# Table of Contents

**Network-as-a-Service Runbook**

***Standard and Regulations: Civil Aviation, Environmental and Radiation Emissions***

**<NaaS Operator’s Name>**

**

*<Release Date>*

[Table of Contents 1](#_Toc47953448)

[1 Document Control 3](#_Toc47953449)

[2 Introduction 4](#_Toc47953450)

[3 Civil Aviation Regulations 4](#_Toc47953451)

[4 Environmental Requirements 5](#_Toc47953452)

[5 Requirements on Radiation Emissions 9](#_Toc47953453)

# Document Control

- Revision Control sheet allows to maintain a record of changes made on the document.

|  |  |  |  |
| --- | --- | --- | --- |
| Version N° | Issue Date | Status | Reasons for Change |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Table 1. Revision History

# Introduction

Construction of towers need to consider Standards and Regulations in the areas of:

* Civil Aviation regulations
* Environmental Safety
* Requirements on radiation emissions

The following paragraphs describe the main items to be considered in these areas. NaaS Operator should check the observance of these regulations by selected Construction Vendors.

# Civil Aviation Regulations

International Civil Aviation Organization (ICAO) regulations will be adopted:

* + Painting stipulations:
    - All skeleton type structures must be painted to International Civil Aviation Organization (ICAO) stipulations on obstruction painting. ICAO stipulates that:
      * For structures up to 212 meters, the structure shall be given seven equal bands of red and white paint or orange and white paint.
      * For structures above 212 meters, nine bands of paint in alternating red and white or red and orange.
      * In all cases the top and bottom of mast or tower must be painted red or orange.
      * Paint shall be non gloss finish (matt).
  + Obstruction Lightning:
    - All mast and tower structures must conform strictly to ICAO guidelines with respect to obstruction lighting of tall structures:
      * For every fifty meters of height above ground level, a tower shall have installed on it, one lamp on top and two lamps at the sides.
      * Obstruction lamps shall always be maintained in a working condition on all structures within 15 kilometers of an airport or helipad.
    - Light intensity and color specifications should be as provided in the following table:

|  |  |  |
| --- | --- | --- |
| Tower Height | Light Intensity | Light Colour |
| Below 45 m | not below 10 candelas | Red and fixed |
| Between 45 and 150m | not below 1600 candelas | Red and flashing |
| Greater than 150m | 4,000 - 20,000 candelas | White Flashing |

* + - The obstruction light must be supplied with uninterruptible power supply in form of battery, solar energy or any other technology to ensure that lights are on during mains power outage and from 6pm to 7am. Aviation lighting gear should be designed to have minimal serviceable components so as to reduce the problems associated with regular climbing of towers to service lamps.
    - The following table shows samples of Lighting Construction components:

|  |  |
| --- | --- |
| Lighting Construction components | |
| Red Light Kits |  |
| Medium Intensity Dual Light Kits |  |
| Beacons |  |

# Environmental Requirements

Environmental Requirements may vary for specific country. For reference purposes, this section presents guidelines for a country in Africa. Requirements could suffer some variations depending on the area of interest of the NaaS Operator. NaaS Operator will require the adoption by selected Construction Vendors of all country’s environmental requirements:

