

Guidelines on Antenna Structures
Based on the
National Policy on Antenna Structures

Telecommunications Regulatory Commission of Sri Lanka
Colombo
October 2017

List of Organizations Represented

1. Telecommunications Regulatory Commission of Sri Lanka
2. Ministry of Defence
3. Ministry of Provincial Councils & Local Government
4. Ministry of Health & Nutrition
5. Ministry of Disaster Management
6. Institution of Engineers, Sri Lanka
7. Institution of Engineering & Technology, Sri Lanka Network
8. University of Moratuwa
9. University of Colombo
10. Urban Development Authority
11. Central Environmental Authority
12. Civil Aviation Authority
13. Department of Meteorology
14. Ceylon Electricity Board
15. Department of Wildlife
16. Sri Lanka Coast Guard
17. National Building Research Organization

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Preamble

The Telecommunications Regulatory Commission of Sri Lanka (TRCSL), was established under the Sri Lanka Telecommunications Act No:25 of 1991 as amended by the Sri Lanka Telecommunications (Amended) Act, No. 27 of 1996 as the national regulatory agency for telecommunications in Sri Lanka. The responsibility of the TRCSL is to promote sustained development in the telecommunication industry by shaping the regulatory process, while protecting the public interests and be responsive to challenges in an increasingly competitive market.

The growing demands of telecommunication market have necessitated fast deployment of networks, resulting increase in erection of communications infrastructure, such as, antenna towers, which are needed to ensure that there are adequate network coverage and access that guarantee minimum Quality of Service (QoS).

The very support structures required to enhance quality of life have also raised public concerns; specially, issues related to health & safety and aesthetics. Even though some of these concerns, particularly with regard to health are not supported by existing scientific findings, it is important to take adequate precautionary measures to protect the public from any perceived health concerns.

The TRCSL appointed a Committee comprising professionals in various disciplines to study these issues in detail and revise/amend the existing Guidelines on Antenna Structures prepared in 2010 where appropriate.

The Terms of Reference (TOR) of the Committee is as follows.

- i. To address practical implementation difficulties/shortcomings in the existing Guideline.
- ii. To amend relevant clauses in the Guideline to safeguard the environment and public interest.
- iii. To address technical compliance requirements on erection of antenna structures and base station installations.
- iv. To propose a more simplified process to obtain clearance from various Government Organizations.

List of Abbreviations

ASF	-	Antenna Structure Farm
BS	-	British Standards
CAASL	-	Civil Aviation Authority of Sri Lanka
CEA	-	Central Environmental Authority
CEB	-	Ceylon Electricity Board
COC	-	Certificate of Conformity
EIA	-	Electronic Industries Alliance
EMC	-	Electromagnetic Compatibility
EMF	-	Electromagnetic Frequency
HRC	-	High Rupture Capacity
ICNIRP	-	International Commission on Non-Ionizing Radiation Protection
IEC	-	International Electrotechnical Commission
IESL	-	Institution of Engineers, Sri Lanka
IET	-	Institution of Engineering and Technology
LA	-	Local Authority
MC	-	Municipal Council
MOD	-	Ministry of Defence
NPPD	-	National Physical Planning Department
PE	-	Protective Earth
PEA	-	Provincial Environmental Authority
PS	-	Pradheshiya Sabha
RF	-	Radio Frequency
SLS	-	Sri Lanka Standards
SPD	-	Surge Protection Device
TAC	-	Technical Advisory Committee
TIA	-	Telecommunication Industries Association
TRCSL	-	Telecommunications Regulatory Commission of Sri Lanka
TSP	-	Telecommunications Service Provider
UC	-	Urban Council
UDA	-	Urban Development Authority
WHO	-	World Health Organization

Definitions

Antenna: One or more radiating elements used for communication purposes

Antenna Structure: A tower, platform and other parts of the structure on which antennae may be installed.

Antenna Structure Farm: A geographical location with a collection of Antenna Structures.

Technical Advisory Committee (TAC): A panel of advisors appointed by the TRCSL to advise on issues related to antenna structures.

Telecommunications Service Provider (TSP): One who provides Telecommunication and Broadcasting Services to the Public.

Qualified Electrical Engineer: A person who possesses at least an associate membership of IESL in the relevant field.

Guideline on Antenna Structures

1. Sharing of Antenna Structures

- 1.1 To minimise the adverse impact to the aesthetic appearance and vegetation, it is encouraged to co-locate antenna structures erected by the TSPs. TRCSL should identify such locations which are named as Antenna Structure Farms (ASFs). TSPs may propose such locations to TRCSL.
- 1.2 Antenna Structures of height more than 30m ground based and the total height more than 30m on roof top, excluding 5m poles, shall be used on shared basis. Hence the antenna structures shall be designed and constructed to accommodate the requirements of two other TSPs. Minimum wind load area of 16m² should be constructed at the tower top and strengthen possibility up to 20m² when the firm confirmation for site sharing is received.
- 1.3 The Antenna Structure Farm will be confined to a maximum radius of 250 m. The distance between any two Antenna Structure Farms will be kept at a minimum separation of 4 km. This criteria will be applicable only for ground based antenna structures with height exceeding 30m and roof top antenna structures with total height exceeding 30m excluding 5 m poles.
- 1.4 Up to three requests will be considered to construct separate antenna structures within the Antenna Structure Farm. Subsequent applicants should share one of the available antenna structures. Additional antenna structures will be permitted only under special circumstances by a technical committee appointed by TRCSL.
- 1.5 Due to the propagation limitations in high frequency bands such as 1800MHz and 2GHz and also to promote Broadband deployments throughout the country, TSPs are permitted to erect ground based antenna structures with height not exceeding 30m and roof top antenna structures with total height not exceeding 30m in between the ASFs. These ground based towers should be camouflage type unless otherwise approved by the CEA.
- 1.6 Cumulative radio frequency power density due to Antenna Structure Farm should be within the limits defined by ICNIRP and adopted by TRCSL provided that the maximum RF power levels allowed are as per Annexure I.
- 1.7 Considering the large antenna spaces required in Broadcasting transmissions, the antenna structures related to Broadcasting service are exempted from the ASF clauses 1.3 and 1.4 provided that application is originally forwarded for an Antenna Structure to be used exclusively for broadcasting services.
- 1.8 TRCSL should prepare a tariff structure for sharing of antenna structures in consultation with the relevant organisations. These tariffs should be gazetted.

