CNS Circular 07 of 2021

Recommended check list for site selection of Radio Navigation Aids at Airport

संचार, दिक्चालन एवं निगरानी- प्रचालन एवं अनुरक्षण निदेशालय

Directorate of Communication Navigation Surveillance – Operations & Maintenance (CNS-OM)

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Safdarjung Airport New Delhi - 110003

CNS Circular 07 of 2021

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Sub: Recommended check list for site selection of Radio Navigation Aids at Airport.

1. Introduction

1.1. The site at which a new or trans installed Radio Navigation facility is to be installed is determined by various operational and technical requirements. The actual site will normally be selected considering satisfaction of the operational requirements, construction aspects and maintainability.

1.2. Generally, the site selected should be at reasonably level, have adequate drainage, be above local flood levels of rivers or sea, and should not have an excess of vegetation such as high grass or trees. In addition, it is desirable that the site be close to electric power and telephone service connections and be accessible from existing roads. In mountainous areas it will often be impossible to find a site meeting these general requirements and satisfying the particular requirements of the aid to be installed. In this case the site chosen should be one that is capable of development to meet the main operational requirements at reasonable cost.

1.3. While selecting a site for a Radio Navigational Aid, minimum requirements for proper performance of each type of Radio Navigation Aid is to be considered. Infringement of the siting standards and the restricted areas does not necessarily mean that a particular aid will be unusable or unsafe, although the service, radio coverage etc. it provides may be degraded or restricted. In certain cases, operational tolerance may permit some relaxation of these criteria.

2. Purpose

2.1. Purpose of this CNS Circular is to provide information and guidelines pertaining to selection of sites for installation of Radio Navigation facilities, which are essential for the provision of safe and efficient air traffic services by Airports Authority of India. It is published for use and guidance of all ATSEPs involved in planning, installation and maintenance of Radio Navigation Aids in Airports Authority of India.

3. Scope and Responsibility: -

3.1. This CNS Circular is applicable to all Radio Navigation facilities at all Airports and Aeronautical Communication Stations (including civil enclaves) of Airports Authority of India.

4. Recommended Checklist for Site Selection of Radio Navigation Aids: -

4.1. Guidelines for site selection of Radio Navigation aids are provided in ICAO Annex 10 Volume-I- Radio Navigational aids, Doc 8071 Volume-I – Testing of Ground Based Radio Navigation Systems.

4.2. Guidelines are also provided in CHQ CNS Manual Volume-III – Siting of CNS facilities.

4.3. Besides above, Frangibility requirements for siting of Radio Navigation aids are provided in ICAO Annex 14 Volume-I – Aerodromes and ICAO Aerodrome Design Manual Doc 9157 Part- 6-Frangibility.

4.4. Based on above guidelines, recommended checklist for Site selection of ILS Localizer Cat-I, ILS Glide Path Cat-I and DVOR along with collocated DME have been framed and enclosed with this CNS Circular as a guidance material for ATSEPs involved in siting as well as maintenance of Radio Navigation Aids.

4.5. Other operational requirements such as from Flight Procedure Design and Height Restriction as per AGA criteria (GSR 751 as amended from time to time) are also to be taken care while siting the Radio navigation aids.

5. Queries: -

5.1. Any queries or further guidance required on the content of this CNS circular should be addressed to: -

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6. Validity: -

6.1. This CNS Circular shall remain in force until further notice.

[G S RAO]
Executive Director [CNS-OM]

Enclosed:

- Attachment- I: *Recommended Checklist for Site selection of Localizer (LLZ) (Cat I)*
- Attachment- II: *Recommended Checklist for Site selection of Glide Path (GP) (Cat I)*
- Attachment- III: *Recommended Checklist for Site selection of DVOR*
- Attachment- IV: *Recommended Checklist for Site selection of LP & HP DME*

Attachment- I

Recommended Checklist for Site selection of localizer (LLZ) (Cat I)