* Height
  + The maximum height for a telecommunication tower shall not exceed 150 meters.
  + Towers exceeding 150 meters in height may be approved by the Commission if it is satisfied that the increased height of the tower:
    - Will not be detrimental to public health, safety or general welfare.
    - Will not have negative effect on the neighborhood.
    - Is in conformity with the plan of the particular area and the general plan of the community.
    - Will not impair compliance with any other applicable laws or guidelines.
* Space requirements.
  + The siting of towers shall conform to the following space requirements:
    - Any tower site shall be served by a parking/loading space.
    - Any tower site lying 50 meters or less from a paved road shall be paved.
    - Where a tower site is more than 50 meters from a paved road, hard-surfacing of the parking/loading spaces and driveways shall not be required for those portions of the site lying more than 50 meters from any paved road.
* Screening
  + The screening of telecommunications masts and towers shall in all cases conform to the followings:
    - The base of all telecommunications towers shall be surrounded by an opaque screen of at least 2.5 meters in height.
    - The screening shall also include landscaping provisions for any portions of the development visible from adjacent residential or used property or right-of way.
    - The use of barbed wire or other security fencing material may be allowed.
  + Screening requirements provided above, may be waived if the design of the tower is found to be compatible with the adjacent land uses.
* Removal of abandoned towers
  + A tower that has not been used for a continuous period of three years may be deemed to have been abandoned.
  + The Commission may request appropriate documentation from the owner/operator to determine the effective date of abandonment.
  + Upon the determination of abandonment, the Commission shall issue a removal notice to the owner, whereupon the owner shall dismantle and remove the tower from the property within 90 days of the receipt of notice from the Commission.
  + An abandoned tower that is not removed within the 90 day period may be removed by the Commission and the removal costs and a minimum penalty shall be paid by the owner to the Commission.
* Inspections
  + All towers shall be subjected to inspection at least once in every six months, to assess the structural condition of the tower and support equipment by a qualified tower inspection service employed by the Commission.
  + Owners of towers which fail to meet the required inspection standards will be notified and required to remedy the situation within 30 days failing which the owner shall pay to the Commission a penalty of 20% of the cost of the tower.
* Shared Use of Towers & Masts
  + The design, construction and Installation of towers over 25 meters shall be done in such a way as to accommodate a minimum of three service providers using the same structure.
  + Owners of Towers shall in furtherance to sub-paragraph above, provide written certifications to the Commission that such towers are available for use by other telecommunications service providers on a reasonable cost and non-discriminatory basis, and modalities and conditions for such shared usage.
  + where any serious disagreement or dispute arises that threatens the shared use of facilities, the Commission shall arbitrate over the dispute and any decision so reached by the Commission shall be final.
  + For the avoidance of doubts, the sharing of towers and masts in these guidelines shall be subject to the provisions of the Collocation and Infrastructure Sharing Guidelines of the Commission.
* Fencing
  + Security fencing, where installed, shall be a wrought iron, barbed wire, or steel chain link fence with evergreen hedge or a masonry wall not less than 1.8 meters in height.
  + The exterior of equipment buildings and/or metal equipment cabinets visible from residential areas or public rights-of-way, shall be painted to reflect the color and character of adjoining structures or blend with adjacent landscaping and other surroundings.
* Setbacks
  + All towers as well as guys and guy anchors shall be located within the build-able area of the property and not within the front, rear, or side building setbacks.
  + All towers in excess of 150 meters in height shall be set back by a minimum of 50 meters from the right-of-way of all controlled access, federal and state roadways designated as freeways, in order to provide unobstructed flight paths for helicopters.
  + In all other cases, the distance for setbacks shall be as follows:
    - 5 meters from any demised property excluding the fence
    - the distance specified as a potential hazard area by the designer of the structure.
    - Guy wire anchors and accessory structures shall not encroach into the mandatory setbacks listed above.
* Signage
  + No signage, lettering, symbols, images, or trademarks in excess of 1200 cm2 shall be placed on or affixed to any part of a tower, mast, antenna or antenna array fencing other than as required by the Commission for the purposes of identifying the operator.
  + No adverts shall be allowed on any of the telecommunication structures stated in sub-paragraph above.
  + Adverts placed contrary to sub-paragraphs above shall be removed by the Commission and the cost of removal shall be borne by the owner of the tower.
* Lighting
  + Towers shall only be illuminated as required by Local and/or the International Civil Aviation Organization (ICAO).
  + No signals, lights or illumination of any kind shall be permitted on or directed towards any tower unless as required by the Local Aviation or any other appropriate public authority.
  + Security lighting around the base of a tower must be shielded so that no light is directed towards adjacent properties or rights-of-way.
* Obstruction Lighting
  + The purpose of obstruction lighting and marking is to ensure that an obstruction to air navigation remains visible at a range sufficient to permit a pilot to take appropriate action in order to avoid the obstruction by not less than 305m vertically within a horizontal radius of 610 meters from the obstruction. A typical obstruction lighting kit shall include the following:
    - Light with bulbs of a minimum of 10,000hrs service life
    - Junction box
    - Photo sensor
    - Power cable (in conduit and armoured)
    - Weather proof Light flasher. Flash rates of 40/min are allowable typical values.
    - Assembly hardware such as U-bolts and connection bolts
  + The obstruction light must be supplied with uninterruptible power supply in form of battery, solar energy or any other technology to ensure that lights are on during mains power outage and from 6pm to 7am. Aviation lighting gear should be designed to have minimal serviceable components so as to reduce the problems associated with regular climbing of towers to service lamps.
  + Owners of mast and towers who do not comply with sub-paragraphs above, shall be liable to pay compensations for accidents occurring as a result of such omissions.
* Tower to Tower Spacing
  + The minimum spacing between two or more towers in excess of 55 meters in height shall be 1 (one) kilometer.
* Nearness to Power Lines
  + No tower or mast shall be installed in close proximity to High Voltage electrical power transmission lines. The nearest distance of a tower to a High Voltage electrical power transmission line shall be the equivalent of 120% of the height of the mast.
  + Owners of mast and towers installed in contravention of the above specifications shall bear the cost of removal of such towers.
* Alternative Mounting Structures
  + Alternative Mounting Structures 30 meters or less in height may be permitted in residential areas. However, Alternative Mounting Structures in excess of 30 meters in height may be permitted in non-residential areas.
  + Alternative Mounting Structures must be similar in color, scale and character to adjoining buildings or structures or blend with the landscaping and other surroundings immediately adjacent to them so as to generally avoid the creation of unique visual objects that stand out in the environment.
* Antenna Mounts