2. Safety and Security Clearance

- 2.1 Security clearance shall be obtained from MOD.
- 2.2 Maximum height of the antenna structure shall be based on the recommendations of the CAASL, MOD and UDA.

3. Lightning and Surge Protection

- 3.1 The Antenna Structure premises should be provided with a comprehensive lightning and surge protection scheme to minimize the lightning related damage and injury as per the Annexure IIA.
- 3.2 The antenna structure should conform to the guidelines specified in Annexure II B with regard to the lightning protection concerns.
- 3.3 Installation of the lightning and surge protection system should be carried out by the TSP as per Annexure II B.
- 3.4 Any lightning damage caused to neighbourhood equipment attributed to antenna structure shall be compensated by the TSP. TSP shall obtain an insurance cover.
- 3.5 Along with the application TSPs should submit the design details of the earthing system certified by a Chartered Electrical Engineer confirming that below or equal 10 Ω earth resistance can be achieved at the proposed site.
- 3.6 Prior to the submission of application, TSPs should carry out the soil resistivity test and design the earthing system to achieve the specified earth resistance value.
- 3.7 A report on the lightning and surge protection system, and other specified information as per Annexure IIC, shall be submitted to TRCSL by TSP once a year certified by a qualified Electrical Engineer.
- 3.8 Electricity to the antenna structure site should be supplied through a dedicated connection from the distribution transformer or a separate transformer should be installed at the site.

4. Electrical Safety Requirements

- 4.1 Electrical wiring should comply IET wiring regulation (BS 7671 standard)

5. Electromagnetic Interference and Health Concerns

- 5.1 Base Station equipment shall comply with the EMC standards (IEC 61000).
- 5.2 TRCSL will enforce and monitor maximum RF power density criteria defined by ICNIRP and adopted by TRCSL as per Annexure I.
- 5.3 Verification of compliance with stipulated standards will be carried out by TRCSL or a recognized institution immediately after commissioning of the site and at the stage of any modifications are done to the antenna installation or once in five years to ensure public safety. The TSP shall inform TRCSL for inspection, immediately after the site is commissioned or any modifications made to the antenna installation.
- 5.4 In line with international best practices a minimum of 150m distance from antenna structures has to be kept to Schools and Hospitals.

6. Environmental and other Concerns

- 6.1 CEA or PEA recommendation shall be obtained to ensure that the natural environment of the area is protected from any potential adverse impacts.
- 6.2 Any Sound generated due to the installation should comply with national standards, as per the sections 23Q and 32 of National Environment Act No 47 of 1980 and amendments.
- 6.3 Prior consent should be obtained from prescribed organisations if the location of the antenna structure falls within any of the protected area declared under the provision of any law in Sri Lanka.
- 6.4 The applicant shall obtain the clearances as recommended by the CEA /PEA from the agencies listed in the Annexure IIIA.
- 6.5 In the event of any archaeological, aesthetic, cultural, social concerns or national security issues are pointed out by the Urban Development Authority the application for antenna structure will be referred to such organization for necessary clearance from the agencies listed in the Annexure IIIB.

7. Construction of Antenna Structures

- 7.1 Relevant clearances of the Central Environmental Authority or Provincial Environmental Authority, Urban Development Authority, Civil Aviation Authority and Ministry of Defence shall be obtained by the TSP. Final approval will be granted by TRCSL.
- 7.2 The Antenna structure and other related infrastructure should be designed and constructed in conformity with BS 8100, TIA/EIA 222F (or latest) or other equivalent international standard accepted by TRCSL.
- 7.3 Ground based antenna structures with height exceeding 30m should be designed and detailed as post- disaster type structures (disaster resilient features).
- 7.4 All the structural designs, construction drawings and proposals are required to be certified by a chartered civil engineer who is specialized in structural design.
- 7.5 Minimum of third-party insurance coverage of the risk of physical damage and injury should be taken prior to the commencement of construction of antenna structure. A copy of the same should be submitted to TRCSL before commencement of the development.
- 7.6 During the construction, an aircraft warning light should be installed on the top most position of the antenna structure as required by CAASL.
- 7.7 TSPs should obtain approval of plans, development permits and certificate of conformity from the respective UDA/Local Authorities and a certified copy of COC should be submitted to TRCSL prior to commissioning.
- 7.8 All the approving agencies are encouraged to establish electronic document transfer in order to expedite the approval process.
- 7.9 TSP who has received TRCSL approval is required to complete the construction of the new antenna structure within one year from the date of granting the approval. TSP should inform TRCSL in writing once the antenna structure construction is completed. Failure to meet this requirement without a valid reason acceptable to TRCSL will result in cancellation of the approval.
- 7.10 The new antenna structure should be available for sharing within 03 months from the date of commissioning. Sharing of Telecommunication Antenna Structure should not be done without the written approval of TRCSL. For the additional load, sharing proposals are required to be certified by a chartered civil engineer who is specialized in structural design.
- 7.11 Site identification board should be displayed on the antenna structure by the TSPs as per the format given in Annexure IV.

