

UT, MTAS Library
37996004036 6



MTAS LIBRARY. DEC 29 1992
UNIV. OF TENN

APA American Planning Association
PAS Planning Advisory Service
 Report Number 437

Vince Papsidero, AICP, is a principal planner with the Mid-Ohio Regional Planning Commission. This report was prepared under contract for Port Columbus International Airport as a part of the airport's Noise Compatibility Program. The author thanks all those who participated in the study and the preparation of the document.

Cover design by Toni Thanasouras Ellis. The illustration represents the noise contours that are an essential element in airport environs zoning.

This report is printed on recycled paper.

The Planning Advisory Service is a subscription service offered by the Research Department of the American Planning Association. Eight reports are produced each year. Subscribers also receive the PAS Memo each month and have use of the Inquiry Answering Service. Israel Stollman, Executive Director; Frank S. So, Deputy Executive Director; Sylvia Lewis, Publications Director; William Klein, Director of Research and Education.

Planning Advisory Service Reports are produced in the Research Department of APA. James Hecimovich, Editor; Marya Morris, Assistant Editor.

Copyright May 1992 by the American Planning Association, 1313 E. 60th St., Chicago, IL 60637. APA has headquarters offices at 1776 Massachusetts Ave., N.W., Washington, DC 20036.

JUL 18 1992

Airport Noise Regulations

VINCE PAPSIDERO, AICP

TABLE OF CONTENTS

| | |
|--|----|
| The Federal Mandate | 4 |
| Noise Contours | 4 |
| Land-Use Compatibility Guidelines | 5 |
| Model Regulations..... | 5 |
| Airport Environs Zoning District Ordinance | 5 |
| Subdivision Regulations | 11 |
| Building Code | 11 |
| Avigation Easement | 14 |
| Bibliography | 15 |

AIRPORT NOISE REGULATIONS

Airports are an important component of a region's economic base, providing for transportation, product distribution, and direct and indirect increases in community employment. They are magnets for development. Indeed, some of the country's most famous airports—Chicago's O'Hare, New York's JFK, and Boston's Logan—were originally in areas in which there was little, if any, urban development. Now, each of these airports is in the midst of a highly developed metropolitan region. And the country is currently in the middle of a rebirth of airport expansion and construction. At least seven major expansions (Pittsburgh, Baltimore, Savannah, Nashville, Memphis, Portland, and Tampa) are currently in process, and four new airports (Austin, Chicago, Minneapolis-St. Paul, and Denver) are in the works. If Congress is successful in persuading the Bush administration to free up more of the \$7.47 billion in the Airport and Airway Trust Fund to spur job development, the country may see an even greater expansion of airport construction in the early 1990s. In all, the market bears out that an airport is, ultimately, an economic development engine and vital public asset.

People living in the communities near an airport might tend to disagree with this assessment. Whether they are drawn to the area because of the job and housing opportunities that arise there or if they were residing there before the airport's siting or expansion, most are not ready for what it means to live near an airport. While everyone experiences noise in their everyday life, people living, working, or playing within close proximity to airports have an additional, significant source of noise in their lives. Anyone who has a home or works near an airport can tell you that the effects can be highly irritating, ranging from

interruptions in conversations to building-rattling vibrations that can cause damage to possessions and the structure itself. According to the Federal Interagency Committee on Urban Noise, in *Guidelines for Considering Noise in Land-Use Planning and Control*, some research has shown that noise levels common to airport operations can be quite stressful. While a relationship between noise and stress-related illnesses has not been proven, the nuisance factor alone is enough to make people consider litigation against airport operators.

But the effect of airport-related noise can be minimized by managing the built environment in the airport area. Noise-sensitive land uses, such as single-family homes, can be sited in a way to prevent the exposure of area residents to significant noise effects of airport operations. Also, certain building techniques can further lessen the impact of airport-related noise for both existing and proposed buildings. Under Federal Aviation Administration (FAA) guidelines, uses compatible with a noise-affected area are those that lack areas of constant human occupation (e.g., offices), or which limit such areas. The most appropriate uses are manufacturing facilities, warehouses, and distribution facilities. Offices and areas opened to the public within these facilities still need to be insulated from aircraft-generated noise.

Dealing with the problems of noise and airport siting is important both to protect the health and safety of community residents and to make the operation of an airport possible. In communities in which the local government has not addressed these concerns, citizens have successfully sued airport operators, claiming nuisance, trespass, or inverse condemnation.

Several measures are available to local government

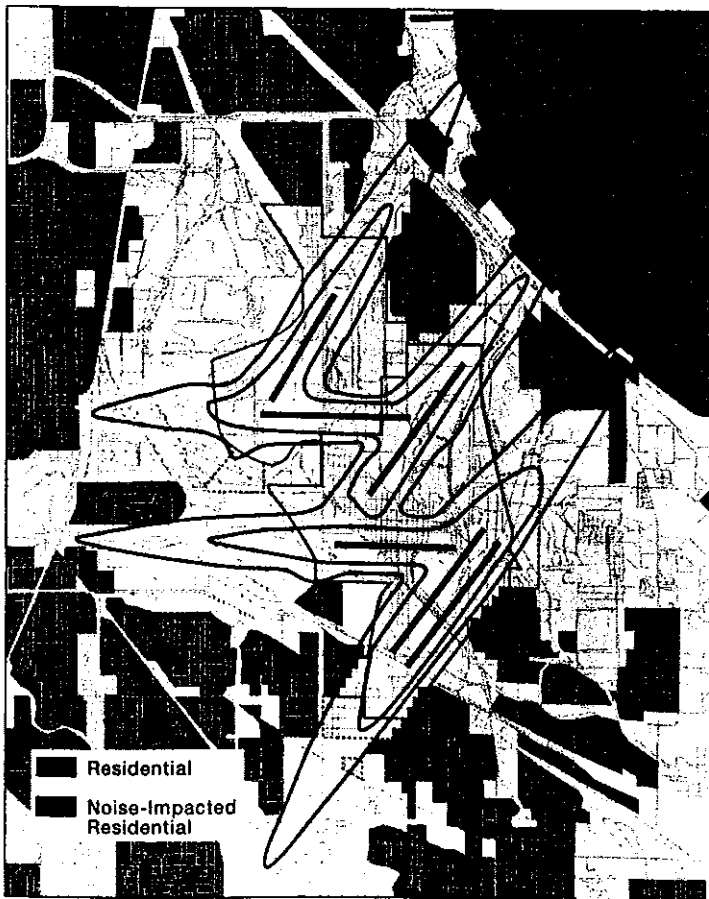
as tools for managing the built environment within noise-sensitive areas. An area can be rezoned so that incompatible uses (e.g., residential) are declared nonconforming. But this technique would only be effective on a very limited scale. Such rezonings are not intended for large areas, and the question of what constitutes a suitable amortization period in these circumstances is a difficult one.

A government can also purchase property around the airport to keep it clear if it is empty or clear it if incompatible development exists there. Purchasing land to create buffers between airport operations and potential development is another possibility. The amount of money necessary to pursue either program makes purchase an unlikely or very limited option. Local governments that have Part 150 Noise Compatibility Studies (see the section on the federal mandate below) approved by FAA can have as much as 90 percent of home buyouts covered by federal airport noise abatement funds, but still the costs are extreme. Soundproofing costs, also covered under the Part 150 plans, can be very high as well. For example, according to a November 17, 1991, article in the *Chicago Tribune*, Chicago's Noise Compatibility Planning Study calls for \$73.8 million for soundproofing homes in some areas around O'Hare airport. The same plan estimates that the buyout of only 220 area homes would cost \$32 million.

The best planning technique to encourage land-use compatibility in an airport area, and the one that this report will address, is the creation of a noise overlay zoning district—a special type of zoning district that places additional requirements on existing (underlying) zoning districts within a given geographical area. In the case of overlay zoning, the more stringent zoning requirements typically apply.

