

# 3



## Appendix

Scott Air Force Base  
MidAmerica St. Louis Airport  
Joint Land Use Study

In an effort to conserve paper, this document is formatted to be printed double sided

## List of Acronyms

AFB	Air Force Base
AICUZ	Air Installation Compatible Use Zone
APZ	Accident Potential Zone
BRAC	Base Alignment and Closure
CZ	Clear Zone
dB	Decibels
dba	A-weighted decibels
DoD	Department of Defense
DNL	Day-night sound level
DU	Dwelling Unit
FAA	Federal Aviation Administration
FICUN	Federal Interagency Committee on Urban Noise
IDOT	Illinois Department of Transportation
JLUS	Joint Land Use Study
LUPZ	Land Use Planning Zone
MOU	Memorandum of Understanding
NVG	Night Vision Goggle
OEA	Office of Economic Adjustment
PAO	Public Affairs Office
REPI	Readiness and Environmental Protection Initiative
RPZ	Runway Protection Zone

## Glossary

**A-weighting (dBA)** - A measure of sound that depicts higher frequency noise caused by small arms firing, aircraft use, and vehicle operations.

**Accident Potential Zone I (APZ I) [Class A Runway Accident]** - An area just beyond the Clear Zones at each end of the runway. Less critical than the Clear Zone it still possesses significant potential for accidents. Land use compatibility guidelines allow a wide variety of industrial, manufacturing, transportation, communication, utilities, wholesale trade, open space, recreation and agricultural uses. Uses that concentrate people in small areas are not acceptable in APZ I.

**Accident Potential Zone II (APZ II) [Class A Runway]** - An area extending beyond APZ I. This area is less critical than APZ I but still possesses potential for accidents. Acceptable land uses include those in APZ I, as well as low density, single family residences. Also acceptable are personal and business services and commercial retail trade uses of low intensity or scale of operation. High-density functions such as multi-story buildings, places of assembly (e.g., theaters, schools, churches, and restaurants) and high-density office uses are not considered appropriate.

**Army Compatible Use Buffer (ACUB)** - A new program allows military installations to provide funds to a partner who, in turn, would purchase title or conservation easements on tracts of land that surround the installation to buffer the installation from further development. Partners may include states, cities and counties as well as not-for-profit, non-governmental conservation organizations.

**Clear Zone (CZ) [Class A Runway]** - An area 1,000 feet wide by 3,000 feet long located at the immediate end of the runway. The accident potential in this area is so high that no building is allowed.

**Day-Night Average Sound Level (DNL)** - The 24-hour average frequency-weighted sound level, in decibels, from midnight to midnight, obtained after addition of 10 decibels to sound levels in the night from midnight up to 7 a.m. and from 10 p.m. to midnight (0000 up to 0700 and 2200 up to 2400 hours).

**Decibels (dB)** - The decibel is a logarithmic unit of measure of sound pressure.

**Land Use Planning Zone.** The noise contours, 65 ADNL and 62CDNL, represent an annual average that separates the Noise Zone II, which has compatibility issues, from the fully compatible NZ I. Since the noise environment at the installation varies daily and seasonally, the Land Use Planning Zone (LUPZ) contour more broadly encompasses off-post lands, where on particularly active days, noise and the resulting community annoyance can approach levels typically associated with NZ II. The LUPZ, thus, gives the installation more flexibility for performing its mission and better reflects actual noise conditions during a period of heightened activity.

**Noise Zone I. Noise Zone I (NZ I)** includes areas around a noise source in which the DNL is less than 65 dBA and less than 62 dBC. Since the noise exposure in this zone is low enough that it does not trigger compatibility with sensitive uses, maps of the noise environment do not show NZ I contours.

**Noise Zone II. Noise Zone II (NZ II)** consists of an area where the A-weighted DNL is between 65 and 75 decibels and the C-weighted DNL is between 62 and 70 decibels. Guidance deems noise exposure within this area to be significant and recommends limiting use of land to non-

sensitive activities such as industry, manufacturing, transportation, and agriculture. However, if the community determines that land in NZ II areas must be used for residential purposes, guidance suggests that the design and construction of the buildings incorporate noise level reduction (NLR) features to minimize the annoyance experienced by residents.