8. Installation of Antenna Structures on Buildings

- 8.1 Relevant clearances of the Central Environmental Authority or Provincial Environmental Authority, Urban Development Authority, Civil Aviation Authority and Ministry of Defence shall be obtained by the TSP. Final approval will be granted by TRCSL.
- 8.2 TSPs are required to submit a Certificate of Conformity (COC) of the building or approved building plan to UDA along with application form. Availability of valid COC or approved building plan will be verified by UDA prior to issuance of the UDA clearance.
- 8.3 The structural stability of the buildings, which are primarily designed for purposes other than facilitating antenna structures, should be certified by a chartered civil engineer who is specialized in structural design, along with the application for the construction of the Antenna Structure.
- 8.4 All Antenna structure approvals are subjected to the approval of relevant Local Authorities/UDA.
- 8.5 Only MOD,UDA and CAASL clearances are required for Antenna structures with height less than or equal to 5m on roof top.
- 8.6 Only MOD clearance is required for wall mounted antennas.
- 8.7 A lightning protection system should be installed as per the Annexure IIA and Annexure IIB, to ensure the safety of occupants.
- 8.8 All requests of antenna structures on buildings shall be certified by a chartered civil engineer who is specialized in structural design.
- 8.9 Along with the application TSPs should submit the design details of the earthing system certified by a Chartered Electrical Engineer confirming that below 10 Ω earth resistance can be achieved at the proposed site.
- 8.10 Installations of Antenna Structures on buildings should conform to all other Guidelines in this document.

9. Maintenance of Antenna Structures

- 9.1 Aircraft warning lighting and painting of Antenna Structures must be in accordance with the specifications of CAASL.
- 9.2 TSP should submit an Annual maintenance report for each site in electronic form to TRCSL as per the format given in Annexure V.
- 9.3 Maintenance of Lightning & surge protection, earthing and electrical distribution system should be done by the TSP in compliance with specifications given in Annexure II A and IIB.
- 9.4 A comprehensive inspection on Lightning & Surge protection system should be done annually. All the items should be checked during the inspection and any defects should be rectified with immediate effect. A full report of the inspection as per the format given in Annexure IIC together with any consequent rectification done should be forwarded to the TRCSL within two weeks after the inspection. A copy of the report certified by qualified Electrical Engineer should also be submitted to CEA to satisfy their requirement.
- 9.5 The following documents should be submitted to TRCSL in every five years.
 - a. A certificate from a Chartered Civil Engineer who is specialised in structural design on the stability of the Antenna structure on the present condition as per Annexure VIII A.

- b. A certificate from a Chartered Electrical Engineer on the compliance of Lightning, surge protection and electrical safety for the electrical installations and earthing system as per Annexure VIII B.

10. Approval for Alterations to Antenna Structures

- 10.1 To ensure the safety of the public and property, an Antenna Structure should not be abandoned even for short period of time, unless otherwise it is completely removed. The TSP should inform the TRCSL and make arrangements to either remove a non-operational installation or transfer it to another antenna structure operator. Until the antenna structure is removed or transferred and the TRCSL is informed the same, the TSP is responsible for the maintenance of the antenna structure in conformity with provisions specified.
- 10.2 Any changes to the antenna structure including change of location are not allowed without a new approval from TRCSL.
- 10.3 Removal of an Antenna Structure also requires insurance to be taken for the coverage of the risk of physical damage and injury during the removal of antenna structure.

11. Rights of TRCSL to modify structures and functions

- 11.1 Upon justifiable request(s) made by concerned parties, the TRCSL, together with relevant authorities, may order alteration to the structure or suspension of operation or complete removal of structure. In such case all costs should be borne by the TSP.

12. Approval Procedure

- 12.1 TSP should submit an application as per Annexure VI in the form of soft and hard copies.
- 12.2 Approval Procedure is as specified in Annexure VII

13. General

- 13.1 All relevant authorities such as MOD, CEA/PEA, UDA, CAASL, LA, CEB and TRCSL are required to facilitate, the TISPs in establishing antenna structures to provide telecommunication services on a priority basis, as telecommunication networks are a vital component of infrastructure development while addressing public health & safety, economic, environmental and other impacts.
- 13.2 TSPs shall adhere to any other relevant laws, regulations, existing procedures or any amendments enforced by recommending/approving agencies from time to time.
- 13.3 Appeals for any deviation from these guidelines caused by technical or commercial issues will be referred to the TAC who will meet once in a month when required.

