

Project Number	PRJ 11231		
Project Name	Naboomspruit SS Radio Tower 25 Meter		
Scope of Work	Tower Requirements		
Site	Naboomspruit Substation		
Compiled by	SV Zungu	Rev	0

1. SITE INFORMATION

Site Name	Naboomspruit Substation
Nearest town	Mookgophong Limpopo
Distance to site from nearest town	In Town
Type of vehicle access to site	Normal
Terrain information	2
GPS co-ordinates	24° 31' 12.09" S
	28° 42' 02.62" E
Height above sea level (HASL)	

2. TOWER SPECIFICATIONS

Design Height	25m
Tower category (A B C or D)	B
Design wind speed	40 m/s
Terrain selection (category 1 2 or 3)	Supplier to advise (require harshest terrain category)
Artificial base height	Supplier to calculate and advise due to terrain
Landing 1 height	15 m
Landing 2 Height	23m
Landing 3 Height	
Aircraft Warning Lights DC	Awaiting CAA
Painting of tower	Awaiting CAA
Overhead gantry length	Please DX GA drawing
Gantry hail guard covers	yes

3. TOWER LOADING

Antenna	Height (Meters)	QTY	Feeder
1.2 m Solid Dish	24	1	LMR 400/10mm

- **To Make allowance for future tower loading requirements, the tower design must make provision for an additional load capacity of 40%.**

4. TOWER DETAILS

- A feeder ladder must be provided, accessible from the climbing ladder, allowing for feeder attachment points along the vertical section. Attachment points must be at most 500mm apart. The feeder ladder must be at least 250mm wide.
- The climbing ladder must be vertical and must be fitted with a continuous safety cage on all towers, with the exception of the bottom two metres. **The ladder must always be fitted on the inside of the tower.** Access from the ladder to the working platforms must be clear and unobstructed. **Trapdoors to be fitted at each landing platform and need to be big enough for persons to climb through.**
- The spacing of all horizontal ladder rungs must be equal and there must be adequate clearance for hands and feet behind each rung of minimum 150 mm. Rung diameter must be a minimum of 16mm.
- A feeder gantry must be provided between the base of the tower and the adjacent equipment building, and must be fitted with a hail-guard. Both the gantry and hail guard must be at least **300mm** wide. Recommended approach would be for the horizontal feeder tray to allow for cables to be suspended underneath the tray. A support pole must be supplied and installed for every **3m** of horizontal gantry.
- Where required (**EIA ROD and CAA specification attached**), provision must be made for the installation of aircraft warning lights and daylight painting in accordance with the DCA regulations. Where required, all paint used to be of a water based galvanized metal type. The Supplier must specify painting standards applied and provide the specifications the paint to be used
- All structural elements must be designed to a recognized STANSA code of practice eg. SANS 10162, which covers the structural use of steel, based on the allowable stress design philosophy.
- All design specifications and drawings for the tower or mast must be provided so that Eskom Telecommunications (PTN) or any other civil engineers can perform further strengthening of the tower to allow for additional expansion.
- The general structural design procedures and minimum design loads to be adopted in the design of all structural members must conform to the SANS 10160 code of practice for wind loading or applicable STANSA Standard. The Supplier must submit information on the standard applied if it is an alternative STANSA standard.
- A maximum twist of 1° and sway of 0.3 at an operational wind speed of 120 km/hr must be permitted for the mast/tower.
- The wind load on the tower must take into account the additional wind load of the antenna, the caged ladder, feeder cables, the cable trays and platforms.
- All steel must be hot-dip galvanized after fabrication in accordance with SANS 657 or if there is any other specification except the above mentioned, the supplier must specify.
- There must be no drilling of the structure after galvanizing.
- Each platform supplied must have waist guardrails and knee rails of sufficient strength to be suitable for the attachment of a safety belt. The kick plate must be a minimum of 150-mm high.