The physical shape of the noise overlay zoning district is based on adopted noise contours (see below), land-use patterns, roadway patterns, and topography. The land-use categories and related development standards that are to be employed in the district are based upon the Land-Use Compatibility Guidelines established by the FAA. Within each specific noise-sensitive area, land-use activities should be managed to ensure that they are properly placed to protect the public health. Land uses that are extremely sensitive to certain noise levels are not permitted to be established within a given area.

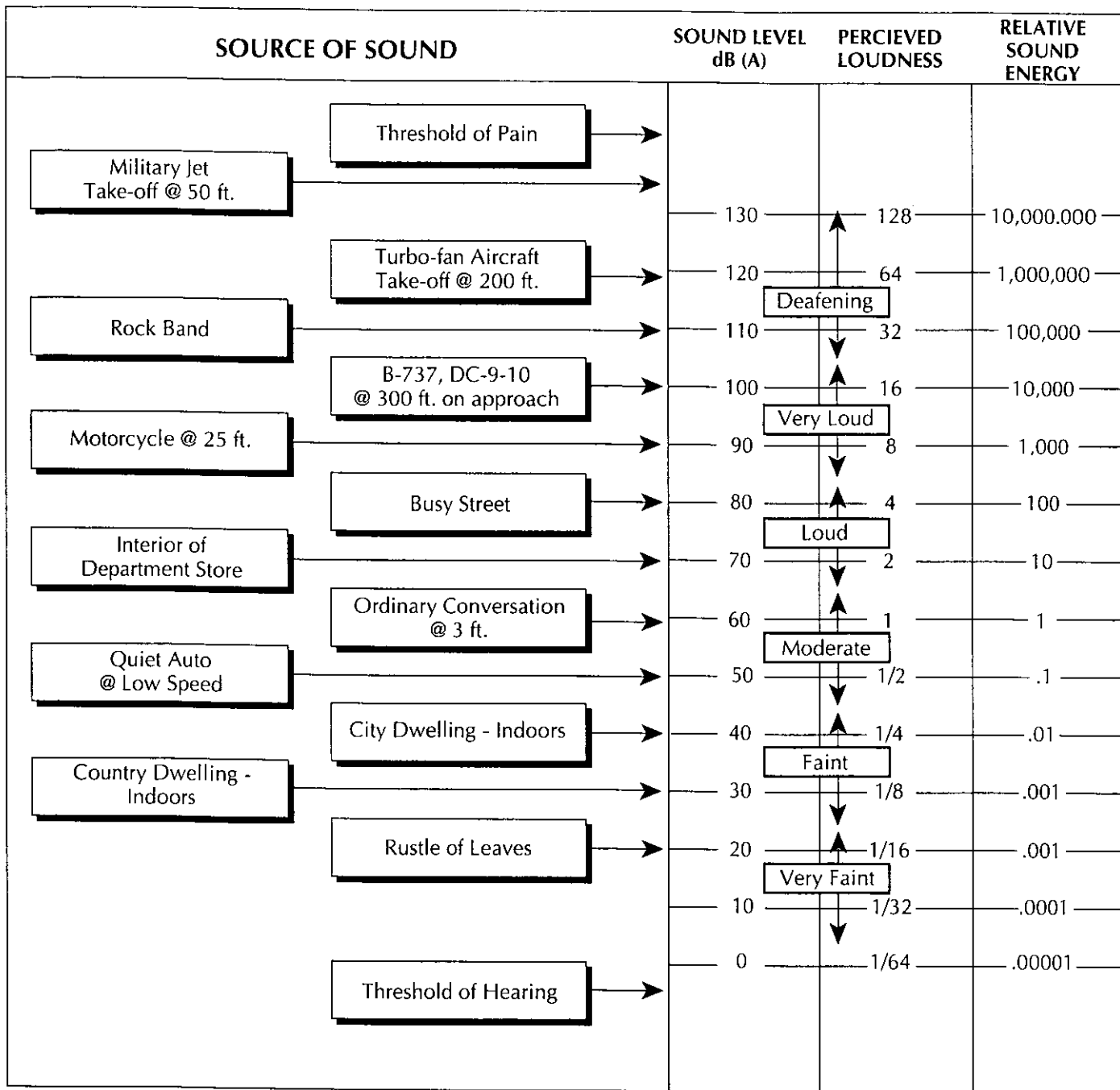
This report reviews the federal guidelines for establishing noise overlay zones, defines the terms used when discussing airport-related noise problems, and offers models of a zoning ordinance, subdivision ordinance, building code, and easement contract for use in an area affected by airport operations. Local communities are advised to check with their municipal attorney and to study their state enabling legisla-



Source: *Lake Calumet Airport: Crossroads of the Nation ... Future of the Region*, City of Chicago, December 1991, 13-2.

Noise contours are lines on a map that show the estimated average noise impact of airport operations at certain locations. For example, this map shows the runway configurations (bold, straight lines) of the proposed Lake Calumet airport in Chicago at its ultimate build-out stage. The two sets of contoured lines around the runways and extending outward represent the 70 Ldn (closest to the runways) and the 65 Ldn noise contours. Noise contours help establish the appropriate area for a noise overlay zone and an airport environs district.

Figure 1. Typical Sound Levels



Source: Coffman Associates, Inc., Master Plan Update and Noise Exposure Map Update, Port Columbus International Airport.

tion before adapting any of the models provided here.

There is one other issue that a community that wants to use these models will need to address. One of the most serious problems in establishing a noise overlay zone is that it may need to be incorporated in more than one jurisdiction. Airport noise effects are usually regional in nature, as are the economic development opportunities presented by the airport. There may be great pressure on individual communities to not "buy into" the zoning because to do so may either limit the types of uses possible in the overlay area or require the retrofitting of existing uses and new types of construction standards for new develop-

ment. In all, the zoning may mean that the airport environs might not be built out to its maximum potential or that it might be more costly to do so.

This report, based on a document produced by the Mid-Ohio Regional Planning Commission (MORPC) under contract to Port Columbus International Airport, was undertaken due to the fact that the operations of Port Columbus were affecting the communities of Bexley, Columbus, Gahanna, Reynoldsburg, Whitehall, Jackson Township, and Franklin County. Those communities were able to work together through MORPC to issue the document and will continue to have to work together to

see through the implementation of the land-use controls that are proposed in the zoning ordinance. Communities that want to address airport-related noise problems due to the expansion or change of airport operations or construction of a new airport will need to seek such regional cooperation if a zoning overlay district is to be successful.

The first step towards regional cooperation is creation of a working committee comprised of community representatives. This ensures communication, begins cooperation, and helps to instill a sense of ownership and participation in addressing a regional problem. In MORPC's case, the 15-member working committee included elected officials, administrators, and planning/zoning staff meeting on a regular basis for four months. The committee reviewed the draft legislation and provided valuable input regarding the model and its implementation.

Following completion of the committee's work, MORPC and Port Columbus staff met with each committee representative to discuss a strategy for adoption. All representatives expressed support for proposing local adoption. The Columbus Municipal Airport Authority has adopted the model. The city of Columbus, in fact, is proposing adoption and implementation of the model codes for three separate airport facilities within its jurisdiction. Support has also been expressed for applying the model to Rickenbacker Air National Guard Base, which straddles Franklin County's southern boundary.

Port Columbus has officially forwarded a written request for adoption to each community's elected leadership. The city of Columbus has begun preparing its legislation, and it is expected that all other participants are likely to begin the legislative process within the second quarter of 1992. At least two zoning proposals for residential subdivisions have failed since completion of the report, despite the fact that airport noise zoning has yet to be officially adopted. In one case, a proposal for a subdivision of 184 homes in the Port Columbus area was withdrawn because the developer was informed of the need for soundproofing called for by the study. The cost of soundproofing for each house was estimated at \$10,000, which the developer felt would make the project unmarketable.

