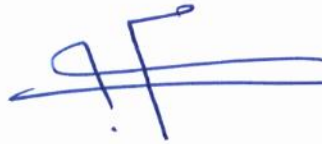


**PART 150****Airport Noise Compatibility Planning**

This new part of Jordanian Civil Aviation Regulations is hereby adopted under the authority and provisions of the Civil Aviation Law No. (41) dated 2007, and its amendments.



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**Chief Commissioner/CEO**  
**Civil Aviation Regulatory Commission**







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#### **Noise Exposure Maps**

## **Subpart -A General Provisions**

### **150.1 Scope and purpose.**

This part prescribes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps. It prescribes single systems for:

- (a) measuring noise at airports and surrounding areas that generally provides a highly reliable relationship between projected noise exposure and surveyed reaction of people to noise; and
- (b) determining exposure of individuals to noise that results from the operations of an airport. This part also identifies those land uses which are normally compatible with various levels of exposure to noise by individuals. It provides technical assistance to the official concerned authorities responsible for land use planning, to prepare and execute appropriate noise compatibility planning and implementation programs.

### **150.3 Applicability.**

This part applies to the airport noise compatibility planning activities of the operators of "public use airports", including heliports.

### **150.5 Limitations of this part.**

- (a) This part provides for airport noise exposure maps developed by the airport operators and presented to the concerned authorities responsible for land use planning necessary to the purposes of those provisions. No submittal of a map, or approval or disapproval, in whole or part, of any map or program submitted under this part is a determination concerning the acceptability or unacceptability of that land use under applicable laws or related national practices on this subject.
- (b) Approval of a noise compatibility program is not a commitment by the CARC to financially assist in the implementation of the program.
- (c) Acceptance of a noise exposure map does not constitute a CARC determination that any specific parcel of land lies within a particular noise contour. Responsibility for interpretation of the effects of noise contours upon subjacent land uses, including the relationship between noise contours and specific properties, rests with the airport operator and concerned authorities.

### 150.7 Definitions.

As used in this part, unless the context requires otherwise, the following terms have the following meanings.

***Airport*** means any public use airport, including heliports, as defined by the Civil Aviation Law, including: (a) Any airport which is used or to be used for public purposes, under the control of the government, the landing area of which is publicly owned; (b) any privately operated airport

***Airport noise compatibility program*** means the program established by the official authorities regarding planning of land use according to this part.

***Airport Operator*** means a person that operates an airport serving an aircraft operator or a foreign air carrier required to be certified under JCAR Part 139.

***Average sound level*** means the level, in decibels, of the mean-square, A-weighted sound pressure during a specified period, with reference to the square of the standard reference sound pressure of 20 micropascals.

***Compatible land use*** means the use of land that is identified under this part as normally compatible with the outdoor noise environment (or an adequately attenuated noise level reduction for any indoor activities involved) at the location because the yearly day-night average sound level is at or below that identified for that or similar use under appendix A (Table 1) of this part or any CARC approved equivalent.

***Day-night average sound level (DNL)*** means the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m., and midnight, local time. The symbol for DNL is Ldn.

***Noise exposure map*** means a scaled, geographic depiction of an airport, its noise contours, and surrounding area developed in accordance with section A150.101 of appendix A of this part or any CARC approved equivalent, including the accompanying documentation setting forth the required descriptions of forecast aircraft operations at that airport during the fifth calendar year beginning after submission of the map, together with the ways, if any, those operations will affect the map (including noise contours and the forecast land uses).

**Noise level reduction (NLR)** means the amount of noise level reduction in decibels achieved through incorporation of noise attenuation (between outdoor and indoor levels) in the design and construction of a structure.

**Noncompatible land use** means the use of land that is identified under this part as normally not compatible with the outdoor noise environment (or an adequately attenuated noise reduction level for the indoor activities involved at the location) because the yearly day-night average sound level is above that identified for that or similar use under appendix A (Table 1) of this part or any CARC approved equivalent.

**Restriction affecting flight procedures** means any requirement, limitation, or other action affecting the operation of aircraft, in the air or on the ground.

**Sound exposure level** means the level, in decibels, of the time integral of squared A-weighted sound pressure during a specified period or event, with reference to the square of the standard reference sound pressure of 20 micropascals and a duration of one second.

**Yearly day-night average sound level (YDNL)** means the 365-day average, in decibels, day-night average sound level. The symbol for YDNL is also Ldn.

