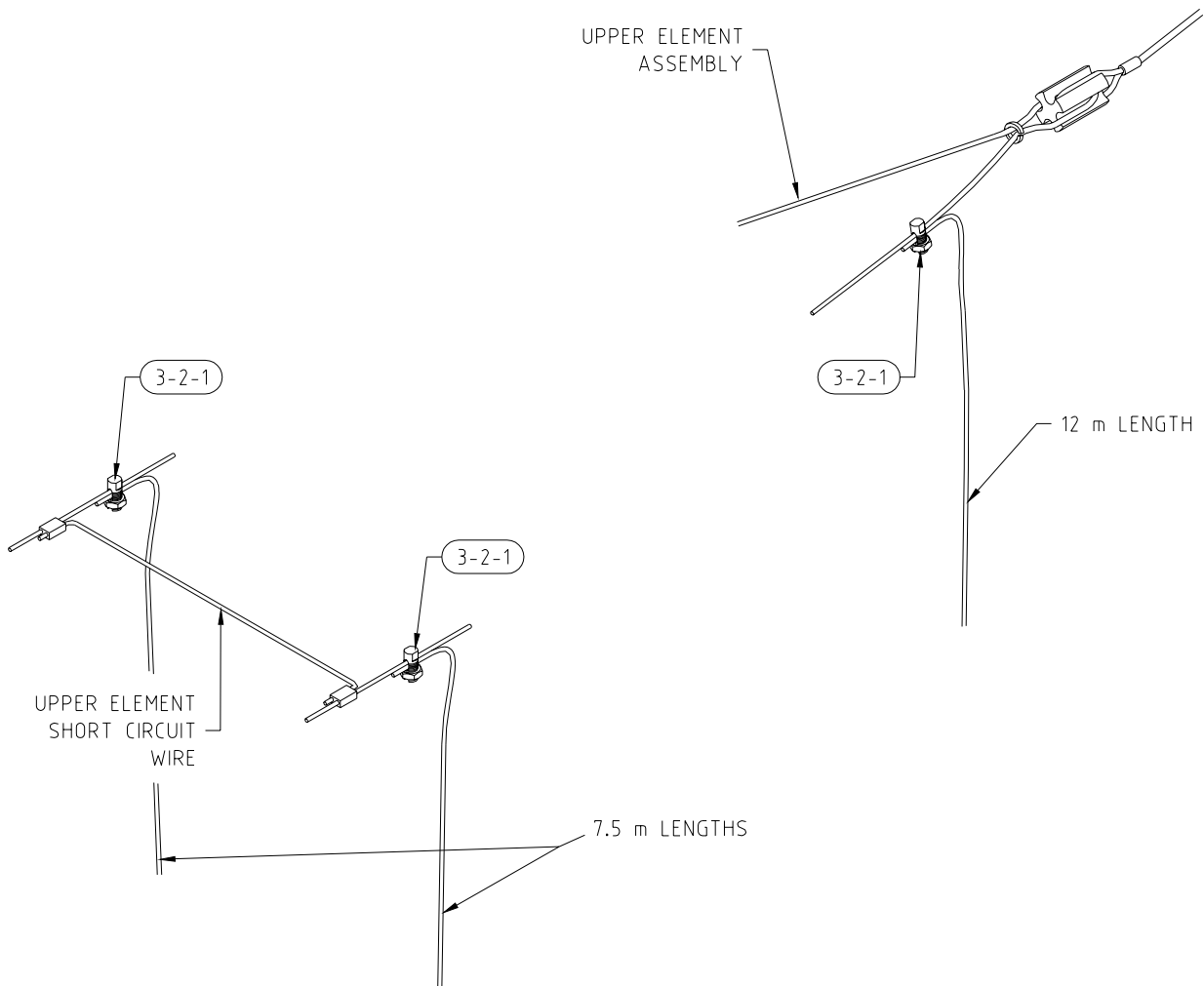


Figure 3-6 Fitting of Low Frequency Kit to Upper Element Assembly

SECTION 4 - INSTALLATION

4.1 GENERAL

This section details the procedures required to install the antenna.

- Attachment of antenna to support structures
- Antenna sag adjustment
- Securing of antenna to support structure No 2
- Mounting of balun
- Connections to balun
- Earthing of support structure No 1 (stub mast)

4.2 ATTACHMENT OF ANTENNA TO SUPPORT STRUCTURES

(a) Secure the lower element to support structure No 1 using the captive bow shackle as shown in *Figure 4-1*.