THE FEDERAL MANDATE

The Federal Aviation Regulation (FAR) Part 150, the Airport Noise Compatibility Program, implements portions of Title I of the Aviation Safety and Noise Abatement Act of 1979 (ASNA). ASNA establishes a system of measurement of airport-generated noise, a system for determining the exposure of individuals to airport-generated noise, and a standardized airport noise compatibility planning program, which includes the following.

Development and submission to FAA of

Noise Exposure Maps and Noise Compatibility Programs by airport operators;

Standard noise units, methods, and analytical techniques for use in airport assessments;

Identification of land uses that are compatible, incompatible, or compatible with modification with various levels of noise around airports; and

Procedures and criteria for FAA review and approval of noise compatibility programs.

While the Part 150 program is voluntary, participation makes local airport authorities eligible for federal funding of noise compatibility planning and development. As noted above, federal funds are also available for land and home purchases as well as soundproofing and other noise-abatement measures. The federal fund is generated from taxes on airline tickets and cargo and fuel receipts. Eight percent of the total fund must be used for noise abatement.

According to the FAA's Office of Environment and Energy, 219 airports were participating in the program as of January 1992. Of these, 113 had approved Noise Compatibility Programs, and 141 had their Noise Exposure Maps in compliance. The program actually got off to a slow start in the late 1980s because many community residents were afraid that, once their properties were identified on the maps as being within an airport's noise contours, their property values would decline. It should be noted that ASNA does not allow the override of local government zoning, subdivision, building, and health authority.

NOISE CONTOURS

Noise contours are a series of lines geographically related and placed on maps to estimate the average noise impact at certain locations. They are the principal tool for analyzing land-use compatibility in the vicinity of airports and heliports. These lines are generated from the FAA's Integrated Noise Model (INM), a computer program that simulates actual noise measurements. Noise contours identify existing and projected areas affected by noise but represent only averaged noise incidents. They are not absolutes and variations in flight activity and locational characteristics (microclimate, vegetation, buildings, etc.) can extend or reduce the noise-affected area.

The unit used in defining noise contours is the average day-night sound level, abbreviated as DNL and symbolized mathematically as Ldn. (The Ldn annotation will be used throughout this report.) Specifically, Ldn is the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after an addition of 10 decibels to sound levels occurring in the night between midnight to 7 a.m. and from 10 p.m. to midnight. Ldn is a measur-

able quantity and can be gauged directly at a specific location, using portable monitoring equipment. The FAA INM calculates Ldn levels associated with the type, frequency, and flight paths of aircraft.

Points having the same Ldn are connected to form noise contours. Typical mapped Ldn levels are 65, 70, and 75 Ldn. Noise contours become more distinct as noise level increases. For example, a 55 Ldn contour would be relatively fuzzy. A 75 Ldn contour, on the other hand, would be more precise.

LAND-USE COMPATIBILITY GUIDELINES

The means for measuring the impact of noise on persons and guidelines for land-use compatibility are found in *Guidelines for Considering Noise in Land-Use Planning and Control* by the Federal Interagency Committee on Urban Noise. The committee was made up of representatives from the Department of Defense, the Department of Housing and Urban Development, the Environmental Protection Agency, the Veterans Administration, and the Department of Transportation, including the Federal Aviation Administration. Table 1, which has been adapted from that document, identifies a set of noise zones based on noise levels. Noise zones are identified in order of increasing noise level by the letters A through D. It is apparent from the table that a 65 Ldn and higher reading means that HUD considers these "unacceptable" levels of noise exposure.

This document also provides land-use compatibility guidelines. (See Table 2.) For the purposes of this table, noise zones C1, C2, D1, D2, and D3 from Table 1, which are those zones in which noise exposure is either significant or severe, have been consolidated in three groups based on ranges of Ldn. Compatibility is based upon federal guidelines and FAA standards. For example, under the guidelines for Residential, Single Units, Detached, for noise zone II (70 to 75

Ldn), the guidelines recommend that this land use would be compatible if a noise-level reduction (NLR) of 30 decibels is achieved through design and construction of the home. But under guideline notes, residential uses are "strongly discouraged" in zone II, and a demonstrated community need for such uses at that location should be shown.

MODEL REGULATIONS

The following regulations are the implementing mechanisms for managing all aspects of the development process in order that the goals of managing land use and noise are met. The model was developed based on work conducted by a number of public agencies and reflects an amalgamation and refinement of their sources, tempered with legal review based on Ohio land-use law.

AIRPORT ENVIRONS ZONING DISTRICT ORDINANCE

Commentary. The Airport Environs Zoning District (AE) is the key mechanism for addressing land use in noise-sensitive areas. Again, this is an overlay zoning district that applies additional standards and requirements to properties located within an underlying zoning district. In cases of a conflict, typically the more restrictive requirement applies. The action for implementing the AE District will be the Certificate of Zoning Compliance. Several aspects of the district are pointed out below.

The district establishes three noise zones that define the three major Ldn contours that affect properties outside the airport proper. Zoning maps should depict each of these zones because, within each, different land-use and noise-attenuation standards will apply.

A number of existing, temporary, and agricultural uses and structures are exempted under the

Table 1. Noise Zone Classification

| Noise Zone | LDN | Noise Exposure Class | HUD Standards |
|------------|--------------|----------------------|-----------------------|
| A | Less than 55 | Minimal | Acceptable |
| B | 55 to 65 | Moderate | Acceptable |
| C-1 | 65 to 70 | Significant | Normally Unacceptable |
| C-2 | 70 to 75 | Significant | Unacceptable |
| D-1 | 75 to 80 | Severe | Unacceptable |
| D-2 | 80 to 85 | Severe | Unacceptable |
| D-3 | Above 85 | Severe | Unacceptable |

Source: *Guidelines for Considering Noise in Land Use Planning and Control*, Federal Interagency Committee on Urban Noise, Washington, D.C., 1980.