### **150.9 Designation of noise systems.**

For purposes of this part, the following designations apply:

- (a) The noise at an airport and surrounding areas covered by a noise exposure map must be measured in A-weighted sound pressure level (LA) in units of decibels (dBA) in accordance with the specifications and methods prescribed under appendix A of this part or any CARC approved equivalent.
- (b) The exposure of individuals to noise resulting from the operation of an airport must be established in terms of yearly day-night average sound level (YDNL) calculated in accordance with the specifications and methods prescribed under appendix A of this part or any CARC approved equivalent.
- (c) Uses of computer models to create noise contours must be in accordance with the criteria prescribed under appendix A of this part or any CARC approved equivalent.

### **150.11 Identification of land uses.**

For the purposes of this part, uses of land which are normally compatible or noncompatible with various noise exposure levels to individuals around airports must be identified in accordance with the criteria prescribed under appendix A of this part or any CARC approved equivalent. Determination of land use must be based on professional planning criteria and procedures utilizing comprehensive, or master, land use planning, zoning, and building and site designing, as appropriate. If more than one current or future land use is permissible, determination of compatibility must be based on that use most adversely affected by noise.

### **Subpart- B Development of Noise Exposure Maps and Noise Compatibility Programs**

#### **150.21 Noise exposure maps and related descriptions.**

(a) Each airport operator may after completion of the consultations and public procedure specified under paragraph (b) of this section submit to the Chief Commissioner /CEO two copies of the noise exposure map (or revised map), as of the date of submission, and two copies of a map each with accompanying documentation setting forth the noise exposure based on forecast aircraft operations at the airport for the tenth calendar year beginning after the date of submission (based on reasonable assumptions concerning future type and frequency of aircraft operations, number of nighttime operations, flight patterns, and airport layout including any planned airport development.

(b) Each map, and related documentation submitted under this section must be developed and prepared in accordance with appendix A of this part, or a CARC approved equivalent, and in consultation with authorities, and public agencies and planning agencies whose area, or any portion of whose area, of jurisdiction is within the Ldn 65 dB contour depicted on the map, CARC officials, and other governmental officials having local responsibility for land uses depicted on the map. This consultation must include regular aeronautical users of the airport. The airport operator shall certify that it has afforded interested persons adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations. Each map and revised map must be accompanied by documentation describing the consultation accomplished under this paragraph during the development of the map. One copy of all written comments received during consultation shall also be filed with the Chief Commissioner/CEO



(c) The Chief Commissioner /CEO acknowledges receipt of noise exposure maps and descriptions and indicates whether they are in compliance with the applicable requirements.

(d) If, after submission of a noise exposure map under paragraph (a) of this section, any change in the operation of the airport would create any “substantial, new noncompatible use” in any area depicted on the map beyond that which is forecast for the tenth calendar year after the date of submission, the airport operator shall, in accordance with this section, promptly prepare and submit a revised noise exposure map. A change in the operation of an airport creates a substantial new noncompatible use if that change results in an increase in the yearly day-night average sound level of 1.5 dB or greater in either a land area which was formerly compatible but is thereby made noncompatible under appendix A (Table 1) or any CARC approved equivalent, or in a land area which was previously determined to be noncompatible under that Table and whose noncompatibility is now significantly increased. If the ten-year forecast map is based on assumptions involving recommendations in a noise compatibility program which are subsequently disapproved by the CARC, a revised map must be submitted if revised assumptions would create a substantial, new noncompatible use not indicated on the initial ten -year map. Revised noise exposure maps are subject to the same requirements and procedures as initial submissions of noise exposure maps under this part.

### **150.23 Noise compatibility programs.**

(a) The airport operator shall submit all noise exposure maps to the concerned official agencies responsible for establishing noise compatibility programs related to land use planning.

(b) Airport operators shall validate the applicability of the noise contour maps at least bi-annually and/or as required by the CARC.

## **Appendix- A**

### **Noise Exposure Maps**

#### **1. GENERAL**

##### **A150.1 Purpose.**

(a) This appendix establishes a uniform methodology for the development and preparation of airport noise exposure maps. That methodology includes a single system of measuring noise at airports for which there is a highly reliable relationship between projected noise exposure and surveyed reactions of people to noise along with a separate single system for determining the exposure of individuals to noise. It also identifies land uses which, for the purpose of this part are considered to be compatible with various exposures of individuals to noise around airports.

(b) This appendix provides standards for developing standardized noise exposure maps and predicting noise impacts. Noise monitoring may be utilized by airport operators for data acquisition and data refinement, but is not required by this part for the development of noise exposure maps or airport noise compatibility programs. Whenever noise monitoring is used, under this part, it should be accomplished in accordance with Paragraph. A150.5 of this appendix.

##### **A150.3 Noise descriptors.**

(a) Airport Noise Measurement. The A-Weighted Sound Level, measured, filtered and recorded in accordance with Paragraph. A150.5 of this appendix, must be employed as the unit for the measurement of single event noise at airports and in the areas surrounding the airports.