Sl. No.	Description Recommendation RCDU Comments	Recommendation			Remarks
1.	LOC antenna installation	Preferably at a distance of 305 M or more from stop end of RWY or beyond declared RESA as per availability of site.			
2.	RESA	Min 90m×90m and Max 240m×90m after over run area.			As per declared RESA of the runway at the airport
3.	Overrun area (part of basic strip)	Extends 60 m from physical end of RWY.			
4.	AMSL of Localizer antenna site	Preferably the same as nearest physical end of RWY.			It depends upon AMSL of Approach THR as well as site condition.
5.	Permissible localizer antenna height (in mtrs). As per AGA criteria	(Distance of loc antenna from physical end - 60 m) ÷50 Note: For same AMSL of both loc site and physical end.			
6.	Critical area/Sensitive area (Loc antenna large aperture): Xc= Critical Yc= Critical Zc= Critical rear side	Medium Aircraft Height: 6 to 14 m	Large aircraft Height: 14 to 20 m	Very large aircraft Height: 20 to 25 m	As per guidelines of CNS Circular on the subject 08/2019 as amended from time to time
		Xc=150 m Yc= 25 m Zc= 10 m	Xc= 410 m Yc= 30 m Zc= 10 m	Xc= 580 m Yc= 40 m Zc= 10 m	
7.	Gradient. (As per RCDU drawing 2017/01)	Slope in any direction shall be less than 1:100 in the critical area. Roughness of the graded area shall be less than 15cm & transverse slope to be symmetrical about the extended centre line.			
8.	LOC Equipment installation	At a lateral distance of 60m from centre of LLZ antenna on either side.			Equipment shelter should be outside the basic strip of runway to the extent possible.
9.	Type of equipment shelter	**Non-frangible** if the equipment shelter is at 81m or more from centre of loc antenna. **Frangible** if the equipment shelter is at a distance of 80 m or less from centre of loc antenna. May vary frangibility requirement depending upon location of loc antenna keeping in view of its distance and land available.			

10.	Obstacle limitation	No object should subtend an angle ≥0.75 deg within ± 10 deg on either side. No object should subtend an angle ≥1.1 deg between ±10 deg and ±35 deg on either side.	Simulation study may be carried out in case of any obstruction observed beyond limit which cannot be removed
11.	Height of antenna pedestal	Preferably flushed with the ground by maintaining recommended gradient.	
12.	NOC criteria for Loc antenna/Equipment shelter	Height including lightning arrestor/ obstruction light etc.	
13.	Future development plan	Future development / runway extension/construction of parallel taxiway etc. as per the Airport Master Plan must be considered	
14.	Miscellaneous	Airport Obstacle Chart, Airport Grid Map & Airport future plan are also to be obtained from respective resources.	

Attachment- II

Recommended Checklist for Site selection of Glide Path (GP) (Cat I)

Sl. No.	Description Recommendation RCDU Comments	Recommendation			Remarks
1.	GP antenna installation	At a longitudinal distance of 300 m or more from RWY threshold and at a lateral distance of 120m-124m from RWY centre line.			Longitudinal distance from RWY THR depends upon GP Ground profile.
2.	AMSL of GP antenna site	Preferably the same as nearest RWY threshold.			Depends upon the site conditions too.
3.	Permissible GP antenna height. (As per PANOPS Doc 8168 Vol II)	Maximum height above threshold 17m (55ft).			
4.	Critical area/ Sensitive area (GP antenna M Array)	Medium Aircraft Height: 6 to 14 m	Large Aircraft Height: 14 to 20 m	Very large Aircraft Height: 20 to 25 m	As per guidelines of CNS Circular on the subject 08/2019 as amended from time to time
		Xc = 329 m Yc = 20 m	Xc= 467m Yc= 22 m	Xc= 610 m Yc= 15 m	
5.	Gradient. (As per RCDU drawing 2017/01)	Area "A" & "B" as marked in the drawing should have same longitudinal slope as Runway and lateral slope is 1.5% maximum. The texture requirement of area A & B should have uniform texture and graded with a constant average slope			Max permissible roughness: Area A ± 4 CM Area B ± 15 CM Transition between Areas: A to B - 2% (A+B) to C - 5%
6.	GP Equipment Installation	At a lateral distance of 120 to 124m from RWY Centre Line and about 03 M longitudinally behind GP antenna.			
7.	Type of GP equipment shelter &Mast	**Frangible**			
8.	Obstacle limitation	No object should subtend an elevation angle ≥1.1 deg within ± 08 deg of azimuth on either side of the GP antenna in the approach direction parallel to RWY C.L.			Simulation study may be carried out in case of any obstruction observed beyond limit which cannot be removed
9.	Height of GP antenna Mast plinth.	Preferably maintained same level as that of Threshold			