Table 2. Land-Use Compatibility Guidelines

| SLUCM Code | Land-Use Name | Noise Zone I (65-70) | Noise Zone II (70-75) | Noise Zone III (75+) |
|-------------------|---|-----------------------------|------------------------------|-----------------------------|
| 10 | Residential | | | |
| 11 | Household Units | | | |
| 11.11 | Single Units - detached | 25 ¹ | 30 ¹ | N |
| 11.12 | Single Units - semi-detached | 25 ¹ | 30 ¹ | N |
| 11.13 | Single Units - attached row | 25 ¹ | 30 ¹ | N |
| 11.21 | Two Units - side-by-side | 25 ¹ | 30 ¹ | N |
| 11.22 | Two Units - over-under | 25 ¹ | 30 ¹ | N |
| 11.31 | Apartments - walk-up | 25 ¹ | 30 ¹ | N |
| 11.32 | Apartments - elevator | 25 ¹ | 30 ¹ | N |
| 12 | Group Quarters | 25 ¹ | 30 ¹ | N |
| 13 | Residential Hotels | 25 ¹ | 30 ¹ | N |
| 14 | Mobile Home Parks | N | N | N |
| 15 | Transient Lodgings, Hotels, Motels | Y ² | Y ³ | N |
| 16 | Other Residential | 25 ¹ | 30 ¹ | N |
| 20 | Manufacturing | | | |
| 21 | Food & kindred products | Y | Y ² | Y ³ |
| 22 | Textile mill products | Y | Y ² | Y ³ |
| 23 | Apparel & other finished products made from fabrics, leather, & similar materials | Y | Y ² | Y ³ |
| 24 | Lumber & wood products (except furniture) | Y | Y ² | Y ³ |
| 25 | Furniture & fixtures | Y | Y ² | Y ³ |
| 26 | Paper & allied products | Y | Y ² | Y ³ |
| 27 | Printing, publishing, & allied industries | Y | Y ² | Y ³ |
| 28 | Chemicals & allied products | Y | Y ² | Y ³ |
| 29 | Petroleum refining and related industries | Y | Y ² | Y ³ |
| 31 | Rubber & miscellaneous plastic | Y | Y ² | Y ³ |
| 32 | Stone, clay, & glass products | Y | Y ² | Y ³ |
| 33 | Primary metal industries | Y | Y ² | Y ³ |
| 34 | Fabricated & metal products | Y | Y ² | Y ³ |
| 35 | Professional, scientific, & controlling instruments; photographic & optical goods; watches & clocks | Y | 25 | 30 |
| 39 | Miscellaneous manufacturing | Y | Y ² | Y ³ |
| 40 | Transportation, Communications, and Utilities | | | |
| 41 | Rail transportation | Y | Y ² | Y ³ |
| 42 | Motor vehicle transportation | Y | Y ² | Y ³ |
| 43 | Aircraft transportation | Y | Y ² | Y ³ |
| 44 | Marine craft transportation | Y | Y ² | Y ³ |
| 45 | Highway & street right-of-way | Y | Y ² | Y ³ |
| 46 | Automobile parking | Y | Y ² | Y ³ |
| 47 | Communication | Y | Y ² | Y ³ |
| 48 | Utilities | Y | Y ² | Y ³ |
| 49 | Other transportation, communications/utilities | Y | Y ² | Y ³ |
| 50 | Trade | | | |
| 51 | Wholesale trade | Y | Y ² | Y ³ |
| 52 | Retail trade-building materials, hardware, & farm equipment | Y | Y ² | Y ³ |
| 53 | Retail trade - general merchandise | Y | 25 | 30 |
| 54 | Retail trade - food | Y | 25 | 30 |
| 55 | Retail trade - auto | Y | 25 | 30 |
| 56 | Retail trade - apparel & accessories | Y | 25 | 30 |
| 57 | Retail trade - furniture & home furnishings | Y | 25 | 30 |
| 58 | Retail trade - eating/drinking establishment | Y | 25 | 30 |
| 59 | Other retail trade | Y | 25 | 30 |

Table 2. Land-Use Compatibility Guidelines (Continued)

| SLUCM Code | Land-Use Name | Noise Zone I (65-70) | Noise Zone II (70-75) | Noise Zone III (75+) |
|------------|--|----------------------|-----------------------|----------------------|
| 60 | Services | | | |
| 61 | Finance, insurance, & real estate | Y | 25 | N |
| 62 | Personal services | Y | 25 | N |
| 62.4 | Cemeteries | Y | Y ² | N |
| 63 | Business services | Y | 25 | 30 |
| 64 | Repair services | Y | Y ² | Y ³ |
| 65 | Professional services | Y | 25 | 30 |
| 65.1 | Hospitals, nursing homes | 25* | 30* | N |
| 65.1 | Other medical facilities | Y | 25 | 30 |
| 66 | Contract construction | Y | 25 | 30 |
| 67 | Governmental services | Y* | 25* | 30* |
| 68 | Education services | 25* | 30* | N |
| 69 | Miscellaneous services | Y | 25 | 30 |
| 70 | Cultural, Entertainment, and Recreational | | | |
| 71 | Cultural activities (including churches) | 25* | 30* | N |
| 71.2 | Nature exhibits | Y* | N | N |
| 72 | Public assembly | Y | N | N |
| 72.1 | Auditoriums, concert halls | 25 | 30 | N |
| 72.11 | Outdoor music shells, amphitheaters | N | N | N |
| 72.2 | Outdoor sports arenas, spectator sports | Y ⁴ | Y ⁴ | N |
| 73 | Amusements | Y | Y | N |
| 74 | Recreational activities (including golf courses, riding stables, water recreation) | Y* | 25* | 30* |
| 75 | Resorts & group camps | Y* | Y* | N |
| 76 | Parks | Y* | Y* | N |
| 79 | Other cultural, entertainment, and recreation | Y* | Y* | N |

Notes

1. All residences in Zone I are discouraged, and all residences in Zone II are strongly discouraged. Prior to approving residential uses in Zones I and II, the community should conduct an analysis to determine that a greater community need is being met by permitting residential uses within either zone.

Where it is determined that residential uses must be allowed, measures to achieve a 25-dB reduction from outdoor noise levels (i.e., Noise Level Reduction or NLR) in Zone I and a 30-dB reduction in Zone II should be a condition of approval. (Normal construction can be expected to provide a NLR of 20, thus the reduction requirements normally assume mechanical ventilation and closed windows year round.) An aviation easement for noise should be provided to [the airport authority].

NLR criteria will not eliminate outdoor noise problems. However, building location, site planning, and the design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground-level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that protect only interior space.

2. Measures to achieve NLR of 25 shall 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 shall 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. Land-use compatible, provided that special sound reinforcement systems are installed.

Key to Table of Land-Use Compatibility Standards

SLUCM Standard Land-Use Coding Manual, U.S. Urban Renewal Admin. and Bureau of Public Roads, 1965.

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 (NLR) measured as the difference between outdoor and indoor noise levels.

25 or 30 Land use and related structures generally compatible; measures to achieve NLR of 25 or 30 dB should be incorporated into design and construction of structure.

25* or 30* Land use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

Y* Land use and related structures generally compatible; see notes 2 and 3.

Source: Federal Interagency Committee on Urban Noise, *Guidelines for Considering Noise in Land Use Planning and Control*, Washington, D.C., 1980.

district. This, in general, applies the nonconforming standards that may be found in each jurisdiction's zoning ordinance or resolution. Those same standards will apply within the AE District.

Avigation easements (a model appears below) should be obtained for conditional use and variance requests and should be obtained when considering any other new use in the district.

There are additional steps in the review of each development, via the certificate of zoning compliance process. It is proposed that the planning staff and airport authority review and forward a recommendation on each zoning compliance certificate. This step is intended to meet an airport authority goal of providing ongoing technical assistance to the affected jurisdictions.

A development plan is required and must be submitted with the zoning compliance application. This plan requires additional information to assist reviewing authorities in determining how a property is affected by noise and whether sufficient actions are being taken to address noise impacts.

Development standards are provided to assist in the review of all applications. This criterion specifically relates to Land Use Compatibility Guidelines (14 CFR Part 150) that have been promulgated by the FAA.

AIRPORT ENVIRONS ZONING DISTRICT (MODEL)

SECTION 1.0. TITLE AND PURPOSE

The Airport Environs Zoning District (AE) is hereby created with the following purposes:

To protect the public health, safety, and welfare by regulating development and land use within noise sensitive areas and airport hazard areas;

To ensure compatibility between _____ Airport and surrounding land uses; and

To protect the airport from incompatible encroachment.

Airport hazards are hereby declared a public nuisance.

The Airport Environs Zoning District (AE) shall serve as an overlay district that applies additional standards and requirements to properties located within an underlying zoning district. In the case of conflicting standards and requirements, the more stringent standards and requirements shall apply.

