



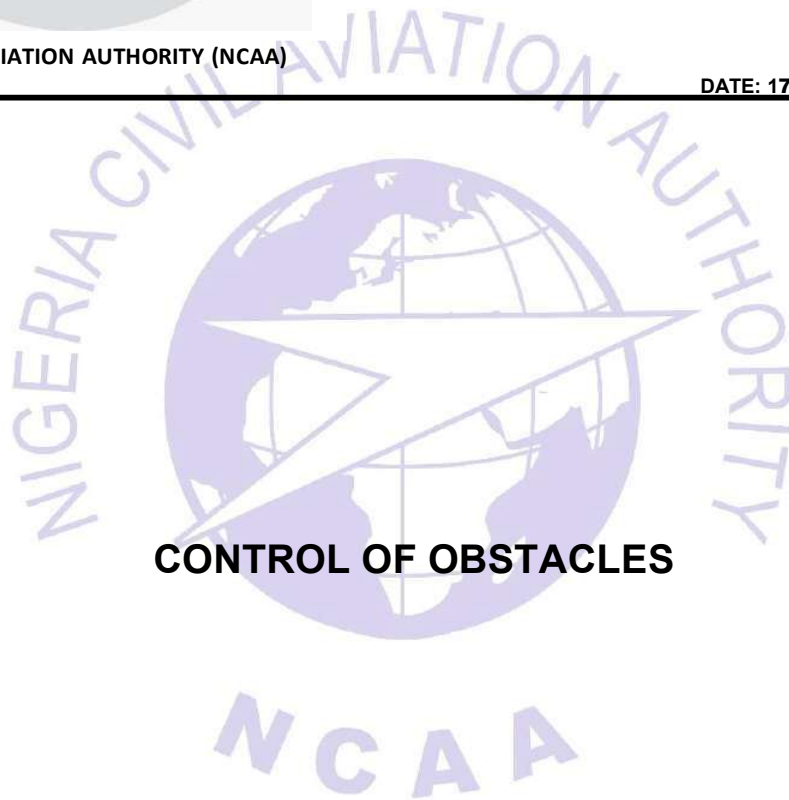
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Advisory Circular

NCAA-AC-ARD013

**NIGERIA CIVIL AVIATION AUTHORITY (NCAA)
ISSUE NO 2**

DATE: 17TH JULY, 2023



CONTROL OF OBSTACLES

Made this ^{17th} day of ^{July} 2023

A handwritten signature in blue ink, appearing to read "Musa Shuaibu Nuhu", is written over a horizontal line.

Captain Musa Shuaibu Nuhu

Director General of Civil Aviation

1.0 GENERAL

Nigeria Civil Aviation Authority Advisory Circulars from Aerodrome Standards Department contain information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated Regulations.

An AMC is not intended to be the only means of compliance with a regulation, and consideration will be given to other methods of compliance that may be presented to the Authority.

2.0 PURPOSE

This Advisory Circular provides methods, acceptable to the Authority, for showing compliance with Control of Obstacles requirements of Part 12 of Nig.CARs Vol I as well as explanatory and interpretative material to assist in showing compliance.

3.0 APPLICABILITY

This AC applies to operators on Aerodrome Certification, Safety Assessments and Aerodrome Compatibility

4.0 REFERENCE

The Advisory Circular relates specifically to 12.1.4.7 and 12.2.4 of Nig.CARs Part 12 Vol I.

5.0 STATUS OF THIS AC

This is a second issue of the AC on this subject.

AMENDMENT PROCEDURES

The Director, Aerodrome and Airspace Standards is responsible for the development, issuance and control of amendments to this document as well as ensuring that the AC is updated in the technical library for staff and the website ncaa.gov.ng for public use.

Each page will show the document number, issue/amendment number, issue date and page number at the base of the page.