Annexure I - Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields

Table 1 – Reference levels for occupational exposure to time-varying electric and magnetic fields (unplumbed rms values)

Frequency range	E-field strength (Vm ⁻¹)	H-field strength (Am ⁻¹)	B-field (μT)	Equivalent plane wave power density S _{eq} (W m ⁻²)
Up to 1 Hz	–	1.63 x 10 ⁵	2 x 10 ⁵	
1-8 Hz	20,000	1.63 x 10 ⁵ /f ²	2x 210 ⁵ /f ²	
8-25 Hz	20,000	2 X 10 ⁴ /f	2.5 X 10 ⁴ /f	
0.025-0.82 kHz	500/f	20/f	25/f	
0.82-65 KHz	610	24.4	30.7	
0.065-1MHz	610	1.6/f	2.0/f	
1-10 MHz	610/f	1.6/f	2.0/f	
10-400 MHz	61	0.16	0.2	10
400-2,000 MHz	3f ^½	0.008f ^{1/2}	0.01f ^{1/2}	f/40
2-300GHz	137	0.36	0.45	50

Source: ICNIRP Guidelines (1998)

Notes:

1. f, as indicated in the frequency range column.
2. Provided that basic restrictions are met and adverse indirect effects can be excluded. Field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz, S_{eq}, E², H², and B² are to be averaged over any 6- min period.
4. For peak values at frequencies up to 100 kHz (For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by $\sqrt{2}$ (~ 1.414). For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f = 1/[2 t_p]$).
5. For peak values at frequencies exceeding 100 kHz see figs.1 and 2 of ICNIRP Guidelines 1998. Between 100 kHz and 10 MHz, Peak values for the field strength are obtained by interpolation from the 1.5 fold peak at 100 kHz to the 32-fold peak at 10 MHz, for frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width, does not exceed 1, 000 times the S_{eq} restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz, S_{eq}, E², H², and B² are to be any 68/f^{1.05}-min period (f in GHz).

7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric field. Electric shock from low impedance source is prevented by established electrical safety procedures for such equipment.

Table 2. Reference levels for general exposure to time-varying electric and magnetic fields (unplumbed rms values)

Frequency range	E-field strength (Vm ⁻¹)	H-field strength (Am ⁻¹)	B-field (μT)	Equivalent plane wave power density S _{eq} (W m ⁻²)
Up to 1 Hz	-	3.2 x 10 ⁴	4 x 10 ⁴	
1-8 Hz	10,000	3.2 x 10 ⁴ /f ²	4 x 10 ⁴ /f ²	
8-25 Hz	10,000	4,000/f	5,000/f	
0.025-0.8KHz	250/f	4/f	5/f	
0.8-3KHz	250/f	5	6.25	
3-150 KHz	87	5	6.25	
0.15-1 MHz	87	0.73/f	0.92/f	
1-10 MHz	87/f ^{1/2}	0.73/f	0.92/f	
10-400MHz	28	0.073	0.092	2
400-2,000MHz	1.375f ^{1/2}	0.0037f ^{1/2}	0.0046/f ^{1/2}	f/200
2-300GHz	61	0.16	0.20	10

Source: ICNIRP Guidelines(1998)

Notes:

1. f, as indicated in the frequency range column.
2. Provided that basic restrictions are met and adverse indirect effects can be excluded. Field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz, S_{eq}, E², H², and B² are to be averaged over any 6- min period.
4. For peak values at frequencies up to 100 kHz (For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by $\sqrt{2}$ (~ 1.414). For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f = 1/[2t_p]$).
5. For peak values at frequencies exceeding 100 kHz see figs.1and 2 of ICNIRP Guidelines - 1998. Between 100 kHz and 10 MHz, Peak values for the field strength are obtained by interpolation from the 1.5 fold peak at 100 kHz to the 32-fold peak at 10 MHz, for frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width, does not exceed 1, 000 times the S_{eq} restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.

6. For frequencies exceeding 10 GHz, S_{eq} , E^2 , H^2 , and B^2 are to be any $68/f^{1.05}$ -min period (f in GHz).
7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric field. Perception of surface Electric changes will not occur at field strength less than 25 kVm^{-1} Sparks discharges causing stress or annoyance should be avoided.

Verification will be carried out as per Safety Guidelines of TRCSL on RF Exposure

Annexure II A - Lightning and Surge Protection of the Antenna Structure Premises

1. The metallic base of the antenna structure should be connected to the earth grid. Material configuration and minimum cross section area of connection shall be as follows.

Table AIIA:1: Minimum cross section area of Earthing Materials

Material	Configuration	Minimum cross-section area (mm ²)
Copper	2 mm minimum thickness solid tape	50
Aluminium	3 mm minimum thickness solid tape	70
Aluminium Alloy	2.5 mm minimum thickness solid tape	60
Hot dipped galvanized steel	2.5 mm minimum thickness solid tape	60

Extracted from IEC 62305-2010 (SLS 1472-2013) Standard

2. The cable sheaths of all signal lines from the antenna structure should be terminated at a bulkhead at the entrance to the equipment cabin. The bulkhead shall be electrically connected to the cable rack. No conducting part inside the cabin should be directly connected to the outside bulkhead.
3. An earth inspection pit should be installed underneath the bulkhead. The bulkhead should be connected to the earth termination rod in the pit. The earth pit should be integrated with the earth grid.
4. The power line to the equipment cabin should be installed with Surge Protective Devices (SPDs) at the main power panel and meter cubical (if any), with following specifications.