SECTION 2.0. DEFINITIONS

- 2.1 **airport environs** The geographic area that is affected by the airport air traffic operations and defined on the basis of those areas immediately affected by the 65 Ldn and greater noise exposure area from the [here specify the noise exposure map that is submitted as part of the airport's FAR Part 150 Noise Compatibility Study.] This area is represented as the Airport Environs Zoning District (AE).
- 2.2 **airport hazard** Any structure or object of natural growth or use of land within an airport hazard area that obstructs the air space required for the flight of aircraft in landing or taking off at any airport or is otherwise hazardous to such landing or taking off of aircraft.
- 2.3 **airport hazard area** Any area of land adjacent to an airport that has been declared to be an "airport hazard area" by the division of aviation in connection with any airport approach plan recommended by such division.
- 2.4 **day-night sound level (Ldn)** A cumulative aircraft noise index that estimates the exposure to aircraft noise at a certain geographic point and relates the estimated exposure to an expected community response.
- 2.5 **Ldn contour** A line linking together a series of points of equal cumulative noise exposure based on the Ldn metric. Such contours are developed based on aircraft flight patterns, number of daily aircraft operations by type of aircraft and time of day, noise characteristics of each aircraft, and typical runway usage patterns.
- 2.6 **structure** Any object, whether permanent or temporary, including, but not limited to, a building, tower, crane, smokestack, earth formation, transmission line, flagpole, or ship mast; also includes a mobile object.

SECTION 3.0. SUBDISTRICTS

The Airport Environs Zoning District (AE) is subdivided into three subdistricts that represent the differing levels of noise impact. The geographic location of these subdistricts is indicated on the [jurisdiction's name] zoning map, having been duly adopted by the [jurisdiction] as per the requirements of this zoning ordinance/resolution. The noise zones are the following:

Subdistrict A. Includes the area within the 65 Ldn to 70 Ldn noise-exposure area.

Subdistrict B. Includes the area within the 70 Ldn to 75 Ldn noise-exposure area.

Subdistrict C. Includes the area within the

75 Ldn and greater noise-exposure area.

The boundaries of the Airport Environs Zoning District (AE) and its subdistricts, as adopted herein, shall be reviewed and amended whenever [the airport authority] updates or amends the noise contour maps and/or the FAR Part 150 Noise Compatibility Program. It shall be the responsibility of [the airport authority] to notify the [jurisdiction] of any such update or amendment and to provide a copy of same to the [jurisdiction]. Copies of the noise contour maps and FAR Part 150 Noise Compatibility Study shall be on file and open to public inspection in offices of the airport authority.

SECTION 4.0. APPLICATION OF ZONING ORDINANCE

Within the Airport Environs Zoning District (AE), any proposed use or structure is subject to review as described herein and shall be evaluated relative to the standards and requirements provided for herein.

SECTION 5.0. EXEMPTIONS

The provisions of this ordinance shall not be deemed applicable to the following when permitted in the underlying district:

Existing Uses. Uses existing on the effective date of this ordinance/resolution shall not be required to change in order to comply with these regulations. The nonconforming use requirements of this zoning ordinance/resolution shall apply to the future applicability of the standards and requirements contained herein.

Temporary Uses. Temporary uses, including but not limited to public celebrations and outdoor entertainment events, so long as the period of operation does not exceed five days. A variance may be requested to extend the time period for a temporary use.

Temporary Structures. Temporary buildings and structures that are not used for residential purposes and that meet said applicable requirements as contained within this zoning ordinance/resolution, so long as such uses and associated structures are constructed incidental to a permitted use, as per the requirements of this zoning ordinance/resolution.

Agricultural Structures. Bona fide agricultural buildings, structures, improvements, and associated nonresidential developments.

Accessory Uses and Structures. Accessory uses and structures incidental to a permitted princi-

pal structure or use and within the intent, purposes, or objectives of these regulations.

SECTION 6.0. DEVELOPMENT STANDARDS

The following development standards shall apply to all proposed uses and structures.

- 6.1 Proposed Uses and Structures. Table A, Land-Use Compatibility Standards, contained herein, identifies development standards that apply to proposed uses and structures within the Airport Environs Zoning District (AE). All proposed uses and structures must comply with these standards.
- 6.2 Interior Day-Night Average Noise Level (Ldn). All proposed uses and structures must comply with the Noise Level Reduction (NLR) standards as provided in Table A. Compliance with NLR requirements shall be evidenced prior to issuance of an Occupancy Permit.

SECTION 7.0. AVIGATION EASEMENT

Relative to residential, public, and semi-public uses, excluding office uses, as per Table A, and in the case of a variance or conditional use permit, the applicant, prior to receiving final approval of said request, shall convey to [the airport authority] an avigation easement permitting the right of flight in the airspace above the subject property. Avigation easements may be obtained for all other new uses. Such easement shall be supplied in a form prescribed by the [jurisdiction] zoning officer in conjunction with [the airport authority] and shall be recorded on the title of the subject property.

SECTION 8.0 NOTICE TO PURCHASERS

The [jurisdiction] may provide a notice to all applicants for any development-related permit, informing the applicant that the respective property is located, either partially or wholly, within the Airport Environs Zoning District (AE) and may be subject to aircraft overflight.

SECTION 9.0. DEVELOPMENT REVIEW

The zoning compliance process for the [jurisdiction] shall apply to the Airport Environs Zoning District (AE), with the following additions.

- 9.1 [Airport Authority Staff Review]. A copy of an application for zoning compliance under the AE District, including the development plan, shall be provided, within five days of submittal by the applicant, by the [jurisdiction] to the staff of the [airport authority], which will provide a written recommendation to the [jurisdiction] zoning officer within seven (7) days of receipt.

Table A. Land-Use Compatibility Standards in Airport Environs (AE) Zoning District

| Land Use | Subdistrict | | |
|--|----------------|----------------|----------------|
| | A | B | C |
| Residential | | | |
| Single- and Two-family, and Multifamily | Y ¹ | N | N |
| Manufactured Housing, Mobile Homes | N | N | N |
| Hotels, Motels, and Lodges | Y ² | Y ³ | N |
| All Other Residential | Y ¹ | Y ¹ | N |
| Commercial | | | |
| Retail | Y | Y ² | Y ³ |
| Business Services | Y | Y ² | Y ³ |
| Personal Services | Y | Y ² | N |
| Professional Services | Y | Y ² | Y ³ |
| Offices | Y | Y ² | N |
| All Other Commercial | Y | Y ² | Y ³ |
| Manufacturing | | | |
| Manufacturing, Warehousing, Distribution | Y | Y ² | Y ³ |
| Parking Facilities | Y | Y ² | Y ³ |
| All Other Manufacturing | Y | Y ² | Y ³ |
| Public and Semi-private | | | |
| Hospitals, Nursing Homes | Y ² | Y ³ | N |
| Other Medical Facilities | Y | Y ² | Y ³ |
| Educational Facilities | Y ² | Y ³ | N |
| House of Worship, Public Assembly | Y ² | Y ³ | N |
| Government Facilities | Y | Y ² | Y ³ |
| Parks, Recreation | Y | Y ² | Y ³ |
| All Other Public and Semi-Public | Y | Y ² | Y ³ |
| All Other Uses | Y | Y ² | Y ³ |

Notes

- Y Land use is permitted.
- N Land use is prohibited.
- 1. Interior Noise Level Reduction of 25 dB is required in District A and 30 dB in District B.
- 2. Interior Noise Level Reduction of 25 dB is required for all areas where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
- 3. Interior Noise Level Reduction of 30 dB is required for all areas where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

SECTION 10.0. DEVELOPMENT PLAN

A development plan as identified herein shall be submitted in addition to the submittal requirements for zoning compliance and said plan shall include, at a minimum, technical substantiation, maps, plans, drawings, and such other information as is necessary to show:

Site/Ldn Contour Map. Zoning district boundaries shall be superimposed on a site plan of the development to show both present and future aircraft-generated sound levels

projected for the property. All maps should be drawn to a scale designated by the [jurisdiction] zoning officer.

Location of Structures. The placement of all existing and proposed buildings and structures shall be shown located on the site/Ldn contour map.

Specification of Uses. Identification of the uses to occur within each structure or activity area shall be designated on the site/Ldn contour map.