- An earthing bar must be provided 1.5 m above the horizontal feed gantry at its tower end, to which the antenna feeders will be earthed. This bar must be connected directly to the earth ring of the tower by a copper strap.
- A data plate must be affixed to the tower between one and two meters above the ground such that it can be easily read. The following data must be recorded on this plate:
 - Manufacturer
 - Date of erection
 - Tower height
 - Platform heights
 - Drawing reference number or tower type
 - Model number
 - Maximum wind loading (State the details of the category applicable)

5. FOUNDATIONS

- The foundation calculations and installation must assume the angle of repose of the soil to be zero.
- The foundation concrete must be min 30MPa grade unless otherwise recommended by the Certified Engineer.
- Form work must be adequately backed and stiffened to avoid any distortion. Form work to the upper side of foundation must extend at least 100 mm below the level of the ground.
- Flow able 30 MPA non-shrink grout must be placed under the base plate only, if so required by the civil engineer. Packer plate underneath the base plate may be required if grout is used.
- If ready-mix concrete is used, the **waybill must be forwarded to the Eskom Telecommunications Project Engineer**. If concrete is mixed on site, concrete cube tests must be undertaken and **the results must be forwarded to the Eskom Telecommunications Project Engineer**.
- The concrete must be thoroughly compacted with an approved high-frequency, low amplitude vibrator.
- All top edges of concrete above ground level must have a 20 mm chamfer at 45°.
- All bolts and nuts must be grade 8.8.

6. ERECTION

- The structure must be erected in accordance with the drawings, manufacturers specifications and the STANSA guidelines listed below:
 - SANS 1200 A - General
 - SANS 1200 C - Site Clearance
 - SANS 1200 DA - Earthworks
 - SANS 1200 GA - Concrete
 - SANS 1200 HA - Structural Steel
 - SANS 1200 HC - Corrosion Protection
- Qualified riggers must supervise the structural erection and they must provide proof of their qualifications.

- All bolts and nuts must be painted with Polygalv or similar product to be approved by Eskom.
- **All tower foundation bolts to have two (2) nuts fitted.?**

7. EARTHING

- A vertical steel rod or tube lightning conductor of no less than 15 mm in diameter, must be welded to and extended 2m above the top of the structure to provide a cone of protection of 30° to the vertical from lightning strikes.
- The Supplier to provide the tower resistance from the base to apex for each tower design.
- All joints are to be hard brazed, with Sibra Alloy rods, or CAD welded, except to the base where bolt and lug connectors of 75 mm² contact area is to be used.
- A tower earth ring must be provided using interconnected earth electrodes placed at each tower leg in accordance with Eskom specification ETST0017.
- **Earthing system to be attached along the length of the main leg of the tower. The earth strap is to be connected to the lightning rod at the top of the tower and bonded at the bottom to the tower leg earth.**
- A bonding method must be used between the galvanizing and the copper. Tenders to provide specification on method and materials used.
- The tower earth ring must be interconnected with the station and/or building earth in accordance with Eskom specification ETST0017.

8. GENERAL

- A Professional Structural Engineer registered with the Engineering Council of South Africa (or equivalent) must do the mast or tower design.
- The Professional Engineer must sign all drawings and designs.
- **The supplier shall provide Eskom with a copy of the design drawings for the tower, plus tower foundation, the tower drawing to include the positioning of the antennas and landings specified by Eskom.**
- Eskom Telecommunications (PTN) representative must inspect and approve the excavation for the tower foundation prior to concrete casting. Appointment to be set up with the Eskom project co-ordinator for the inspection five working days in advance. Tower foundation will not be accepted without Eskom's approval of the excavation prior to concreting.
- The erector must provide a certificate, signed by a Professional Engineer (Civil) indicating that all criteria, as mentioned in this document has been met.
- The tower needs to be fenced three sides with a double vehicle gate and 2.4 meter high. This fence needs to comply with Eskom fencing specification.