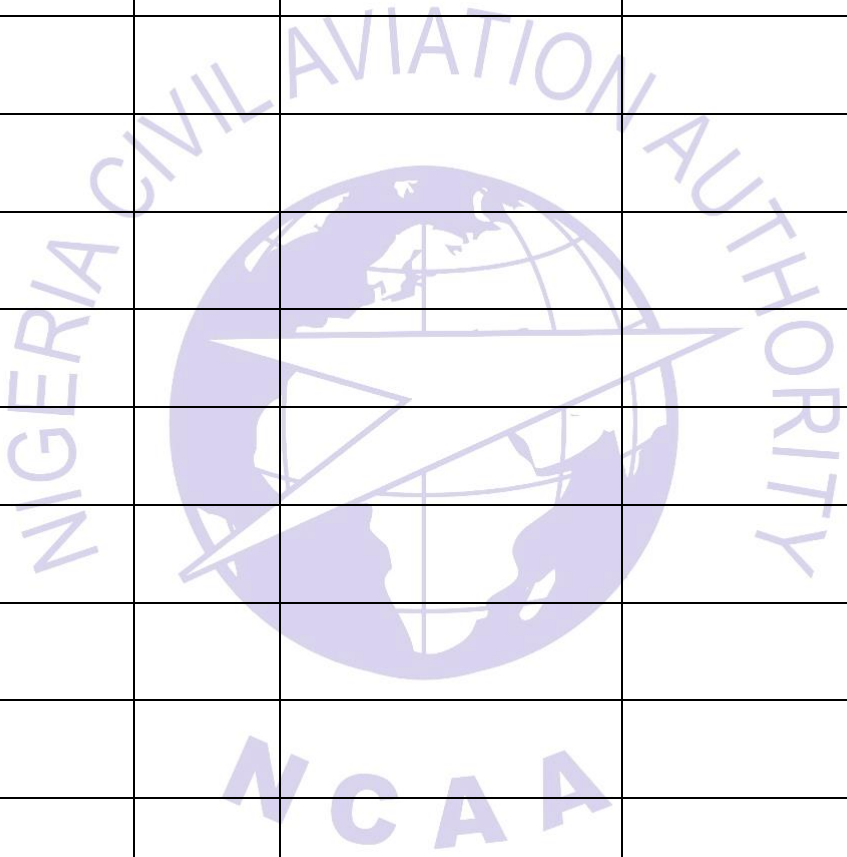
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Nigeria Civil Aviation Authority
Corporate Headquarters
Nnamdi Azikiwe International Airport,
FCT, Abuja.

RECORD OF AMENDMENTS

Issue No/ Amendment No	Page(s) Affected	Date Entered	Entered By	Signature
1/0	All	28 th September,2012		
2/0	All	12 th June, 2023		



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FOREWARD

This document provides guidance to Aerodrome Operators on Obstruction Marking and Lighting, describes the standards for marking and lighting structures such as buildings, chimneys, antenna towers, storage tanks, supporting structures of overhead masts, etc.



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CHAPTER 1

AERODROME OBSTACLE LIMITATION SURFACES

1.1 General

- (a) The effective utilization of an aerodrome may be influenced by natural features and manmade objects inside and outside the aerodrome boundary, furthermore to be effective, they should be enacted in local Government laws. The surfaces established shall allow not only for existing operations, but also for the ultimate development envisaged for each aerodrome. These may result in:
- (1) limitations on the distance available for aircraft take-off and landings;
 - (2) the range of meteorological conditions in which take-off and landings can be undertaken; or
 - (3) a reduction in the payload of some aircraft types, or all the above.

1.2 Obstacle limitation surfaces

- (a) Of the aerodrome design obstacle limitation surfaces the following are the essential elements —
- Inner Transitional Surface
 - transitional surfaces
 - Inner Horizontal Surface
 - conical surface
 - Outer Horizontal surface
 - Inner Approach Surface
 - Approach surface
 - Balked landing surface
- (b) The aerodrome design specifications state that all existing objects penetrating the obstacle limitation surfaces should, as far as practical, be removed unless they are shielded by existing immovable objects. Detailed specifications about the marking and lighting of obstacles are contained in **Nig.CARs Part 12 Vol I, 12.2.4.2.**

1.3 Aerodrome obstacle chart Type “A”

- (a) The aerodrome obstacle chart Type “A” represents a profile of the take-off obstruction environment on departure from a specific runway. The basic slope shown on the chart is 1.2 percent which is below the slope of the protected take-

off climb surface established for a runway intended for use by multi-engine aircraft.