Narrative Description. A narrative shall be provided describing the location of the site, its total acreage, existing character and use; the concept of the proposed development or use, such as proposed residential density, and the relation of the proposed development plan to the [jurisdiction's] land-use planning.

land use within noise-sensitive areas and airport hazard areas; to ensure compatibility between [name of airport] and surrounding land uses; and to protect the airport from incompatible encroachment.

SECTION 2.0. DEFINITIONS

[This Section is identical to the definitions section in the model zoning ordinance above.]

SECTION 3.0. AREA OF APPLICABILITY

For purposes of this chapter, the standards and requirements provided herein shall apply within the Airport Environs Zoning District (AE) as adopted and amended by the [jurisdiction].

SECTION 4.0. PLAT NOTICE

A notice shall be placed on all subdivision plats for properties located within the Airport Environs Zoning District (AE) that states the following:

Noise Warning. This property, either partially or wholly, lies within the noise exposure map area of [name of airport] and is subject to noise that may be objectionable.

SECTION 5.0. AVIGATION EASEMENT

For a subdivision located within the Airport Environs Zoning District (AE), an avigation easement shall be dedicated to [the airport authority] prior to approval of the final plat or deed, and a notice of potentially high aircraft noise levels shall be affixed to and recorded with the final plat (or in the case of a minor subdivision, the deed). Suggested wording: "NOTE: All or part of this property is located in an area potentially subject to aircraft noise levels high enough to annoy users of the property and interfere with its unrestricted use. Contact [the airport authority] for information regarding the most recently calculated levels of current and forecast aircraft noise levels on the property.

BUILDING CODE

Commentary. The model building code relates AE District standards to the building code and applies noise reductions standards found within 14 CFR Part 150, Appendix A. Suggested building code standards are provided as well. The source of these standards is the building code of Tucson, Arizona.

BUILDING CODE (MODEL)

SECTION 1.0. PURPOSE

The purpose of this chapter is to establish uniform insulation performance standards to protect persons with hotels, motels, apartment houses, attached and detached single-family dwellings, and within other buildings where noise-sensitive activities are affected

SECTION 11.0. DEVELOPMENT REVIEW CRITERIA

The development plan described in Section 10.0 shall be reviewed and evaluated using, at a minimum, the following criteria:

Proposed Uses. All elements of the proposed development are consistent with Table A, Land-Use Compatibility Standards.

Siting. Buildings and structures should be located the greatest distance from the noise source, taking maximum advantage of existing topographical features to minimize noise impact, and within zoning district requirements, such as required setbacks. Buildings and structures should be oriented to minimize exposure to the noise source and building openings, such as windows, should be located away from the noise source.

Passive Outdoor Recreation Space. The amount of passive outdoor recreational space where individuals would be subject to noticeable or severe levels of noise should be minimized. Landscaping materials should be used to deflect noise.

SECTION 12.0. FIELD TESTING OF INTERIOR SOUND LEVELS

Field testing of interior sound levels may occur as requested by the applicant, property owner, and/or [jurisdiction]. Such field testing may be provided by the staff of the [airport authority], provided sufficient staff resources, time, and equipment is available; otherwise, such testing shall occur at the expense of the [jurisdiction].

SUBDIVISION REGULATIONS

Commentary. The model subdivision regulations apply standards, as found in the Airport Environs Zoning District (AE), to the subdivision of land. Avigation easement and noise notice requirements are also specified.

SUBDIVISION REGULATIONS (MODEL)

SECTION 1.0. TITLE AND PURPOSE

This chapter is intended to protect the public health, safety, and welfare by regulating development and

by excessive aircraft noise. Effects of airborne noise include, but are not limited to, hearing loss or impairment, and persistent interference with speech and sleep. This chapter is intended to be a companion to adopted zoning ordinances establishing noise zones and limiting land use in these zones.

SECTION 2.0. SCOPE

The performance standards in this chapter are intended to provide for the insulation of the interior of buildings to an Ldn 45 or less from outside noise levels over Ldn 65. The standards shall be applied to construction of new residential or noise-sensitive commercial uses, and for reconstruction, remodeling, or additions to existing buildings of the types mentioned above when the value of the improvement exceeds 50 percent of the value of the existing structures. Where noise-sensitive activities are carried on in only a portion of new or reconstructed commercial buildings, only those areas judged noise-sensitive need be protected.

SECTION 3.0. DEFINITIONS

The special terms used in these provisions are defined as follows:

day-night average sound level (Ldn) The estimated cumulative aircraft or other noise exposure in decibels of noise as measured by an A-weighted sound-level meter. In the Ldn procedure, noise exposures are accumulated for a typical 24-hour period. A weighing factor equivalent to a penalty of 10 decibels is applied to aircraft operations or other noise sources between 10:00 p.m. and 7:00 a.m. to account for the increased sensitivity of people to night-time noise. The Ldn values can be expressed graphically on maps using either contours or grid cells.

decibel (db) A unit of measure of a sound expressed from a calibrated sound-level meter using an A-level weighting scale.

noise Aircraft or other noise that interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

noise control areas Those areas officially adopted in the Airport Environs District (AE) designated to be within a Ldn 65 noise area or greater.

interior noise level Sound level of noise in any habitable room with windows and doors closed.

SECTION 4.0. STRUCTURES REQUIRING PROTECTION

Structures to be protected shall include, but are not limited to:

All residential structures (R1, R2, and R3 occupancies); and;

The portion of nonresidential structures in which noise-sensitive activities are conducted (e.g., research facilities, hotel sleeping rooms, meeting rooms, and similar activities).

SECTION 5.0 REQUIREMENTS FOR NOISE LEVELS OVER 65 LDN

All structures regulated under this chapter in noise-level area Ldn 65 shall meet the following criteria:

A. General

1. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.
2. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar.
3. Window and/or through-the-wall HVAC type units shall not be used.
4. Operational, vented fireplaces shall not be used.
5. All sleeping spaces shall be provided with a sound-absorbing ceiling and carpeted floor.
6. Through-the-wall/door mailboxes shall not be used.

B. Exterior Walls

1. Masonry walls having a surface weight of at least 40 pounds per square foot do not require a furred interior wall. In areas over 70 Ldn, masonry walls having a surface weight of at least 75 pounds per square foot do not require a furred interior wall. At least one surface of concrete block wall shall be plastered or painted with heavy "bridging" paint.
2. Stud walls shall be at least four inches in nominal depth and shall be finished on the outside with siding on sheathing, stucco, or brick veneer.
 - a. Interior surface of the exterior stud walls shall be of gypsum board or plaster at least 1/2-inch thick, installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.
 - b. Continuous composition board, plywood, or gypsum board sheathing shall cover the exterior side of the wall studs behind wood or metal siding. The sheathing and facing shall weigh at least four pounds per square foot.
 - c. All edges of the sheathing shall be sealed

with resilient caulking.

- d. Insulation material at least two inches thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

C. Windows

1. Glass of double-glazed windows shall be used and at least 1/8-inch thick.
2. Double-glazed windows shall employ fixed sash or efficiently weatherstripped operable sash. The sash shall be rigid and weatherstripped with material that is compressed airtight when the window is closed.
3. Glass of fixed-sash windows shall be sealed in an airtight manner with a nonhardening sealant, or a soft elastomeric gasket or glazing tape.
4. The perimeter of the window frame shall be sealed airtight to the exterior wall construction with a resilient sealant.
5. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20 percent of the floor area.

D. Doors

1. All exterior side-hinged doors shall be solid-core wood or insulated or hollow metal at least 1.75 inches thick and shall be fully weatherstripped.
2. The glass of double-glazed sliding doors shall be at least 3/16 of an inch thick and separated by a minimum 1/2-inch airspace. The frame shall be provided with an efficiently airtight weatherstripping material.
3. The perimeter of door frames shall be sealed airtight to the exterior wall construction.
4. Glass in doors shall be set and sealed in an airtight nonhardening sealant, or a soft elastomeric gasket or glazing tape.