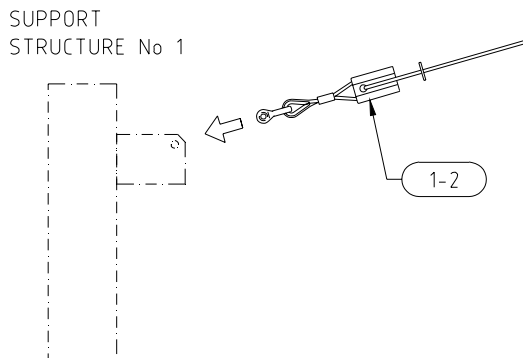


Figure 4-1 Attachment of Lower Element to Support Structure No 1

(b) Secure the wireblock (which is captive to the halyard rope) to support structure No 2 as shown in *Figure 4-2*.

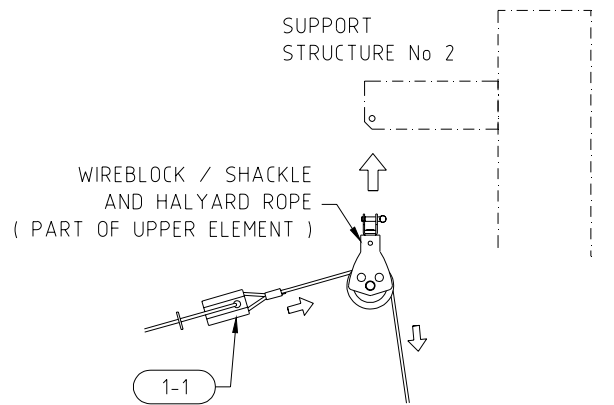


Figure 4-2 Attachment of Wireblock to Support Structure No 2

4.3 ANTENNA SAG ADJUSTMENT

(a) Commence hoisting of the antenna using the halyard.

(b) Adjust height until the vertical sag at the spreader is a minimum of 1 m as shown in *Figure 4-3*.

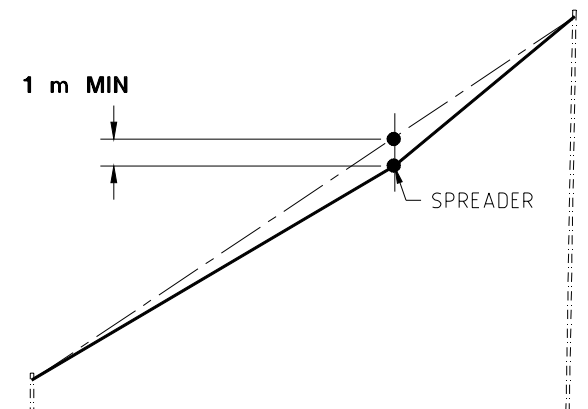


Figure 4-3 Antenna Element Sag

4.4 SECURING OF ANTENNA TO SUPPORT STRUCTURE NO 2

When adjustments are complete secure halyard and low frequency kit to the support structure.

(a) Attach the halyard to the base of support structure No 2 as shown in *Figure 4-4*.

(b) Coil excess halyard rope and store.

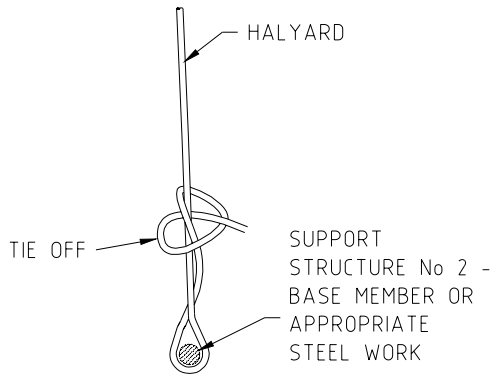


Figure 4-4 Attachment of Halyard to Support Structure No 2

(c) Where a low frequency kit is supplied, attach galvanized rope tail to base of support structure No 2 as for the halyard (refer to *Figure 4-4*), or use the wire rope grips to secure tail to lower end of halyard (near base member) as shown in *Figure 4-5*.