- (b) Although objects may penetrate the 1.2 percent (1:83.3) slope, there is no need to remove any which are beneath the aerodrome design take-off climb surface. However, all objects shown are accountable in the calculation of the aircraft take-off performance and in some instances may affect the payload of a particular aircraft type. The extent of this limitation depends on individual circumstances, but it is possible to significantly reduce the payload penalty by judicious obstacle removal close to the aerodrome. Conversely, it may be that an obstacle several kilometres from the aerodrome is the limiting factor.

1.4 ICAO PANS-OPS surfaces

- (a) The PANS-OPS surfaces are used in the construction of instrument flight procedures. They are designed to safeguard an aeroplane from collision with obstacles when flying on instruments. Pilots use minimum safe altitudes, established for each segment of the instrument procedures, which are based on obstacle clearances in the procedure areas.
- (b) Instrument flight procedure obstacle free surfaces sizes and dimensions do not usually coincide with the aerodrome design obstacle limitation surfaces. Look in PANS-OPS, Doc 8168, Volume 2 for the obstacle free surfaces needed for instrument approach, missed approach procedures, and for visual maneuvering (circling) procedures.

CHAPTER 2

OBSTACLE CONTROL

2.1 General

- (a) When considering obstacle control the following should not be overlooked as they could have an adverse effect on the regularity of aircraft operations:
- (1) Objects which penetrate the approach surface are critical since they represent an erosion of the clearance between the final approach path, usually 3 degrees, and fixed or mobile obstacles on the ground.
 - (2) On an approach where the approach surface is significantly obstructed, the safe operation of aircraft is ensured by raising the aerodrome approach meteorological minima. If the object penetrates into the approach surface, the landing threshold is displaced, effectively reducing the available landing distance. This can have an adverse effect on the regularity of aircraft operations and could impose payload penalties on landing aircraft.
 - (3) The transitional surfaces are adjacent to the runway strip and approach surface. Penetration of them by an obstacle result in the reduction in the clearance available whilst carrying out an approach to land or during a missed approach procedure.
 - (4) Such obstacles may have an adverse effect on the aerodrome meteorological minima and may need marking and lighting.
 - (5) Aircraft performance requirements, applicable to take-off and climb, require all aircraft to clear all obstacles by a minimum specified margin.
 - (6) For a multi-engine aircraft, that requirement includes the climb following failure of the critical engine. Objects which penetrate approach and take-off climb surfaces do not represent a degradation of safety standards but they may impose significant payload penalties on aircraft taking off.
 - (7) The inner horizontal surface is more significant for VFR operations.
 - (8) It also provides protection for circuiting aircraft following an instrument approach. It does not usually represent a critically limiting surface around a large aerodrome handling IFR traffic, except in so far that it extends beneath the approach surface.
 - (9) The conical surface represents the obstacle limiting surface some distance from the aerodrome.
 - (10) It is often not practical to control obstacles which penetrate this surface, although it does usually provide a limit to new construction.

- (11) Obstacle control, to maintain or improve the Aerodrome Obstacle Chart - Type "A" obstacle profile, should be based on the clear understanding of the performance requirements of the aircraft regularly using the aerodrome or those proposed to be brought into regular use.
- (12) Any obstacles which are allowed to penetrate the established PANS-OPS surfaces could raise the minimum safe altitudes of the aerodrome instrument flight procedures.

