

uses around the airport and of preventing the introduction of additional noncompatible land uses;

(2) The program provides for revision if made necessary by the revision of the noise map; and

(3) Those aspects of programs relating to the use of flight procedures for noise control can be implemented within the period covered by the program and without—

(i) Reducing the level of aviation safety provided;

(ii) Derogating the requisite level of protection for aircraft, their occupants and persons and property on the ground;

(iii) Adversely affecting the efficient use and management of the Navigable Airspace and Air Traffic Control Systems; or

(iv) Adversely affecting any other powers and responsibilities of the Administrator prescribed by law or any other program, standard, or requirement established in accordance with law.

(c) When a determination is issued, the Regional Airports Division Manager notifies the airport operator and publishes a notice of approval or disapproval in the FEDERAL REGISTER identifying the nature and extent of the determination.

(d) Approvals issued under this part for a program or portion thereof become effective as specified therein and may be withdrawn when one of the following occurs:

(1) The program or portion thereof is required to be revised under this part or under its own terms, and is not so revised;

(2) If a revision has been submitted for approval, a determination is issued on the revised program or portion thereof, that is inconsistent with the prior approval.

(3) A term or condition of the program, or portion thereof, or its approval is violated by the responsible government body.

(4) A flight procedure or other FAA action upon which the approved program or portion thereof is dependent is subsequently disapproved, significantly altered, or rescinded by the FAA.

(5) The airport operator requests rescission of the approval.

(6) Impacts on flight procedures, air traffic management, or air commerce occur which could not be foreseen at the time of approval.

A determination may be sooner rescinded or modified for cause with at least 30 days written notice to the airport operator of the FAA's intention to rescind or modify the determination for the reasons stated in the notice. The airport operator may, during the 30-day period, submit to the Regional Airports Division Manager for consideration any reasons and circumstances why the determination should not be rescinded or modified on the basis stated in the notice of intent. Thereafter, the FAA either rescinds or modifies the determination consistent with the notice or withdraws the notice of intent and terminates the action.

(e) Determinations may contain conditions which must be satisfied prior to implementation of any portion of the program relating to flight procedures affecting airport or aircraft operations.

(f) Noise exposure maps for current and forecast year map conditions that are submitted and approved with noise compatibility programs are considered to be the new FAA accepted noise exposure maps for purposes of part 150.

[Doc. No. 18691, 49 FR 49269, Dec. 18, 1984, as amended by Amdt. 150-2, 54 FR 39295, Sept. 25, 1989; Amdt. 150-4, 69 FR 57626, Sept. 24, 2004]

#### APPENDIX A TO PART 150—NOISE EXPOSURE MAPS

##### PART A—GENERAL

Sec. A150.1 Purpose.

Sec. A150.3 Noise descriptors.

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##### PART B—NOISE EXPOSURE MAP DEVELOPMENT

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Sec. A150.201 General.

Sec. A150.203 Symbols.

Sec. A150.205 Mathematical computations.

## PART A—GENERAL

*Sec. 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 for the use of the FAA's Integrated Noise Model (INM) or an FAA approved equivalent, 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 Sec. A150.5 of this appendix.

*Sec. A150.3 Noise descriptors.*

(a) *Airport Noise Measurement.* The A-Weighted Sound Level, measured, filtered and recorded in accordance with Sec. 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.

*Sec. 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 as defined in International Electrotechnical Commission (IEC) Publication No. 179, entitled "Precision Sound Level Meters" as incorporated by reference in part 150 under §150.11. For purposes of this part, the tolerances allowed for general purpose, type 2 sound level meters in IEC 179, are acceptable.

(b) Noise measurements and documentation must be in accordance with accepted acoustical measurement methodology, such as those described in American National Standards Institute publication ANSI S1.13, dated 1971 as revised 1979, entitled "ANSI—Methods for the Measurement of Sound Pres-

sure Levels"; ARP No. 796, dated 1969, entitled "Measurement of Aircraft Exterior Noise in the Field"; "Handbook of Noise Measurement," Ninth Ed. 1980, by Arnold P.G. Peterson; or "Acoustic Noise Measurement," dated Jan., 1979, by J.R. Hassell and K. Zaveri. For purposes of this part, measurements intended for comparison to a State or local standard or with another transportation noise source (including other aircraft) must be reported in maximum A-weighted sound levels ( $L_{AM}$ ); for computation or validation of the yearly day-night average level ( $L_{dn}$ ), measurements must be reported in sound exposure level ( $L_{AE}$ ), as defined in Sec. A150.205 of this appendix.