E. Roofs

1. With an attic or rafter space at least six inches deep, and with a ceiling below, the roof shall consist of 1/2-inch composition board, plywood, or gypsum board sheathing topped by roofing as required.
2. If the underside of the roof is exposed, or if the attic or rafter space is less than six inches, the roof construction shall have a surface weight of at least six pounds per square foot, except that, in areas over 70 Ldn, the roof construction shall have a surface weight of at least nine pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculation.

3. Window or dome skylights shall be double glazed and separated by minimum 1/2-inch airspace. In areas over 70 Ldn, skylights are not permitted.

F. Ceilings

1. Gypsum board of plaster ceilings at least 1/2-inch thick shall be provided where required by Section 5.0(A)(5). Ceilings shall be substantially airtight, with minimum number of penetrations.
2. Glass fiber or mineral wool insulation at least six inches thick shall be provided above the ceiling between joists.

G. Floors

The floor of the lowest occupied rooms shall be slab on grade, below grade, or over a fully enclosed basement. All door and window openings in the fully enclosed basement shall be tightly fitted.

H. Ventilation

1. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air-supply requirements for various uses in occupied rooms, without need to open any windows, doors, or other openings to the exterior.
2. Gravity vent openings in the attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least three feet in length, containing approved internal sound-absorbing duct lining. Each duct shall have a line 90-degree bend in the duct such that there is no direct line of sight from the exterior through the duct into the attic.
3. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20-gauge steel, which shall be lined with one-inch thick approved duct liner, and shall be at least five-feet long with one 90-degree bend. In areas over 70 Ldn, the duct lining shall be at least 10 feet long.
4. All vent ducts connecting the interior space to the outdoors, excepting domestic range and dryer exhaust ducts, shall contain at least a 10-foot length of approved internal sound-absorbing duct lining. Each duct shall be provided with a line 90-degree bend in the duct such that there is no direct line of sight through the duct.
5. Duct lining shall be a coated glass fiber duct liner at least one-inch thick, approved and suitable for the intended use.
6. Domestic range and dryer exhaust ducts

connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination that allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material and shall have the same free area as the vent duct.

7. Building heating units with flues or combustion air vents shall be located in a closet or room closed off from the occupied space by doors.
8. Doors between occupied space and mechanical equipment areas shall be solid-core wood or 20-gauge steel hollow metal at least 1.75 inches thick and shall be fully weatherstripped.

AVIGATION EASEMENT

Commentary. The model avigation easement provides for an easement and right-of-way for aircraft in the air space above a given property and gives the airport authority a mechanism to control the construction of buildings and structures that could affect said air space. Those granting the easement waive the right to take a cause of action in response to airport operational effects. The source of this avigation easement document is the Southeast Michigan Council of Governments (SEMCOG).

AVIGATION EASEMENT (MODEL)

WHEREAS, [full name of property owner(s)], hereinafter called the Grantors, as the owners in fee of that certain parcel of land situated in the City/Township of [jurisdiction], more particularly described as follows:

[full description of property to be covered by easement]

hereinafter called "Grantors' property," and outlined on the attached map (Exhibit I);

NOW, THEREFORE, in consideration of the sum of [____ dollars] and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Grantors, for themselves, their heirs, administrators, executors, successors, and assigns, do hereby grant, bargain, sell, and convey unto [the airport authority], hereinafter called the Grantee, its successors and assigns, for the use and benefit of the public, an easement and right of way, appurtenant to [the airport], for the unobstructed passage of all aircraft, ("aircraft" being defined for the purposes of this instrument as any contrivance now flown or hereafter invented, used or designed for navigation of or flight in the air) by whomsoever

owned and operated, [Select one of the following]

- 1) In the air space above Grantors' property, above an imaginary plane rising and extending in a generally [e.g., easterly] direction over Grantors' property, said imaginary plane running from approximately [e.g., 25] feet mean sea level above Point A on Exhibit I at the rate of one foot vertically for each [e.g., 50] feet horizontally to approximately [e.g., 55] feet mean sea level above Point B on Exhibit I, to an infinite height above said imaginary plane,
- 2) In the air space above Grantors' property above a mean sea level of [e.g., 150] feet, to an infinite height above said mean sea level of [e.g., 150] feet,

together with the right to cause in all air space above the surface of Grantor's property such noise, vibrations, fumes, dust, fuel particles, and all other effects that may be caused by the operation of aircraft landing at, or taking off from, or operating at or on said [airport]; and Grantors do hereby waive, remise, and release any right or cause of action which they may now have or which they may have in the future against Grantee, its successors and assigns, due to such noise, vibrations, fumes, dust, and fuel particles that may cause or may have been caused by the operation of aircraft landing at, or taking off from, or operating at or on said [airport].

The easement and right-of-way hereby granted includes the continuing right in the Grantee to prevent the erection or growth upon Grantors' property of any building, structure, tree, or other object, [Use the option that concurs with the above selection]

- 1) Extending into the air space above the aforesaid imaginary plane,
- 2) Extending into the air space above said mean sea level of [e.g., 150] feet,

and to remove from said airspace, or at the sole option and expense of the Grantee, as an alternative, any such building, structure, tree, or other object now upon, or which in the future may be upon, Grantors' property, together with the right of ingress to, egress from, and passage over Grantors' property for the above purposes.

TO HAVE AND TO HOLD said easement and right of way, and all rights appertaining thereto unto the Grantee, its successors and assigns, until said [airport] shall be abandoned and shall cease to be used for public airport purposes.

AND for the consideration hereinabove set forth, the Grantors, for themselves, their heirs, administrators, executors, successors, and assigns, do hereby agree that for and during the life of said easement and right-of-way, they will not hereafter erect, permit the erection or growth of, or permit or suffer to remain upon Grantor's property any building, structure, tree, or other object extending into the aforesaid prohibited airspace. And they shall not hereafter use or permit or suffer the use of Grantors' property in such a

manner as to create electrical interference with radio communication between any installation upon said airport and aircraft, or as to make it difficult for flyers to distinguish between airport lights and others, or as to impair visibility in the vicinity of the airport, or as otherwise to endanger the landing, taking off, or maneuvering of aircraft, it being understood and agreed that the aforesaid covenant and agreements shall run with the land. [Appropriate seals and signatures should be added.]

BIBLIOGRAPHY

- Brubaker/Brandt, Inc., et al. *Port Columbus International Airport, Part 150 Noise Compatibility Study*, Columbus, Ohio, 1988.
- City of Columbus, Ohio. *Noise Legislation*. 1979.
- City of Tucson, and Pima County, Arizona. *Modifications to Uniform Building Code*. 1988.
- Coffman Associates. *Airport Master Plan and F.A.R. Part 150 Noise Compatibility Study*. Rickenbacker Airport, Columbus, Ohio.
- Coons, Steven R. *A Guide for Land Use Planning Around Airports in Wisconsin*. Wisconsin Department of Transportation, Madison, Wisconsin, 1989.
- Dolley, Leland C., and Douglass G. Carroll. "Airport Noise Pollution Damages: The Case for Local Liability." *The Urban Lawyer* (1983).
- Fairfax County, Virginia. *Airport Noise Impact Overlay District (7400)*. 1984.
- Federal Interagency Committee on Urban Noise. *Guidelines for Considering Noise in Land Use Planning and Control*. Washington, D.C.: USGPO, June 1980.
- Harris, Richard L. *Land Use Compatibility Study: Aircraft Noise and Land Use*. Washington, D.C.: U.S. Department of Transportation, Federal Aviation Administration, 1984.
- Knack, Ruth Eckdish, and Jim Schwab. "Learning to Live with Airports." *Planning* (October 1986): 11-15.
- Los Angeles International Airport. *Noise Control and Land Use Compatibility Study*.
- Mayo, Louis H., Jr. "Noise-Compatible Land Uses in Airport Environs." *Environmental Commentary*, March 1979, 8-10.
- "New Jersey Adopts Airport Zoning Rules." *Zoning News* (July 1985).
- Newman, J. Steven, and Kristy R. Beattie. *Aviation Noise Effects*. Washington, D.C.: U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, Report No. FAAEE852, March 1985.
- Pensacola, Florida. *Airport Zoning (Chapter 12-11)*.
- Southeast Michigan Regional Planning Commission. *Selected Model Ordinances*.
- Tedrick, R.N., and R.B. Hixson. *Aircraft Noise and the Airport Community*. International Air Transportation Conference, 1983.
- Texas Transportation Institute. *Airport Compatibility Guidelines*. Austin, Texas, 1986.
- Train, Russell E. *Quiet. People Living Here: A Strategy for Coping With Aviation Noise*. Washington, D.C., 1976.
- U.S. Department of Transportation, Federal Aviation Administration. *Airport-Land Use Compatibility Planning*. Washington, D.C., 1977.