Table AIIA:2

#	Characteristic	Value
1	System Voltage (U_0)	230V or relevant
2	Maximum continuous voltage (U_c)	320V or above for TT system and 280 V and above for TN systems.
3	SPD Class	Class I as per IEC 61643-11 or equivalent
4	Configuration	1+NPE for single phase supply and 3+NPE for three phase supply
5	I_{imp} (10/350 μ s)	30kA or above for phases and 100 kA or above for NPE *
6	Voltage protection level at I_{max} per phase	1.8 kV or below

* Higher values may be used for better safety of the equipment in the cabin.

- It is necessary to protect the SPDs against the over currents by High Rupture Capacity (HRC) fuses with sufficient current rating. Rating should be selected in accordance with the Table P.1 of IEC 61643-12. Circuit breakers with electromagnetic tripping mechanism are not allowed to use as the overcurrent protective devices of the SPDs at the antenna structure sites.
- It is recommended to provide additional surge protection for any other equipment of TSP.
- All surge protective components shall comply with IEC 61643-11. certified by accredited test laboratories.

4.1 The earth terminal of the SPD should be connected to the earth bar via copper wire of minimum cross section 16 mm² and lead length should not be more than 50 cm.

4.2 The earth bar should be connected to an external earth pit using approved material as specified in the Table AIIA1. The earth pit should be integrated with the earth grid by an approved material as specified in the Table AIIA1.

Annexure II B - Lightning Protection Concerns

- As far as lightning is concerned, it should be noted that communication antenna structures differ from tall buildings of same height by the fact that currents pertinent to lightning that strike to antenna structures flow to ground within a small area (concentrated current flow).

Item No	Situation	Regulation
01	Ground Based Antenna structures of height less than or equal 100 m	<p>a. The minimum distance from the metal base of the antenna structure to the boundary of the other land plot should be 5 m from all directions (Refer section 01(e). for further restrictions)</p> <p>b. The antenna structure earthing should be done by an approved material as specified in the Table AIIA1 (preferably rectangular). Additional components (buried plates, deep driven rods etc. should be installed to achieve an earth resistance less than 10Ω measured under dry conditions</p> <ul style="list-style-type: none"> • It is the responsibility of the TSP to maintain earth resistance value on or below the above limit. <p>c. An adequate Surge Protective Device (SPD) should be installed at the electricity supply entrance to the antenna structure related equipment with following specifications: Configuration: 3L-N; 1 N-PE for 3 phase supply 1L-N; 1 N-PE for 1 phase supply Class I SPD Minimum I_{imp} (10/350 μs): 30 kA per phase and 120 kA for NPE The earthing of the SPD should be properly connected to the antenna structure earthing.</p> <ul style="list-style-type: none"> • It is the responsibility of the TSP to check and maintain the SPDs on regular basis. <p>d. If the antenna structure is close to a place of mass gathering (pre-school, day care centres, religious places, cinema halls etc.), the</p>

		<p>minimum distance from the metallic antenna structure base to the boundary of the land plot should be 15m</p> <p>e. Any existing hospital building situated within 150 m from the metallic antenna structure base, the TSP should provide SPDs at the main power entrance of the building with proper earthing (according to IEC 62305-4). The SPD should be in accordance with the specifications given in section 01 (c).</p>
02	Ground Based Antenna structures of height greater than 100 m	<p>a. The minimum distance from the metal base of the antenna structure to the boundary of the other land plot should be 10 m from all directions (Refer section 02 e for further restrictions)</p> <p>b. The antenna structure earthing should be done by an approved material as specified in the Table AIIA1 (preferably rectangular). Additional components (buried plates, deep driven rods etc. should be installed to achieve an earth resistance less than 5Ω measured under dry conditions.</p> <ul style="list-style-type: none"> It is the responsibility of the TSP to maintain earth resistance value on or below the above limit. <p>c. A Surge Protective Device (SPD) should be installed at the electricity supply entrance to the antenna structure related equipment with following specifications Configuration: 3L-N; 1 N-PE for 3 phase supply 1L-N; 1 N-PE for 1 phase supply Class I SPD Minimum I_{imp} (10/350 μs): 50 kA per phase and 150 kA for NPE The earthing of the SPD should be properly connected to the antenna structure earthing</p> <ul style="list-style-type: none"> It is the responsibility of the TSP to check and maintain the SPDs on regular basis. <p>d. If the antenna structure is close to a place of mass gathering (pre-schools, day care centres, religious places, cinema halls etc.), the minimum distance from the metallic antenna structure base to the boundary of the land plot should be 30m.</p> <p>e. If any existing hospital is situated within 150m from the metallic antenna structure base, the operator should provide SPDs at the main power entrance of the hospital with proper earthing (according to IEC Standards 62305-4). The SPD should be in accordance with the specifications given in section 02c.</p>