2.2 Legal authority and responsibility

- (a) Pursuant to the Civil Aviation Act and Nig.CARs, the Authority may impose prohibitions or restrictions on the use of any area of land or Water in the vicinity of aerodromes as may be necessary to ensure Safe and efficient aircraft operations.
- (b) The ultimate responsibility for limitation and control of obstacles must, rest with the Authority. This includes the responsibility for controlling obstacles on airport property and for arranging the removal or lowering of existing obstacles outside the airport boundaries. The latter obligation can be met by negotiations leading to purchase or condemnation the site authorized.
- (c) The NCAA, The Aerodrome Operator, local governments, planning agencies and construction licensing authorities should develop height zoning regulations based on appropriate obstacle limitation surfaces, and limit future developments accordingly. The airport operators shall require property owners or developers to give formal notice of any proposed structure which may penetrate an obstacle limitation surface. Local bodies should co-operate closely with airport operators to ensure that the measures taken provide the greatest possible degree of safety and efficiency for aircraft operations, the maximum economic benefits to neighboring communities and the least possible interference with the rights of property owners.
- (d) NCAA shall designate an aerodrome inspector to be responsible for monitoring the growth of obstacles at and in the vicinity of aerodromes and coordinate with local authorities prevent unauthorized growth of obstacles.

2.3 Identifying obstacles

- (a) Identification of obstacles requires a complete engineering survey of all areas beneath the aerodrome obstacle limitation surfaces.
- (b) The initial survey should produce a chart presenting a plan view of the entire aerodrome and its environs. The scope of the chart should be to the outer limit of the conical, approach and take-off climb surfaces. It will need to include profile views of all obstacle limitation surfaces. Each obstacle should be identified in both plan and profile with its description and height above the datum, which should be specified on the chart. Engineering field surveys can be

supplemented by aerial photographs and photogrammetry to identify possible obstacles not readily visible from the aerodrome.

- (c) Notification of aerodrome data and information, as it is data and information that is required to be provided for promulgation by AIS.
- (d) Periodic surveys should be conducted to ensure the validity of the information in the initial survey. The aerodrome operator should make frequent visual observations of surrounding areas to determine the presence of new obstacles. Follow-up surveys should be conducted whenever significant changes occur. A detailed survey of a specific area may be necessary when the initial survey indicates the presence of obstacles for which a control programme is contemplated. Following completion of an obstacle control programme, the area should be resurveyed to provide corrected data on the presence or absence of obstacles. Similarly, revision surveys should be conducted if changes are made, or planned, to the aerodrome characteristics such as runway length, elevation or orientation. No firm rule can be set down for the frequency of periodic surveys, but constant vigilance is required. Changes in obstacle data arising from surveys are to be notified to the Aeronautical Information Service (AIS) in accordance with established process as soon as practicable for promulgation to the aircraft operators.

2.4 Methods of control

- (a) The viability and safety of aerodrome use by aircraft operators, can be assured by establishing effective obstacle control to maintain the obstacle limitation surfaces. Control can be achieved, in a number of ways, by:
 - (1) enactment of height zoning protection by the local authority;
 - (2) establishing an effective obstacle monitoring and removal programme; or
 - (3) purchasing of easement or property rights, or all of these.

2.5 Height zoning

- (a) The objective of height zoning is to protect the aerodrome obstacle limitation surfaces from intrusion by manmade objects and natural growth such as trees.
- (b) This is done by the enactment of ordinances identifying height limits underneath the aerodrome obstacle limitation surfaces. The responsibility for the enactment of such an ordinance is a matter between the aerodrome operator and the local authority.
- (c) To give effect to height-zoning a zoning map should be prepared for the guidance of the responsible local authority. The map is a composite, relating all zoning criteria to the ground level around the aerodrome. It should cover the aerodrome design obstacle limitation surfaces and, where

applicable, the take-off flight path for the aerodrome obstacle chart Type “A” and any PANS-OPS surfaces.

- (d) Typical zoning ordinances include a statement of the purpose of, or necessity for, the action. They include a description of the obstacle limitation surfaces which should conform to the aerodrome design surfaces and, if applicable, the aerodrome obstacle chart Type “A” and the PANS-OPS surfaces. They also contain a statement of allowable heights which should conform to the specifications for these surfaces. Provisions are made, in the ordinances, for a maximum allowable height, for existing non-conforming uses, for marking and lighting of obstacles and for appeals from the provision of the ordinance. The matter of bird control could also be addressed at the same time by defining areas which the siting of gravel pits, refuse dumps, sewage outfalls and other features, which attract birds, may be subjected to restriction in the interests of aviation safety.