**Noise Zone III.** **Noise Zone III (NZ III)** consists of the immediate areas around the source of the noise in which the A-weighted DNL (ADNL) is more than 75 decibels, and the C-weighted DNL (CDNL) exceeds 70 decibels. Guidance indicates that noise in this zone is severe enough to cause conflicts with almost all activities, particularly sensitive land uses, such as housing, schools, medical facilities, and places of worship.

## GUIDELINES FOR CONSIDERING NOISE IN LAND USE PLANNING AND CONTROL. (FICUN 1980)

	NZ I		NZ II			NZ III	
	0-55	55-65	65-70	70-75	75-80	80-85	85+
RESIDENTIAL							
HOUSEHOLD UNITS	YES	YES <sup>+</sup>	25 <sup>1</sup>	30 <sup>1</sup>	NO	NO	NO
GROUP QUARTERS	YES	YES <sup>+</sup>	25 <sup>1</sup>	30 <sup>1</sup>	NO	NO	NO
RESIDENTIAL HOTELS	YES	YES <sup>+</sup>	25 <sup>1</sup>	30 <sup>1</sup>	NO	NO	NO
MANUFACTURED HOUSING	YES	YES <sup>+</sup>	NO	NO	NO	NO	NO
OTHER RESIDENTIAL	YES	YES <sup>+</sup>	25 <sup>1</sup>	30 <sup>1</sup>	NO	NO	NO
MANUFACTURING							
FOOD PRODUCTS	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
TEXTILE MILL PRODUCTS	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
APPAREL	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
WOOD PRODUCTS	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
FURNITURE	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
PAPER	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
PRINTING	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
MANUFACTURING	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
TRANSPORT, COMMS & UTIL							
RAILROAD	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
MOTOR VEHICLE	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
AIRCRAFT	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
MARINE CRAFT	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
HIGHWAY & STREET	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
PARKING	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
COMMUNICATIONS	YES	YES	YES	25 <sup>5</sup>	30 <sup>5</sup>	NO	NO

UTILITIES	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>4</sup>
OTHER T, C & U	YES	YES	YES	25 <sup>5</sup>	30 <sup>5</sup>	NO	NO
TRADE							
WHOLESALE TRADE	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
RETAIL - BUILDING	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
RETAIL - GENERAL	YES	YES	YES	25	30	NO	NO
RETAIL - FOOD	YES	YES	YES	25	30	NO	NO
RETAIL - AUTO	YES	YES	YES	25	30	NO	NO
RETAIL - APPAREL	YES	YES	YES	25	30	NO	NO
RETAIL - FURNITURE	YES	YES	YES	25	30	NO	NO
RETAIL - EATING	YES	YES	YES	25	30	NO	NO
OTHER RETAIL TRADE	YES	YES	YES	25	30	NO	NO
SERVICES							
FINANCE, INSURANCE	YES	YES	YES	25	30	NO	NO
PERSONAL SERVICES	YES	YES	YES	25	30	NO	NO
CEMETERIES <sup>11</sup>	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	YES <sup>6</sup>
REPAIR SERVICES	YES	YES	YES	YES <sup>2</sup>	YES <sup>3</sup>	YES <sup>4</sup>	NO
PROFESS SERVICES	YES	YES	YES	25	30	NO	NO
HOSPITALS, NURSING	YES	YES <sup>*</sup>	25 <sup>*</sup>	30 <sup>*</sup>	NO	NO	NO
OTHER MEDICAL	YES	YES	YES	25	30	NO	NO
FACILITIES							
CONTRACT CONSTRUCTION	YES	YES	YES	25	30	NO	NO
GOVERNMENT SERVICES	YES	YES <sup>*</sup>	YES <sup>*</sup>	25 <sup>*</sup>	30 <sup>*</sup>	NO	NO
EDUCATIONAL SERVICES	YES	YES <sup>*</sup>	25 <sup>*</sup>	30 <sup>*</sup>	NO	NO	NO
MISC SERVICES	YES	YES	YES	25	30	NO	NO