03	Roof Top antenna structures with total height less than or equal 100m	<p>a. The building should be installed with a structural protection system as per the IEC 62305-3 and Level of protection I.</p> <ul style="list-style-type: none"> • It is the responsibility of the TSP to maintain the protection system as per the standards <p>b. If the antenna structure is close to a place of mass gathering (pre-schools, day care centres, religious places, cinema halls etc.), there should be at least 1 down conductor. The earth pits should be joined by a down conductor. The minimum distance from the perimeter of the building to the boundary of the land plot should be 15 m .</p> <p>c. The antenna structure earthing should be done by an approved material as specified in the Table AIIA1 (preferably rectangular). Additional components (buried plates, deep driven rods etc. should be installed to achieve an earth resistance less than 10Ω measured under dry conditions.</p> <p>d. A Surge Protective Device (SPD) should be installed at the electricity supply entrance to the antenna structure related equipment with following specifications Configuration: 3L-N; 1 N-PE for Three phase supply 1L-N; 1 N-PE for single phase supply Class I SPD per phase Minimum I_{imp} (10/ 350 μs): 30 kA per phase and 120kA N-PE. The earthing of the SPD should be properly connected to the antenna structure earthing by copper conductors of minimum cross section 16 mm². It is the responsibility of the TSP to check and maintain the SPDs on regular basis.</p>
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04	Roof Top antenna structures with total height more than 100m	<p>a. The building should be installed with a structural protection system as per the IEC 62305-3 and Level of protection I.</p> <ul style="list-style-type: none"> • It is the responsibility of the TSP to maintain the protection system as per the standards <p>b. If the antenna structure is close to a place of mass gathering (pre-schools, day care centres, religious places, cinema halls etc.), there should be at least 1 down conductor. The earth pits should be joined by the down conductor. The minimum distance from the perimeter of the building to the boundary of the land plot should be 30m</p> <p>c. The antenna structure earthing should be done by an approved material as specified in the Table AIIA1 (preferably rectangular). Additional components (buried plates, deep driven rods etc. should be installed to achieve an earth resistance less than 05Ω measured under dry conditions.</p> <p>d. A Surge Protective Device (SPD) should be installed at the electricity supply entrance to the antenna structure related equipment with following specifications Configuration: 3L-N; 1 N-PE for Three phase supply 1L-N; 1 N-PE for single phase supply Class I SPD per phase Minimum I_{imp} (10/ 350 μs): 50 kA per phase and 120kA N-PE. The earthing of the SPD should be properly connected to the antenna structure earthing by copper conductors of minimum cross section 16 mm². It is the responsibility of the operator to check and maintain the SPDs on regular basis.</p>
05	Any other antenna structure types	Will be considered on case by case basis.

Where the specified earth resistance and buffer zones cannot be achieved due to very specific practical reasons, the case shall be referred to **TAC**.

Annexure II C Report on Earthing, Lightning & Surge Protection System
(Inspection Report of the Antenna Structure)

TRCSL Reference No :

Site Name :

Main Operator :

Shared Operators :

Site Address :

Location Longitude :

Latitude :

I. Introduction

Date of the earth resistance test performed :

Type (make & model) of equipment used :

Test Requirement :

II. Site Condition

Description about neighbourhood:

The distance from the metal base to the nearest boundary fence (m):

Site Elevation :

Tower Type :

Tower Height (m) :

Photograph of the tower:



III. Description of the Tower Items with Photographs

	Description	Photograph	Remark
a	Lightning Air Terminal		
b	Down Conductor		
c	Tower Leg Grounding		
d	Equipment Bonding		
e	Earth Test Pit		
f	Surge Protection Devices		

IV. Test Result :

Earth Resistance Measurement

Location	Earth Electrode Resistance (Ω)	Image

V. Electricity Supply

Power Source	Phases	Type	Gen Capacity (kVA)	Sound Proof	Comment	Photo

VI. Observations

Observation	Image	Comment

VII. Conclusion

.....
.....
.....
.....
.....
.....
.....
.....
.....

Signature :

Name :

Date :

Annexure III A - List of Organisations associated with Environmental Concerns

Wildlife Department

Forest Department

Coastal Conservation Department

Irrigation Department

Mahaweli Authority

Sri Lanka Land Reclamation and Development Corporation

National Building Research Organization

Any other Organization recommended by CEA/PEA

Annexure III B - List of Organisations associated with Other Concerns

Archaeological Department

Department of Agrarian Services

Petroleum Corporation

Land Commissioners General Department

Any other Organization recommended by UDA or NPPD

Annexure IV - Format of the Site Identification Board

Following information should be displayed in the site identification board.

Sizes of the board should be decided by the TSP.

Main Operator's Sign Board

Main Operator's Logo & Name	
Site Name	: yyyyy
TRC Ref. No.	: aa/bb/cc
Commissioned Date	: dd/mm/yyyy
Contact No.	:

Shared Operator's Sign Board

Shared Operator's Logo & Name	
Commissioned Date	: dd/mm/yyyy

General Conditions

Ground Based Antenna Structures

1. Site identification board should be rigidly fixed and displayed on the Antenna structure or at the boundary fence of the Antenna Structure premises.
2. The content in the board should be easily readable to the public.
3. Specifications of the Site identification board should be as follows

Material - Aluminum

Character font - Arial

Background colour -Yellow

Character colour -Black

Roof Top Antenna Structures

1. Site identification board should be rigidly fixed and displayed at the Antenna structure or on the wall of the building of the Antenna Structure premises.
2. The content in the board should be easily readable to the public.
3. Specifications of the Site identification board should be as follows

Material - Aluminum

Character font - Arial

Background colour -Yellow

Character colour -Black

Annexure V - Format of the Antenna Structure Site Maintenance Report

1. General

a.	Name of the Operator	
b.	TRCSL Reference Number	
c.	Site Name	
d.	Site Address	
e.	Antenna Structure Geo. Coordinates	
f.	Date of Visit	