RECENT PLANNING ADVISORY SERVICE REPORTS

- 377 **Flexible Parking Requirements.** August 1983. 38 pp. \$20; PAS subscribers \$10.
- 378 **Working With Consultants.** October 1983. 33 pp. \$20; PAS subscribers \$10.
- 379 **Appearance Codes for Small Communities.** October 1983. 26 pp. \$20; PAS subscribers \$10.
- 380 **Analyzing the Economic Feasibility of a Development Project: A Guide for Planners.** November 1983. 38 pp. \$20; PAS subscribers \$10.
- 381 **Increasing Housing Opportunities for the Elderly.** December 1983. 16 pp. \$20 (photocopy).
- 383 **How To Set Up a Planning Agency Library.** April 1984. 38 pp. \$20; PAS subscribers \$10.
- 384 **Regulating Radio and TV Towers.** June 1984. 38 pp. \$20; PAS subscribers \$10.
- 385 **Affordable Single-Family Housing: A Review of Development Standards.** August 1984. 117 pp. \$30; PAS subscribers \$15.
- 386 **State and Local Regulations for Reducing Agricultural Erosion.** September 1984. 42 pp. \$20; PAS subscribers \$10.
- 387 **Traffic Impact Analysis.** October 1984. 34 pp. \$20; PAS subscribers \$10.
- 389 **Tax Increment Financing: Part 1. What Is TIF? Part 2. Determining Potential Gains and Losses of TIF.** December 1984. 19 pp. \$20; PAS subscribers \$10.
- 390 **Infrastructure Support for Economic Development.** September 1985. 38 pp. \$20; PAS subscribers \$10.
- 391 **Home Occupation Ordinances.** October 1985. 38 pp. \$20; PAS subscribers \$10.
- 392 **Innovative Capital Financing.** December 1985. 38 pp. \$20; PAS subscribers \$10.
- 393 **Managing Municipal Information Needs Using Microcomputers.** April 1986. 22 pp. \$20 (photocopy).
- 394 **Regulating Satellite Dish Antennas.** May 1986. 30 pp. \$20; PAS subscribers \$10.
- 396 **Standards for Self-Service Storage Facilities.** September 1986. 22 pp. \$20; PAS subscribers \$10.
- 397 **Siting Group Homes for Developmentally Disabled Persons.** October 1986. 46 pp. \$20; PAS subscribers \$10.
- 398 **Regulating Manufactured Housing.** December 1986. 38 pp. \$20; PAS subscribers \$10.
- 399 **Aesthetics and Land-Use Controls.** December 1986. 46 pp. \$20; PAS subscribers \$10.
- 400 **The Planning Commission: Its Composition and Function, 1987.** May 1987. 11 pp. \$20; PAS subscribers \$10.
- 401 **Transferable Development Rights Programs: TDRs and the Real Estate Marketplace.** May 1987. 38 pp. \$20; PAS subscribers \$10.
- 402 **Seven Methods for Calculating Land Capability/Suitability.** July 1987. 22 pp. \$24 (photocopy).
- 403 **Computer Applications in Economic Development.** August 1987. 38 pp. \$24; PAS subscribers \$12.
- 404 **How to Conduct a Citizen Survey.** November 1987. 24 pp. (photocopy) \$20.
- 405 **New Standards for Nonresidential Uses.** December 1987. 26 pp. \$24; PAS subscribers \$12.
- 406 **Housing Trust Funds.** December 1987. 25 pp. \$24; PAS subscribers \$12.
- 408 **The Calculation of Proportionate-Share Impact Fees.** July 1988. 38 pp. \$24; PAS subscribers \$12.
- 409 **Enforcing Zoning and Land-Use Controls.** August 1988. 30 pp. \$24; PAS subscribers \$12.
- 410 **Zoning Bonuses in Central Cities.** September 1988. 30 pp. \$24; PAS subscribers \$12.
- 411 **The Aesthetics of Parking.** November 1988. 42 pp. \$24; PAS subscribers \$12.
- 412/413 **Protecting Nontidal Wetlands.** December 1988. 76 pp. \$44; PAS subscribers \$22.
- 414/415 **A Planners Review of PC Software and Technology.** December 1988. 102 pp. \$44; PAS subscribers \$22.
- 416 **Responding to the Takings Challenge.** May 1989. 40 pp. \$24; PAS subscribers \$12.
- 417 **Reaching Consensus in Land-Use Negotiations.** July 1989. 14 pp. \$24; PAS subscribers \$12.
- 418 **Designing Urban Corridors.** September 1989. 38 pp. \$24; PAS subscribers \$12.
- 419 **Sign Regulation for Small and Midsize Communities: A Planners Guide and a Model Ordinance.** November 1989. 42 pp. \$24; PAS subscribers \$12.
- 420 **Community-Based Housing for the Elderly: A Zoning Guide for Planners and Municipal Officials.** December 1989. 30 pp. \$24; PAS subscribers \$12.
- 421 **A Survey of Zoning Definitions.** December 1989. 36 pp. \$24; PAS subscribers \$12.
- 422 **Zoning for Child Care.** December 1989. 30 pp. \$24; PAS subscribers \$12.
- 424/425 **Solid Waste Management: Planning Issues and Opportunities.** September 1990. 71 pp. \$44; PAS subscribers \$22.
- * 426 **Private Funding for Roads.** October 1990. 30 pp. PAS subscribers \$12.
- 427/428 **Planning Software Survey, 1990.** December 1990. 55 pp. \$44; PAS subscribers \$22.
- * 429 **Preserving Rural Character.** December 1990. 20 pp. PAS subscribers \$12.
- 430 **Reinventing the Village: Planning, Zoning, and Design Strategies.** December 1990. 44 pp. \$24; PAS subscribers \$12.
- * 431 **Preparing a Landscape Ordinance.** December 1990. 26 pp. PAS subscribers \$12.
- 432 **Off-Street Parking Requirements: A National Review of Standards.** May 1991. 27 pp. \$24; PAS subscribers \$12.
- 433 **GIS: Assessing Your Needs and Choosing a System.** August 1991. 28 pp. \$24; PAS subscribers \$12.
- * 434 **Personnel Practices in Planning Offices.** August 1991. 32 pp. PAS subscribers \$12.
- 435 **Electromagnetic Fields and Land-Use Controls.** December 1991. 20 pp. \$24; PAS subscribers \$12.
- * 436 **TIGER: A Primer for Planners.** December 1991. 16 pp. PAS subscribers \$12.
- * 437 **Airport Noise Regulations.** May 1992. 16 pp. PAS subscribers \$12.