Antenna mounts must have structural integrity so as to guarantee public safety. To this end, the following specifications shall be strictly adhered to:

* Whip and Panel Antenna Mounts
  + - Individual telecommunications antennas may be permitted on existing low tension electric utility poles, light standards, and towers in excess of 12 meters in height, provided that the total length of any antenna does not exceed 15 percent of the height of the existing structure.
    - Telecommunications antennas and arrays are not permitted on existing high tension electric transmission towers.
    - Panel and whip antennas may be permitted on billboard structures.
* Dish Antenna Mounting Standards
  + - Ground mounted dish antennas in excess of 1.5 meters in height shall be screened from roadways and adjacent property by a minimum of 1.8 meter high screening fence.
    - Building and roof mounted dish antennas of one (1) meter or less in diameter, are permitted in all areas. No permits are required for this category
    - The Commission may permit building/roof mounted dish antennas in excess of one (1) meter in diameter, to be placed on buildings on the certification of a structural engineer to the effect that the building can withstand the additional load.

# Requirements on Radiation Emissions

NaaS Operator can be authorized to use radiofrequency spectrum for its business activity. To this extent, holders of authorizations for usage of radiofrequency spectrum must ensure that specific exposure limits are in conformity with those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which are recommended by the World Health Organization (WHO), to protect workers and the general public against excessive exposure to RF fields.

The following Technical Standards and Specifications must be complied to mitigate against any harmful effects of human exposure to Radiofrequency Electromagnetic Fields:

Basic Restrictions for public and occupational exposures as indicated by Basic Limits for Public and Occupational Exposure (ICNIRP)/ITU-T K.52

Where the Basic Restrictions are exceeded, the Reference Levels for public and occupational exposure as set out in Reference Levels for Public and Occupational Exposure (ICNIRP/ITU-T K.52)

Measurement/modelling may be carried out in accordance with the measurement standards recommended by any of the following organizations:

International Electrotechnical Commission (IEC);

International Telecommunication Union (ITU);

Institute of Electrical and Electronics Engineers (IEEE);

European Committee for Electrotechnical Standardization (CENELEC); and

World Health Organization (WHO)

All measurements/modelling or evaluations to establish compliance with these emission limits shall be made or authorized by the Country Radiation Protection Institute (RPI).

The RPI shall determine the appropriate measures to be undertaken in areas where emission levels are exceeded. Such measures may include:

Extending the boundaries of the areas;

Using appropriate signs, warnings and public notices;

Using Engineering or Administrative controls

Undertaking routine monitoring of radiation emissions of antennae once a year in rural areas and twice a year in urban areas to ensure continuous compliance with emission levels.