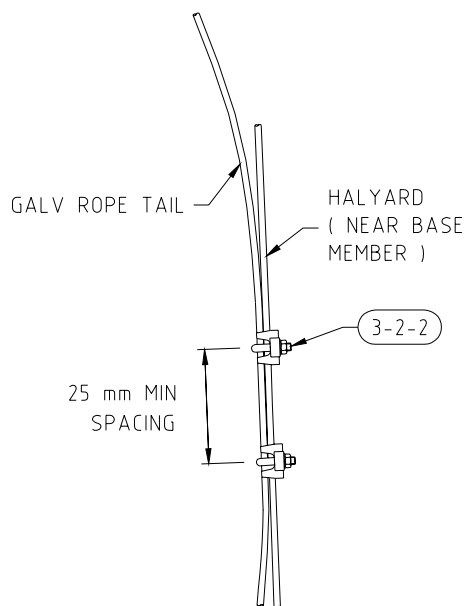


Figure 4-5 Attachment of Low Frequency Kit Rope Tail to Halyard

(d) Adjust galvanized rope tail to a light hand tension only.

(e) Check that the three copper element wires have approximately the same tension. If excessive drop exists, then adjust the length of the rear element wire accordingly, and re-tension tail as required. Secure excess length to wire element, or trim as required.

(f) Coil excess rope and store.

4.5 MOUNTING OF BALUN

(a) Secure the balun to support structure No 1 as shown in *Figure 4-6a* or *Figure 4-6b* for 100 W and 500 W models respectively.