2.6 Obstacle removal

- (a) When obstacles have been identified, the aerodrome operator should make every effort to have them removed, or reduced in height so that they are no longer an obstacle. If the obstacle is a single object it may be possible to reach agreement with the owner of the property to reduce the height to acceptable limits without adverse effect. Examples of such objects are a tree, a television aerial or a chimney.
- (b) In the case of trees, which are trimmed, agreement should be reached in writing with the property owner to ensure that future growth will not create new obstacles. Property owners can give such assurance by agreeing to trim the trees when necessary, or by permitting access to the premises to have the trimming done by the aerodrome operator’s representative. It is important to assess the growth rate of trees and trim them low enough so that the ensuing growth will be below the obstacle surface until the surface is next due for survey.
- (c) Some aids to navigation both electronic, such as ILS components, and visual, such as approach and runway lights, constitute obstacles which cannot be removed. Such objects should be frangible designed and constructed, and mounted on frangible couplings so that they will fail on impact without significant damage to an aircraft.

2.7 Easements or property rights

- (a) In those areas where zoning is inadequate, the aerodrome operator may take steps to protect the obstacle limitation surfaces by other means. Examples of zoning inadequacies might be locations close to runway ends or where obstacles exist. Examples of other means might be such as gaining easements or property rights. They should include removal or reduction in height of existing

obstacles and measures to ensure that no new obstacles may be erected in the future.

- (b) Where agreement can be reached, for the reduction in height of an obstacle, the agreement should include a written aviation easement limiting heights over the property to specific levels unless effective height zoning has been established.

2.8 Marking and lighting of obstacles

- (a) Where it is impractical to eliminate an obstacle, it should be appropriately marked or lighted, or both, to be clearly visible to pilots in all weather and visibility conditions. **Nig.CARs Part 12 Vol I, 12.2.6** contains detailed specifications about the marking and lighting of obstacles.
- (b) Note that the marking and lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be caused by the obstacle. Nigeria Civil Aviation Regulations specifies that obstacles be marked and, if the aerodrome is used at night, lighted, except that:
 - (1) lighting and marking may be omitted when the obstacle is shielded by another obstacle; and
 - (2) the marking may be omitted when the obstacle is lighted by high intensity obstacle lights by day.
- (c) Vehicles and other mobile objects, excluding aircraft, on movement areas of aerodromes should be marked and lighted, unless they are used on apron areas only.

2.9 Obstacle shielding

- (a) The principle of obstacle shielding is employed to permit a more logical approach to restricting new construction and to the requirements for marking and lighting of obstacles. Shielding principles are employed when some object, an existing building or natural terrain, already penetrates above one of the aerodrome design obstacle surfaces. If the obstacle is permanent, then additional objects within a specified area around it can penetrate the surface without being obstacles. The original obstacle dominates or shields the surrounding area.

Note: Further guidance material on the principle of obstacle shielding is contained in ICAO Doc 9137-AN/898, *Airport Services Manual, Part 6, Control of obstacles*.

CHAPTER 3

3.1 Introduction:

- (a) The Authority may regulate or prohibit any structure which by virtue of its height, location or position is considered to constitute a hazard to air navigation. . Any person who proposes any of the following construction or alteration should notify the Authority of:
- (1) Any high-rise construction or alteration above the ground level at its site.
 - (2) Any construction or alteration which extends above an obstacle limitation surface prescribed in the Nigeria Civil Aviation Regulations.
 - (3) Any highway, railroad or other transverse way for mobile objects of which if adjusted upwards 4.8m for roads and highways, 5.4m for railroads or the height of the highest mobile object that would traverse the road will not exceed the standard of paragraph (a)(2) of this chapter.
- (b) A construction or alteration on any of the following:
- (1) Aerodrome, heliport or landing facility;
 - (2) An aerodrome under construction that is subject of a notice or proposal on file with the Authority; and
 - (3) Aerodrome operators should monitor and report to the Authority any erection of high rise man-made structures outside the boundary of their aerodromes to ensure the safety of airspace for aircraft operations.