## PART B—NOISE EXPOSURE MAP DEVELOPMENT

*Sec. 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  $L_{dn}$  contours. Continuous contours must be developed for YDNL levels of 65, 70, and 75 (additional contours may be developed and depicted when appropriate). In those areas where YDNL values are 65 YDNL or greater, the airport operator shall identify land uses and determine land use compatibility in accordance with the standards and procedures of this appendix.

(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 non-compatible 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 government 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  $L_{dn}$  65 dB. Local needs or values may dictate further delineation based on local requirements or determinations.

(e) Except as provided in (f) below, the noise exposure maps must also contain and identify:

- (1) Runway locations.
- (2) Flight tracks.
- (3) Noise contours of  $L_{dn}$  65, 70, and 75 dB resulting from aircraft operations.
- (4) Outline of the airport boundaries.
- (5) Noncompatible land uses within the noise contours, including those within the  $L_{dn}$  65 dB contours. (No land use has to be identified as noncompatible if the self-generated noise from that use and/or the ambient noise from other nonaircraft and nonairport uses is equal to or greater than the noise from aircraft and airport sources.)
- (6) Location of noise sensitive public buildings (such as schools, hospitals, and health care facilities), and properties on or eligible for inclusion in the National Register of Historic Places.
- (7) Locations of any aircraft noise monitoring sites utilized for data acquisition and refinement procedures.
- (8) Estimates of the number of people residing within the  $L_{dn}$  65, 70, and 75 dB contours.

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

(f) Notwithstanding any other provision of this part, noise exposure maps prepared in connection with studies which were either Federally funded or Federally approved and which commenced before October 1, 1981, are not required to be modified to contain the following items:

- (1) Flight tracks depicted on the map.
- (2) Use of ambient noise to determine land use compatibility.
- (3) The  $L_{dn}$  70 dB noise contour and data related to  $L_{dn}$  70 dB contour. When determinations on land use compatibility using Table 1 differ between  $L_{dn}$  65–70 dB and the  $L_{dn}$  70–75 dB, determinations should either use the more conservative  $L_{dn}$  70–75 dB column or reflect determinations based on local needs and values.
- (4) Estimates of the number of people residing within the  $L_{dn}$  65, 70, and 75 dB contours.

TABLE 1—LAND USE COMPATIBILITY\* WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS

Land use	Yearly day-night average sound level ( $L_{dn}$ ) 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
Governmental 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 camps .....	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 designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. 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. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

## KEY TO TABLE 1

SLUCM=Standard Land Use Coding Manual.

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.

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

(a) The airport operator shall acquire the aviation operations data necessary to develop noise exposure contours using an FAA approved methodology or computer program, such as the Integrated Noise Model (INM) for airports or the Heliport Noise Model (HNM) for heliports. 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 paragraph (c) of this section, 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 inch to 2,000 feet) indicating runway length, alignments, landing thresholds, takeoff start-of-roll points, airport boundary, and flight tracks out to at least 30,000 feet 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 (0700-2200 hours local) and nighttime (2200-0700 hours local) 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 section shall not be less than 1 inch to 2,000 feet and shall indicate heliport boundaries, takeoff and landing pads, and typical flight tracks out to at least 4,000 feet 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 4,000 feet 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 the HNM or other FAA approved methodology or computer program.

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

(a) The airport proprietor shall identify each public agency and planning agency whose jurisdiction or responsibility is either

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wholly or partially within the  $L_{dn}$  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.

**PART C—MATHEMATICAL DESCRIPTIONS**

*Sec. A150.201 General.*

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

*Sec. A150.203 Symbols.*

The following symbols are used in the computation of  $L_{dn}$ :

Measure (in dB)	Symbol
Average Sound Level, During Time T .....	$L_T$
Day-Night Average Sound Level (individual day) ...	$L_{dni}$
Yearly Day-Night Average Sound Level .....	$L_{dn}$
Sound Exposure Level .....	$L_{AE}$

*Sec. A150.205 Mathematical computations.*

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

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

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  $L_{dni}$  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:

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

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

where  $T$  is the length of the time period, in seconds, during which the average is taken;  $L_A(t)$  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  $L_{AEi}$  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,  $L_T$  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:

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.

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**APPENDIX B TO PART 150—NOISE COMPATIBILITY PROGRAMS**

- Sec. B150.1 Scope and purpose.
- Sec. B150.3 Requirement for noise map.
- Sec. B150.5 Program standards.