(b) Airport Noise Exposure. The yearly day-night average sound level (YDNL) must be employed for the analysis and characterization of multiple aircraft noise events and for determining the cumulative exposure of individuals to noise around airports.

##### **A150.5 Noise measurement procedures and equipment.**

(a) Sound levels must be measured or analyzed with equipment having the “A” frequency weighting, filter characteristics, and the “slow response” characteristics.

(b) Noise measurements and documentation must be in accordance with accepted acoustical measurement methodology acceptable to the Chief Commissioner /CEO.

## 2. NOISE EXPOSURE MAP DEVELOPMENT

### A150.101 Noise contours and land usages.

(a) To determine the extent of the noise impact around an airport, airport proprietors developing noise exposure maps in accordance with this part must develop Ldn contours. Continuous contours must be developed for YDNL levels of 65, 70, and 75 (additional contours may be developed and depicted when appropriate).

(b) Table 1 of this appendix describes compatible land use information for several land uses as a function of YDNL values. The ranges of YDNL values in Table 1 reflect the statistical variability for the responses of large groups of people to noise. Any particular level might not, therefore, accurately assess an individual's perception of an actual noise environment. Compatible or noncompatible land use is determined by comparing the predicted or measured YDNL values at a site with the values given. Adjustments or modifications of the descriptions of the land-use categories may be desirable after consideration of specific local conditions.

(c) Compatibility designations in Table 1 generally refer to the major use of the site. If other uses with greater sensitivity to noise are permitted by local authorities at a site, a determination of compatibility must be based on that use which is most adversely affected by noise. When appropriate, noise level reduction through incorporation of sound attenuation into the design and construction of a structure may be necessary to achieve compatibility.

(d) For the purpose of compliance with this part, all land uses are considered to be compatible with noise levels less than Ldn 65 dB. Local needs or values may dictate further delineation based on local requirements or determinations.

(e) The noise exposure maps must also contain and identify:

(1) Runway locations.

(2) Flight tracks.

(3) Noise contours of Ldn 65, 70, and 75 dB resulting from aircraft operations.

(4) Outline of the airport boundaries.

(5) Location of noise sensitive public buildings (such as schools, hospitals, health care facilities and historic places).

(6) Locations of any aircraft noise monitoring sites, if any, utilized for data acquisition and refinement procedures.

(7) Estimates of the number of people residing within the Ldn 65, 70, and 75 dB contours where required.

(8) Depiction of the required noise contours over a land map of a sufficient scale and quality to discern streets and other identifiable geographic features.

**TABLE 1****Land Use Compatibility \* With Yearly Day-Night Average Sound Levels**

Land Use	Yearly day–night average sound level (L <sub>dn</sub> ) in decibels					
	Below 65	65–70	70-75	75-80	80-85	Over 85
<b>RESIDENTIAL</b>						
Residential, other than mobile homes and transient lodgings.	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
<b>PUBLIC USE</b>						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
<b>COMMERCIAL USE</b>						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail – building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade – general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
<b>MANUFACTURING AND PRODUCTION</b>						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
<b>RECREATIONAL</b>						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and campus	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

\* The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

Key to Table 1

- Y (Yes) = Land Use and related structures compatible without restrictions.
- N (No) = Land Use and related structures are not compatible and should be prohibited.
- NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
- 25, 30, or 35 = Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table 1

- (1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
- (2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- (3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- (4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.
- (5) Land use compatible provided special sound reinforcement systems are installed.
- (6) Residential buildings require an NLR of 25.
- (7) Residential buildings require an NLR of 30.
- (8) Residential buildings not permitted.

**A150.103 Use of computer prediction model.**

(a) The airport operator shall acquire the aviation operations data necessary to develop noise exposure contours using a **CARC** approved methodology or computer program. In considering approval of a methodology or computer program, key factors include the demonstrated capability to produce the required output and the public availability of the program or methodology to provide interested parties the opportunity to substantiate the results.

(b) Except as provided in (c) of this paragraph, the following information must be obtained for input to the calculation of noise exposure contours:

(1) A map of the airport and its environs at an adequately detailed scale (not less than 1:10000) indicating runway length, alignments, landing thresholds, takeoff start-of-roll points, airport boundary, and flight tracks out to at least 15000 meters from the end of each runway.

(2) Airport activity levels and operational data which will indicate, on an annual average-daily-basis, the number of aircraft, by type of aircraft, which utilize each flight track, in both the standard daytime (07:00-22:00 local time) and nighttime (22:00-07:00 local time) periods for both landings and takeoffs.