3.2 Requirement for Construction/ Erection of High-rise Structure

- (a) To put up a structure (permanent or temporary) within the navigable airspace of Nigeria, such a person or organization will be required to obtain Aviation Height Clearance (AHC) Certificate from the Authority.
- (b) **Process for construction and erection of high structures:**

The Authority will conduct a study when:

- (1) Requested by the sponsor of any proposed construction or alteration for which an application is submitted.
- (2) The Authority determines a study is necessary;
- (3) The study serves as the basis for :
 - (i) Evaluating the effect of the construction or alteration on operating procedures;

- (ii) Determining the potential hazardous effect of the proposed construction on air navigation;
- (iii) Identifying mitigating measures to enhance safe air navigation;
- (iv) Charting of new objects.

3.3 Requirements for AHC Certificate

- (a) A person or organisation proposing the construction of a structure or alterations to existing structure should request in writing to the Authority.
- (b) The application letter should contain the following information
 - (1) Owner of the proposed structure;
 - (2) Address of the proposed structure;
 - (3) Geographical Coordinates (WGS 84) of the site;
 - (4) Elevation (above mean sea level) of the site; and
 - (5) Proposed height of the structure including antennas or other appurtenances.
- (c) For “On-Aerodrome” proposal, the additional information will be required:
 - (1) Drawing (preferably scaled) showing location of the object in relation to nearest active runways;
 - (2) Perpendicular distance of the proposed structure to the nearest active runway centerline;
 - (3) Distance along centerline (actual or extended) from runway end to the perpendicular intercepts point;
 - (4) Ground elevation at the site of the proposed structure; and
 - (5) Geographical Coordinates (WGS 84) of the site.
 - (6) Proposed height of the structure including antennas or other appurtenances ;
 - (7) Sketches, drawings, etc showing the type of construction or alteration being proposed.

3.4 Permanent and Temporary Obstructions

- (a) Aerodrome owners and operators should ensure that all structures whether permanent or temporary in nature are evaluated by the Authority prior to commencement of work.
- (b) Listed below are some typical examples of permanent and temporary structures. These lists shall not be construed as all-inclusive of such objects that require AHC:
 - (1) **Permanent Construction or Alteration** : Tower, Mast, Prominent Building, Elevated Signs, Fences, Light Fixtures, Navaid Facilities, National Weather Service Facilities, Power and Cable Lines or Catenaries, Wind Turbine, Chimney, Gas Flare Stacks, Storage Tanks (water or fuel) and similar solid structures.
 - (2) **Temporary Construction or Alteration** : Construction Equipment, Moored Balloon and Kites, Cranes, Drilling Rigs, Stock Piles, Staging Areas, Trucks and Temporary Lights poles.

3.5 Evaluating Aeronautical Effect

- (a) The Authority may conduct a study to determine the impact of a proposed structure, an existing structure that has not yet been studied by the Authority, or an alteration of an existing structure on aeronautical operations, procedures, and the safety of flight. These studies will include evaluating :
 - (1) The impact on arrival, departure, and en route procedures for aircraft operating under visual flight rules;
 - (2) The impact on arrival, departure, and en route procedures for aircraft operating under instrument flight rules;
 - (3) The impact on existing and planned public use aerodromes;
 - (4) Aerodrome traffic capacity of existing public use aerodromes and public use aerodrome development plans received before the issuance of the final determination;
 - (5) Minimum obstacle clearance altitudes, minimum instrument flight rules altitudes, approved or planned instrument approach procedures, and departure procedures;
 - (6) The potential effect on ATC radar, direction finders, ATC tower line-of-sight visibility, and physical or electromagnetic effects on air navigation, communication facilities, weather observation facilities and other surveillance systems;

- (7) The aeronautical effects resulting from the cumulative impact of a proposed construction or alteration of a structure when combined with the effects of other existing or proposed structures.

Note 1: *The Authority encourages the use of antenna farms and the single structure–multiple antenna concepts for telecommunication towers/ masts whenever possible.*

Note 2: *In considering proposals for establishing antenna farm areas, the Authority considers as far as possible, the revision of aeronautical procedures and operations to accommodate antenna structures that will fulfill broadcasting requirements.*

(b) **Site Inspection:**

The proposed site(s) will be assessed by the Authority to verify the accuracy of the information submitted by the applicant and for effective evaluation of the structure(s).