2. Site Details

a.	Type of Antenna Structure		
b.	Electricity supply to the site	Dedicated/Common power supply	
c.	Condition of the Fence and the Gate {Ground based only}	In Order/Not in Order	{Attach a Photograph}
d.	Condition of the Premises	In Order/Not in Order	{Attach a Photograph}
e.	Site Security personnel	Available/ Not available	

3. Antenna Structure

a.	Has the initial design loading of the tower been exceeded?	Yes / No (If yes please submit a chartered structural engineer's report for stability)
b.	Painting as per CAASL Recommendations	Complied/Not Complied
c.	Fixing of Aircraft warning lamp as per CAASL Recommendations	Complied/Not Complied

4. General

a.	Availability of Site Identification Board:	Yes/No	{Attach a Photograph}
b.	Names of other Shared Operators		

5. Any other remarks

Signature:

Name:

Designation:

Date:

Annexure VI – Format of the Application for Erection of Antenna Structure

Format of the Application for Erection of Antenna Structure										
1 General Information										
1.1 Site Operator Details										
a) Name/Address/Telephone Number of the Operator:										
Name:										
Address:										
Telephone No:										
b) Name/Designation/Tel No. of the contact person										
Name										
Designation:										
Telephone No:										
c) Name/Designation/Tel. No. number of the person responsible for maintenance										
Name:										
Designation:										
Telephone No:										
1.2 Site Owner's Details										
Name:										
Address:										
Telephone / Fax No:										
Owner Type										
1.3 Site Details										
Site Name:										
Address:										
Province:										
District:										
Local Authority Area:										
DS Division:										
GN Division:										
Police Station:										
Site Type Deed										
No:										
Land Extent:										
Boundary Coordinates (Clockwise, starting form one boundary)			A		B		C		D	
			Lat	Long	Lat	Long	Lat	Long	Lat	Long

2	Technical Details					
2.1	Tower Details					
a)	Tower Coordinates	Latitude:		Longitude:		
	Mean Sea Level (m):					
	Tower type & Height:	Type:		Height(m)		
	Building Height(m):					
	Tower Type & No of Legs	Type:		No of Legs:		
b)	Maximum Load(Kg):					
2.2	Lightning Protection					
	Surge Diverter (Including parameters according to the guideline):					
	Status:	Brand:		Model:		
	Minimum I _{max} (8/20 μs)					
	Minimum I _{max} (10/350 μs)					
	Air Terminal Type/Material	Type:		Material:		
	Earthing Layout					
2.3	Technology					
a)	Total number of channels	2G		ODU		IDU
		3G		ODU		IDU
		4G		ODU		IDU
b)	What are the frequencies of the RF signals being transmitted(MHz)?					
		Channel				
c)	Effective Radiated Power per Channel(W)					
d)	Broadcasting					
e)	Height above ground of the lowest point of the antenna:					
2.4	Cabin Details					
	Construction Material					
	Air Condition					
	Exhaust Fan					
	Fire Alarm					
3	Infrastructure Details					
3.1	Power Supply					
	Power Source	Phase		Power Source Type		Capacity(KVA)

4	Health Concern	
4.1	Distance and nature of the neighborhood up to 150 m radius by plan view :	
4.2	List any other antenna structure located in the area (may be from some other operator at the vicinity of the antenna structure) within 500 m range.	
4.3	What are the heights of above antenna structures?	
4.4	Sharing of infrastructure	
	If these are similar structure/facilities available within 500 m range (Q - 2.3) Applicant shall submit necessary information and evidence as to why this structure/facility cannot be accommodated with such existing facilities.	
4.5	Further information on the surrounding and the location.	
a)	The closest school/Nursery - Name and Distance (km)	
	Name:	Distance (km) :
b)	The closest city - Distance to the city (km)	
	City:	Distance (km) :
c)	The closest hospital - Name and Distance	
	Hospital:	Distance (km) :
d)	The closest religious place - Name and Distance	
	Name:	Distance (km) :
4.6	What is the expected RF power densities at the above locations (Q - 4.5) in mW/cm ² average in any thirty minutes period (worst case).?	
4.7	Number of people who would work in the premises once the service is commissioned?	
5	Zoning Classification	
5.1	What is the current use of the site?	
5.2	Describe any existing structures on the site if such structures will be demolished.?	
5.3	If any other ancillary building are proposed to be constructed along with the antenna structure ,please give details with building plans.?	