(3) For landings—glide slopes, glide slope intercept altitudes, and other pertinent information needed to establish approach profiles along with the engine power levels needed to fly that approach profile.

(4) For takeoffs—the flight profile which is the relationship of altitude to distance from start-of-roll along with the engine power levels needed to fly that takeoff profile; these data must reflect the use of noise abatement departure procedures and, if applicable, the takeoff weight of the aircraft or some proxy for weight such as stage length.

(5) Existing topographical or airspace restrictions which preclude the utilization of alternative flight tracks.

(6) The government furnished data depicting aircraft noise characteristics (if not already a part of the computer program's stored data bank).

(7) Airport elevation and average temperature.

(c) For heliports, the map scale required by paragraph (b)(1) of this paragraph shall not be less than 1:2500 and shall indicate heliport boundaries, takeoff and landing pads, and typical flight tracks out to at least 1200 meters horizontally from the landing pad. Where these flight tracks cannot be determined, obstructions or other limitations on flight tracks in and out of the heliport shall be identified within the map areas out to at least 1200 meters horizontally from the landing pad. For static operation (hover), the helicopter type, the number of daily operations based on an annual average, and the duration in minutes of the hover operation shall be identified. The other information required in paragraph (b) shall be furnished in a form suitable for input to a **CARC** approved methodology or computer program

**A150.105 Identification of public agencies and planning agencies.**

(a) The airport operator shall identify each public agency and planning agency whose jurisdiction or responsibility is either wholly or partially within the Ldn 65 dB boundary.

(b) For those agencies identified in (a) that have land use planning and control authority, the supporting documentation shall identify their geographic areas of jurisdiction.

**3. MATHEMATICAL DESCRIPTIONS**

**A150.201 General.**

The following mathematical descriptions provide the most precise definition of the yearly day-night average sound level (Ldn), the data necessary for its calculation, and the methods for computing it.

**A150.203 Symbols.**

The following symbols are used in the computation of Ldn;

Measure (in dB)	Symbol
Average Sound Level, During Time T.....	L <sub>T</sub>
Day-Night Average Sound Level (individual day)....	L <sub>dni</sub>
Yearly Day-Night Average Sound Level.....	L <sub>dn</sub>
Sound Exposure Level.....	L <sub>AE</sub>

**A150.205 Mathematical computations.**

(a) Average sound level must be computed in accordance with the following formula:

$$L_T = 10 \log_{10} \left[ \frac{1}{T} \int_0^T 10^{L_A(t)/10} dt \right] \quad (1)$$

where T is the length of the time period, in seconds, during which the average is taken; L<sub>A</sub>(t) is the instantaneous time varying A-weighted sound level during the time period T.

**Note:** When a noise environment is caused by a number of identifiable noise events, such as aircraft flyovers, average sound level may be

conveniently calculated from the sound exposure levels of the individual events occurring within a time period T:

$$L_T = 10 \log_{10} \left[ \frac{1}{T} \sum_{i=1}^n 10^{L_{AEi}/10} \right] \quad (2)$$

where LAEi is the sound exposure level of the i-th event, in a series of n events in time period T, in seconds.

**Note:** When T is one hour, LT is referred to as one-hour average sound level.

(b) Day-night average sound level (individual day) must be computed in accordance with the following formula:

$$L_{dn} = 10 \log_{10} \left[ \frac{1}{86400} \left( \int_{0000}^{0700} 10^{[L_A(t)+10]/10} dt + \int_{0700}^{1100} 10^{L_A(t)/10} dt + \int_{2200}^{2400} 10^{[L_A(t)+10]/10} dt \right) \right] \quad (3)$$

Time is in seconds, so the limits shown in hours and minutes are actually interpreted in seconds. It is often convenient to compute day-night average sound level from the one-hour average sound levels obtained during successive hours.

(c) Yearly day-night average sound level must be computed in accordance with the following formula:

$$L_{dn} = 10 \log_{10} \frac{1}{365} \sum_{i=1}^{365} 10^{L_{dni}/10} \quad (4)$$

where Ldni is the day-night average sound level for the i-th day out of one year.

(d) Sound exposure level must be computed in accordance with the following formula:



$$L_{AE} = 10 \log_{10} \left( \frac{1}{t_0} \int_{t_1}^{t_2} 10^{L_A(t)/10} dt \right) \quad (5)$$

where  $t_0$  is one second and  $L_A(t)$  is the time-varying A-weighted sound level in the time interval  $t_1$  to  $t_2$ .

The time interval should be sufficiently large that it encompasses all the significant sound of a designated event.

The requisite integral may be approximated with sufficient accuracy by integrating  $L_A(t)$  over the time interval during which  $L_A(t)$  lies within 10 decibels of its maximum value, before and after the maximum occurs.