(c) **Determinations:**

- (1) The Authority will issue a determination stating whether the proposed construction or alteration would be a hazard to air navigation, and will advise the applicant(s) and/or known interested person(s).
- (2) The Authority makes determinations based on the study findings and will identify the following:
 - (i) The effects on VFR/IFR aeronautical departure/arrival operations, air traffic procedures, minimum flight altitudes, and existing, planned, or proposed aerodromes of which the Authority has received actual notice prior to issuance of a final determination; and
 - (ii) The extent of the physical and/or electromagnetic effect on the operation of existing or proposed air navigation facilities, communication aids, or surveillance systems.

3.6 Refusal to grant AHC:

- (a) The Authority will not grant AHC to any structure when the evaluation concludes that the proposed construction or alteration will exceed an obstruction standard and would have a substantial aeronautical impact.

Note : *When the aeronautical study concludes that temporary structure will exceed an obstruction standard but would not have a substantial aeronautical impact to air navigation, all relevant conditional provisions - notice requirements, operational hours, marking and lightings as appropriate - to prevent potential problems should be put in place.*

3.7 Grant of AHC to erect Structures:

- (a) The Authority will issue AHC if the results of the evaluation carried out indicates that the erection of the structure on the proposed site will not constitute hazard to air navigation

3.8 Obligations of AHC Holder:

- (a) Ensure that the height of the structure does not exceed the height for which AHC has been granted.
- (b) Ensure that the structure is appropriately marked and lighted as stipulated in the conditions for granting the AHC.
- (c) Ensure that the painting and warning lights to be used on the approved structures conform to appropriate standards for conspicuity that would better serve aviation safety.
- (d) Ensure proper records of AHC granted to it and the renewal of the AHC, at least 30 days to the expiry dates.

3.9 Markings and Lights

- (a) Alternate sections of aviation orange (or red) and white paints will be used as they provide maximum visibility of an obstruction by contrast in colour.
- (b) The height of the structure will determine the number of alternate marking sections and number of light levels as stipulated in the Nigeria Civil Aviation Regulations.

3.10 Markers

Markers should be used to highlight structures when it is impractical to make them conspicuous by painting or when additional conspicuity is necessary for aviation safety.

Markers should be:

- (a) displayed in conspicuous positions on or adjacent to the structures so as to retain the general definition of the structure.
- (b) **distinctly shaped** – spherical or cylindrical – so they are not mistaken for items that are used to convey other information and shall be recognisable in clear air from a distance of at least 4000ft (1.22km) and in all directions from which aircraft are likely to approach. displayed in conspicuous positions on or adjacent to the structures so as to retain the general definition of the structure.

3.11 Maintenance:

- (a) The structure surfaces should be repainted when the colour changes noticeably or its effectiveness is reduced by scaling, oxidation, chipping, or layers of contamination.
- (b) Markers should be replaced when faded or otherwise deteriorated and obstruction warning lights shall be closely monitored by visual or automatic means to ensure that burnt lights are replaced without delay.

3.12 Period of Validity and Renewal:

The AHC will remain in force for a period of one (1) year when it shall be due for renewal unless suspended or cancelled by the Authority.

3.13 Suspension or Cancellation

- (a) The Authority may suspend or cancel aviation height clearance certificate if there is a variation in the approved height of structure without notification to the Authority or the holder of the AHC fails to carry out appropriate maintenance regarding the painting, markers and warning lights on the structure; and
- (b) The holder of a suspended or cancelled AHC should ensure that the anomalies that caused the suspension or cancellation are addressed within 21- days or have the structure dismantled.

3.14 Change of ownership

- (a) The holder of AHC should notify the Authority whenever there is a change in ownership of a structure;
- (b) An evaluation of the structure may be conducted by the Authority of any construction or alteration for which a notice is made in order to determine the effect of the proposal upon the operation of air navigation facilities and the safe and efficient use of the navigable airspace.
- (c) The evaluation may include the physical and electromagnetic radiation effect the proposal may have on the operation of air navigation facility.