6	Environmental Aspects	
6.1	Land	
	Could any disturbance to the natural terrain occur as a result of the construction of the proposed structure and if so provide details on the proposed mitigatory measures. (Land Slides, Soli erosion, etc.)	
6.2	Vegetation	
	Types of Vegetation and whether they will be removed or altered. (Tea, Rubber, Coconut, Mixed Forest, Forest Plantation Shrubs, Grass, Pasture, Crop or other)	
6.3	Historical & Archaeological Importance	
	Describe any landmarks or evidence of historical, religious, archaeological, scientific or Cultural sites known to be on or in close proximity to the antenna site (especially within 50m Radius)	
6.4	Aesthetic & Visual Environment	
a)	Describe the impacts to the immediate vicinity (Whether it would be altered, Impaired or obstructed as a result of the proposed structure.	
b)	Proposed landscaping, use of native plants or other measures to preserve or enhance Vegetation on the site.	
c)	Any other impacts which have not been anticipated at this stage but may come up in the future	
6.5	Whether proposed site is located within any of the areas listed below?	
	Located Area	Remarks
a)	Within 100m from the boundaries of or within any area declared under The National Heritage Wilderness Act No.03 of 1998; The Forest Ordinance (Chapter 451) The Fauna & Flora Protection Ordinance (Chapter 469)	
b)	Within any erodible area declared under the soil Conservation Act. (Chapter 540)	
c)	Within any Flood Areas declared under the Flood Protection Ordinance (Chapter 449) and any Flood Protection area declared under the Sri Lanka Land Reclamation & Development Co-operation Act, 15 of 1968 as amended by Act, No. 52 of 1982	
d)	Within 60m from the Bank of a public stream as defined in the Crown Land ordinance: (Chapter 454) and having width of more than 25 meters at any point of its course	
e)	Within any reservation beyond the full supply level of the reservoir	
f)	Within any archaeological reserve, ancient or protected monuments as defined or declared under the Antiquities Ordinance (Chapter 188)	
g)	Within any area declared under The Botanic Gardens Ordinance (Chapter 446).	
h)	Within 100m from the height flood level contour of , or within a public lake as defined in the Crown Land Ordinance (Chapter 454) including those declared under the section 71 of the said Ordinance.	
i)	Within any Environmental Protection Area / Scenic places declared under the National Environmental Act.	
j)	If the area is within the Coastal Zone as defined in the Coastal Conservation Act No. 57 1981. applicant should obtain approval from Coast Conservation department and attach a copy of such approval letter.	

7	Security Implications	
7.1	Indicate whether the proposed Antenna masts and Radio Base Station is near proximity to any of the following establishments and if so indicate the distance and exact location	
	1. Military and Police Establishments:	
	2. Military and Commercial Airports:	
	3. Naval & Commercial Harbors:	
	4. Explosive & Ammunition Storage Depots:	
	5. Petroleum storage tanks:	
	6. Vulnerable Places (CP) / Very Important Personnel (VIP) locations:	
	7. Areas declared as a High Security Zone by the MP&SLO:	
	8. Any other location declared by the Ministry of Defence:	
7.2	Negative impacts of existing certain attractive areas by making them inaccessible to General public (E.g: Piduruthalagala case)	

Name:

Signature:

Date:

List of Attachments

No	Document	Attachment No
1	Relevant Sub Division Survey Plan	
2	Deed	
3	Consent/ No Objection Letter	
4	Consent/ No Objection Letter with the approval of TRC for the Mother Operator	
5	Topographical Map	
6	Route Map	
7	Tower structural drawing certified by chartered structural Engineer and certificate of structural stability of the tower structure with loading	
8	Lightning, surge protection and electrical safety certificate by a chartered Electrical Engineer	
9	Tower site plan with the distance to the boundaries of the fence (5m)	
10	Undertaking Letter	

Name:

Signature:

Date:

Annexure VII - Approval Procedure

1. Telecommunications Regulatory Commission of Sri Lanka (TRCSL) shall coordinate and regulate the erection of antenna structures as the single point of contact for Telecommunication Service Providers including Broadcasters (TSPs).
2. TSP should submit the request as an application along with other supporting documents as per Annexure VI in the form of soft and hard copies.
3. If all the details are in accordance with the provisions in the Guideline, TRCSL will submit the application to the relevant Government Organisations such as Ministry of Defence, Urban Development Authority, Civil Aviation Authority and Central Environmental Authority or Provincial Environmental Authority (NWP) and coordinate with them.
4. Relevant clearances of the Government Organisations shall be obtained prior to grant approval of the TRCSL. The final approval will be granted by TRCSL.
5. Upon receipt of approval from TRCSL, TSPs should submit an application to relevant Local Authority to obtain development permit.
6. TSP who has received TRCSL approval is required to complete the construction of the new antenna structure within one year from the date of granting the approval.
7. TSP should inform TRCSL in writing once the antenna structure construction is completed. Failure to meet this requirement without a valid reason acceptable to TRCSL will result in cancellation of the approval.
8. The new antenna structure should be available for sharing within 03 months from the date of completion.
9. Sharing of Telecommunication Antenna Structure should not be done without the written approval of TRCSL.
10. Any changes to the antenna structure including change of location and structure are not allowed without a new approval from TRCSL.

Annexure VIII A

Structural stability Report of Antenna structure

To be certified by a suitably qualified Chartered Engineer specialized in structural design.

I am a Chartered Engineer specialized in structural design, who is a member of the Institution of Engineers, Sri Lanka.

I certify that the structural stability of the Antenna Structure with loading and any building on which it may be constructed for a period of five years from the date of this certification.

Location of the site:

Lot No(if any):..... in Survey Plan No. dated by the Registered Licensed Surveyor

Signature:..... Date :

Registered No of the IESL:

NIC No. :

Address and Seal:

Email :

TP. No. :

Annexure VIII B

Compliance of lightning , surge protection and electrical safety Report of Antenna structure

To be certified by a suitably qualified Chartered Electrical/Electronics Engineer.

I am a Chartered Electrical/Electronics Engineer, who is a member of the Institution of Engineers, Sri Lanka.

I certify the **lightning , surge protection and electrical** system of the Antenna Structure for a period of five years from the date of this certification.

Location of the site:

Lot No(if any):..... in Survey plan No. dated by the Registered Licensed Surveyor

Signature:..... Date :

Registered No of the IESL:.....

NIC No. :

Address and Seal:.....

Email :

TP. No. :