10.	NOC criteria for Loc antenna/Equipment shelter	Height including lightning arrestor/obstruction light etc.	
11	Future development plan	Future development / runway extension/construction of parallel taxiway as per the Airport Master Plan must be considered	
12	Miscellaneous	Airport Obstacle Chart, Airport Grid Map & Airport future plan are also to be obtained from respective resources.	

Attachment- III

Recommended Checklist for Site selection of DVOR

Sl. No.	Description Recommendation RCDU Comments	Recommendation	Remarks
1.	DVOR site	Suitability/feasibility of the site (s) as per ATM/IAL criteria.	
2.	Minimum distance of site from Rwy.	**a)** If site is in transition of RWY, site should be at a minimum lateral distance of 140 M (Basic Strip) + 77 M (1: 7 for requisite height of 11 M AGL) = 217 M from the RWY C/L. **b)** If site is in approach of RWY, site should be at a minimum longitudinal distance of 60 M (Basic Strip) + 550 M (1 : 50 for requisite height of 11 M AGL) = 610 M from the Physical end of RWY and preferably within 100 to 150 M away from extended RWY C/L. **Note:** For same AMSL of both site and RWY C/L (abeam) / RWY physical end. (Difference of AMSL of site to be considered for requisite height calculation).	
3.	Permissible Height NOC, through NOCAS.	Permissibility of requisite height (NOC) of about 11M AGL including lightning Arrestor/obstruction light etc.	
4.	NCZ (No Construction Zone)	NCZ of 300 meters shall generally be protected.	**a.** No metallic structure/ construction having horizontal span/spread of 10 degree shall be constructed/ available in the area between Centre of DVOR CP up to minimum 100 meters must be protected. **b.** One of trees less than 7 meter with horizontal span of not more than 7 degrees can be there in the area between Centre of DVOR CP up to minimum 100 meters.

			c. Power lines less than 5 meter having horizontal span/spread of 10 degree can be there in area between 100 to 200 meters area from Centre of DVOR CP. **d.** Group of trees less than 10 meter with horizontal span of not more than 7 degrees can be there in the area between 100 to 200 meters area from Centre of DVOR CP. **e.** Metallic construction less than 6 meters having horizontal span/spread of 10 degree can be constructed/ available in the area between 200 to 300 meters area from Centre of DVOR CP. **f.** One of building/structure less than 12 meters having horizontal span/spread of 7 degree can be constructed/ available in the area between 200 to 300 meters area from Centre of DVOR CP. **g.** Terrain slope can preferably be less than equal to 2-3 % up to 100 meters from Centre of DVOR CP, less than equal to 4% up to 200 meters from Centre of DVOR CP and less than equal to 8% up to 300 meters from Centre of DVOR CP & beyond. **h.** Preferably No water bodies or accumulation shall be there in the area between Centre of DVOR CP up to minimum 100 meters.
5.	High Tension lines	HT lines preferably shall be underground or it should not subtend more than 0.5 deg. from the CP level.	
6.	Obstacle limitation	No object should subtend a vertical angle more than 1.5 deg. from the CP level or as per CNS siting criteria & GSR 751. If no alternate site is available and obstacles cannot be removed than simulation may be carryout to observe impact of the obstacle on DVOR coverage, distant hills/mountains should not subtend more than 0.75 deg.	