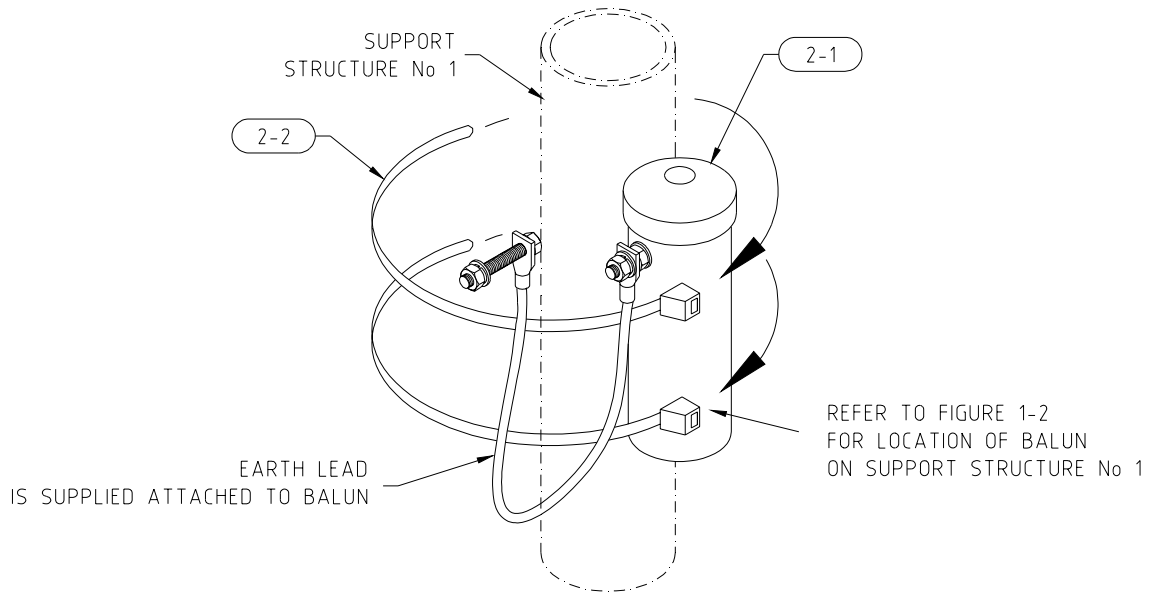


Figure 4-6a Mounting of Balun – 100 W

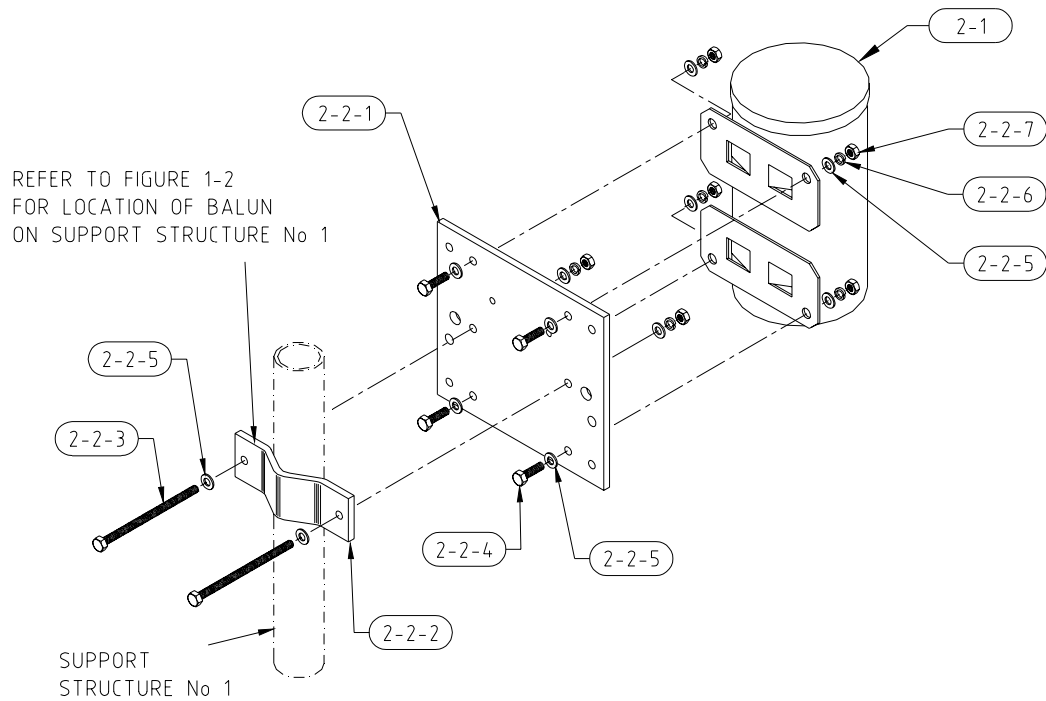


Figure 4-6b Mounting of Balun – 500 W

4.6 CONNECTIONS TO BALUN

(a) Secure the fly lead to the balun terminal using the M6 hardware as shown in *Figure 4-7a* or *Figure 4-7b* for 100 W & 500 W models respectively.

(b) Fit the earth lead to the other balun terminal using the M6 hardware, (if not already fitted) as shown in *Figure 4-7a* or *Figure 4-7b*.

(c) Secure the other end of the earth lead to the support structure using the M6 hardware supplied or an alternative arrangement to suit as shown in *Figure 4-7a* or *Figure 4-7b*.

NOTE

Apply 'corrosion inhibiting and conducting paste' at the lug attachment points.