7.	Existing Flight route (radials) protection	Existing flight route/radials should be considered during site selection.	
8.	Site selection near existing DVOR site	Site can be selected about 60 M or more from existing DVOR.	Simulation study may be carried out in case of any obstruction observed beyond limit which cannot be removed.
9.	Future development, if any	Future development / runway extension as per the Airport Master Plan must be considered	
10.	Boundary wall	Preferably distance of nearest boundary wall should be more than 40 M.	
11.	WGS 84 Co- ordinates, AMSL, X & Y distances of the site.	Must be noted carefully. (X– distance from RWY end / RWY THR Y- perpendicular distance of DVOR from RWY C/L.	
12.	Any other issue/ obstruction.	Issues, if any regarding operationalization of DVOR/DME and any other significant obstruction like Hills, Buildings etc. around the site. Existing DVOR FIU report must be checked.	
13.	Location of Monitor antenna	To be ensure space for installation of monitor antenna available, monitor antenna to be installed at about 100-110 meters from the centre of the DVOR counterpoise. The monitor antenna preferably is not to be installed towards runway side to meet the obstruction criteria, however if constructed/erected then frangibility requirements shall be ensured in the structure constructed/erected. The height of the monitor may be taken 6 meters AGL or as same as DVOR CP mesh level.	
14.	Requirement of plot size for DVOR installation.	If a suitable space is not available with airport, a plot size of 200 X 200 Meter +/- 10% may be acquired to accommodate DVOR & monitor antenna and best effort shall be to meet MPS (Minimum Performance Specification) for DVOR siting.	
15.	Miscellaneous	Wherever MPS for DVOR siting is fringed or not feasible to meet then same shall be put for considered approval along with simulation evaluation/ studies results/inputs/ constraints.	

Attachment- IV

Recommended Checklist for Site selection of LP & HP DME

Sl. No.	Description Recommendation RCDU Comments	Recommendation	Remarks
1.	When LP/HP DME associated with ILS or VOR/NDB.	When a LP/HP DME function is combined with either an ILS or VOR/NDB for the purpose of constituting a single facility, they shall be considered to be associated in a manner complying to recommended check list of associated facility.	
2.	When DME is Collocated with VOR/NDB	**a) coaxial collocation:** the VOR and DME antennas are located on the same vertical axis &/ on the same Counterpoise. **b) offset collocation:** **1)** for those facilities used in terminal areas for approach purposes or other procedures where the highest position fixing accuracy of system capability is required, the separation of the VOR/NDB and DME antennas does not exceed 30 m (100 ft) except that, at Doppler VOR facilities, where DME service is provided by a separate facility, the antennas may be separated by more than 30 m (100 ft), but not in excess of 80 m (260 ft); **2)** for purposes other than those indicated in **1)**, the separation of the VOR/NDB and DME antennas does not exceed 600 m (2 000 ft).	

3.	When DME is Collocated with ILS.	**a)** When DME is used as an alternative to ILS marker beacons, the DME should be located on the airport so that the zero-range indication will be a point near the runway. If the DME associated with ILS uses a zero-range offset, this facility has to be excluded from RNAV solutions. **b)** In order to reduce the triangulation error, the DME should be sited to ensure a small angle (e.g. less than 20 degrees) between the approach path and the direction to the DME at the points where the distance information is required. **c)** The use of DME as an alternative to the middle marker beacon assumes a DME system accuracy of 0.37 km (0.2 NM) or better and a resolution of the airborne indication such as to allow this accuracy to be attained. **d)** While it is not specifically required that DME be frequency paired with the localizer when it is used as an alternative for the outer marker, frequency pairing is preferred wherever DME is used with ILS to simplify pilot operation and to enable aircraft with two ILS receivers to use both receivers on the ILS channel. **e)** When the DME is frequency paired with the localizer, the DME transponder identification should be obtained by the "associated" signal from the frequency paired localizer.	
4.	Standalone LP/HP DME Facility	No steel tower, power lines, metal building shall preferably be not located within the area of 150 Meter radius or shall make/protrude elevation angle of 3 degree measured from the base of Distance Measuring Equipment antenna.	