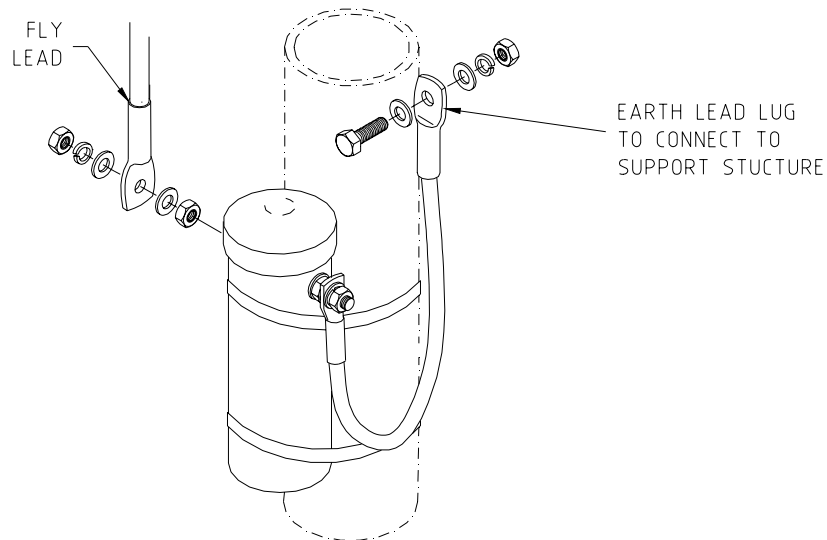


Figure 4-7a Connection of Fly Lead and Earth Lead to Balun – 100 W

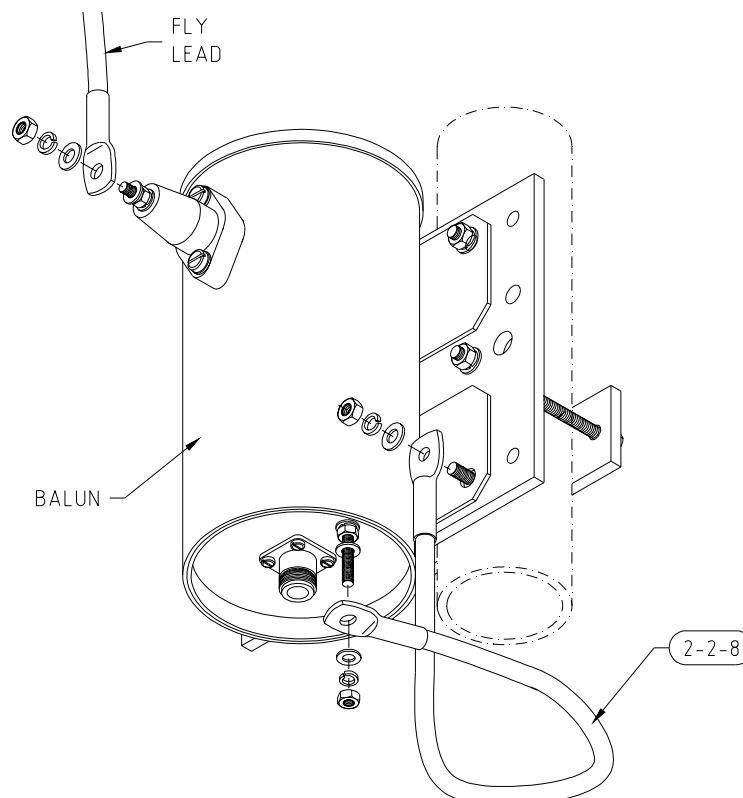


Figure 4-7b Connection of Fly Lead and Earth Lead to Balun – 500 W

(d) Secure the feed cable to the balun 'N' type socket as shown in *Figure 4-8*.

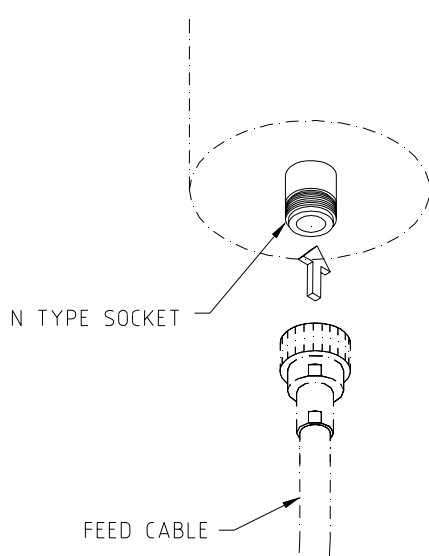


Figure 4-8 Fitting of Feed Cable

(e) Tighten connection and then weatherproof.

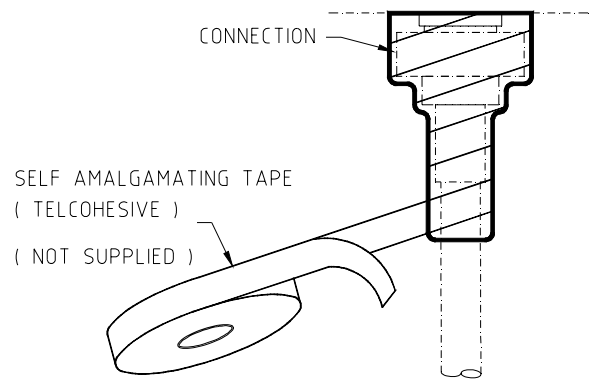
RECOMMENDATION

A recommended method of weatherproofing is to double wrap under tension the connection for approximately 50 mm with self amalgamating tape such as Telcohesive as shown in *Figure 4-9*.

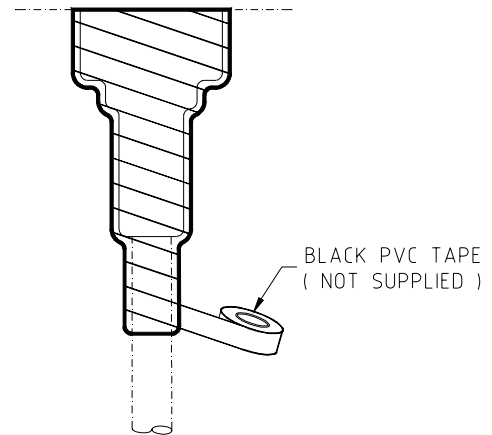
A good quality black PVC tape should then be used to overwrap the joint as shown in *Figure 4-9*.

NOTE

Any sleeving fitted over the cable, adjacent to the joint, must have its end overwrapped with the amalgamating and PVC tapes.



Double Wrap with Self Amalgamating Tape



Overwrap with PVC Tape

Figure 4-9 Weatherproof Connection

(f) Secure the feed cable to the support structure as appropriate.

4.7 EARTHING OF SUPPORT STRUCTURE NO 1 (STUB MAST)

Support Structure No 1 with attachment of balun is part of the antenna electrical circuit and must be earthed for the antenna to operate.

(a) Connect support structure No 1 to ground with an adjacent stack (to be supplied by customer).

NOTE

Apply 'corrosion inhibiting and conducting paste' at earth strap attachment points.

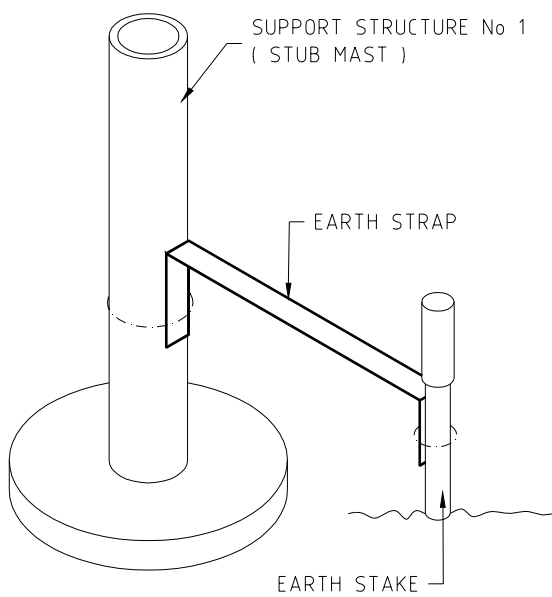


Figure 4-10 Earthing of Support Structure No 1

SECTION 5 - MAINTENANCE

5.1 GENERAL

Prior to maintenance, ensure all rules and regulations applicable to local requirements are reviewed and adhered to.

WARNING

Ensure that for maintenance operations the equipment is:

- Deactivated and rendered safe;
- Assessed as being free from induced voltages, and radiation field from adjacent equipment.

Personnel should never be directly underneath the antenna or close to the support structure during the maintenance of the antenna.

Carry out checks and adjustments as detailed below. These should be initially 3 months after installation, then annually (or more frequently if dictated by local conditions).

It is important that the antenna be inspected for loosening of components or damage after a period of high winds, and especially thunderstorm activity (see also *ELECTRICAL*).

5.2 ADJUSTMENT

Check and adjust if required:

- The antenna elements have the required sag as shown in *Figure 5-1*. Use the halyard for adjustment.
- Ensure that all wire rope grips are tight (if used).

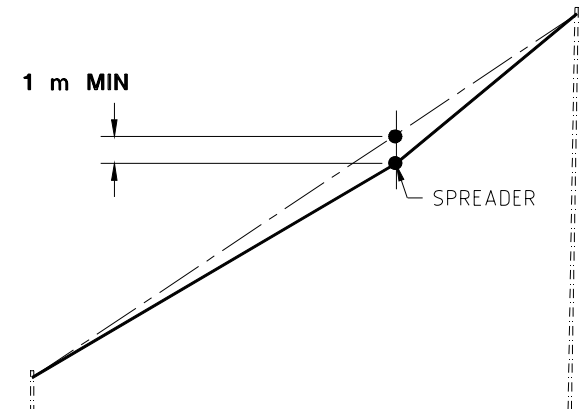


Figure 5-1 Antenna Element Sag

5.3 INSPECTION

Inspect the antenna for any visible signs of corrosion, and repair as required. In particular, steel wire work and fittings should be closely inspected.

Check that all electrical connections are tight and free from corrosion. Clean and re-apply 'corrosion inhibiting and conducting paste' as required.

5.4 ELECTRICAL

Under normal operation, no electrical maintenance is required. However, if thunderstorm activity is experienced in the vicinity of the antenna, an inspection should be made for lightning damage. In particular the balun and terminations and their connections should be inspected.

If a lightning strike is apparent or suspected, check the antenna VSWR.

The VSWR specification for the antenna is 2.0 : 1 average, 2.5 : 1 maximum, when installed over normal soil conditions (in accordance with this installation instruction).

If this has changed from the value of the antenna when installed, or outside its specified value, the balun and/or termination may have been damaged internally. Electrical testing will be required to determine the faulty unit(s). Have them returned to RFS for repair.