## CULTURAL, ENTERTAINMENT &amp; RECREATION

CHURCHES	YES	YES <sup>*</sup>	25 <sup>*</sup>	30 <sup>*</sup>	NO	NO	NO
NATURE EXHIBITS	YES	YES <sup>*</sup>	YES <sup>*</sup>	NO	NO	NO	NO
PUBLIC ASSEMBLY	YES	YES	YES	NO	NO	NO	NO
AUDITORIUMS	YES	YES	25	30	NO	NO	NO
AMPHITHEATERS	YES	YES <sup>*</sup>	NO	NO	NO	NO	NO
OUTDOOR SPORTS	YES	YES	YES <sup>7</sup>	YES <sup>7</sup>	NO	NO	NO
AMUSEMENTS	YES	YES	YES	YES	NO	NO	NO
RECREATIONAL	YES	YES <sup>*</sup>	YES <sup>*</sup>	25 <sup>*</sup>	30 <sup>*</sup>	NO	NO
RESORTS	YES	YES <sup>*</sup>	YES <sup>*</sup>	YES <sup>*</sup>	NO	NO	NO
PARKS	YES	YES <sup>*</sup>	YES <sup>*</sup>	YES <sup>*</sup>	NO	NO	NO
OTHER	YES	YES <sup>*</sup>	YES <sup>*</sup>	YES <sup>*</sup>	NO	NO	NO

## RESOURCE PRODUCT

AGRICULTURE	YES	YES	YES <sup>8</sup>	YES <sup>9</sup>	YES <sup>10</sup>	YES <sup>10</sup>	YES <sup>10</sup>
LIVESTOCK	YES	YES	YES <sup>8</sup>	YES <sup>9</sup>	NO	NO	NO
FORESTRY	YES	YES	YES <sup>8</sup>	YES <sup>9</sup>	YES <sup>10</sup>	YES <sup>10</sup>	YES <sup>10</sup>
FISHING	YES	YES	YES	YES	YES	YES	YES
MINING	YES	YES	YES	YES	YES	YES	YES
OTHER RESOURCE	YES	YES	YES	YES	YES	YES	YES

Legend:

Yes	Land use and related structures compatible without restrictions.
No	Land use and related structures are not compatible and should be prohibited.
ADNL	A-weighted day-night sound level
NZ	Noise Zone
Yes <sup>x</sup>	(Yes with restrictions) Land use and related structures generally compatible; see footnotes.
25, 30, 35	Land use and related structures generally compatible; measures to achieve noise level reduction (NLR) of 25, 30 or 35 must be incorporated into design and construction of structure.
25 <sup>*</sup> , 30 <sup>*</sup> , 35 <sup>*</sup>	Land use generally compatible with NLR; however, measures to achieve an overall NLR do not necessarily solve noise difficulties; additional evaluation is warranted.
NLR	Noise level reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

Footnotes:

The designation of these uses as "compatible" in this zone reflects individual Federal agencies' consideration of general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

- 1 (a) Although local conditions may require residential use, it is discouraged in 65-70 ADNL and strongly discouraged in 70-75 ADNL. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approvals.
- (b) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 dB (65-70 ADNL) and 30 dB (70-75 ADNL) should be incorporated into building codes and be considered in individual approvals. Normal 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. Additional consideration should be given to modifying NLR levels based on peak noise levels.
- (c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level transportation sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.
- 2 Measures to achieve NLR of 25 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 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 of 35 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.
- 5 If noise-sensitive, use indicated NLR; if not, use is compatible.
- 6 No buildings.
- 7 Land use compatible provided special sound reinforcement systems are installed.
- 8 Residential buildings require a NLR of 25.
- 9 Residential buildings require a NLR of 30.
- 10 Residential buildings not permitted.
- 11 In areas with ADNL greater than 80, land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

## DoD COMPATIBLE LAND USE GUIDELINES FOR CLEAR ZONES AND ACCIDENT POTENTIAL ZONES (APZ).

(U.S. Army 1981)

LAND USE	CLEAR ZONE	APZ I	APZ II
<i>A. RESIDENTIAL</i>			
Single Family Unit	No	No	Yes <sup>2</sup>
2-4 Family Units	No	No	No
Multifamily Dwellings (Apartments)	No	No	No
Group Quarters	No	No	No
Residential Hotels	No	No	No
Mobile Home Parks or Courts	No	No	No
Other Residential	No	No	No
<i>B. INDUSTRIAL &amp; MANUFACTURING<sup>3</sup></i>			
Food and Kindred Products	No	No	Yes

Apparel	No	No	No
Lumber and Wood Products	No	Yes	Yes
Furniture and Fixtures	No	Yes	Yes
Printing, Publishing	No	Yes	Yes
Miscellaneous Manufacturing	No	Yes	Yes
<i>C. TRANSPORTATION, COMMUNICATIONS &amp; UTILITIES<sup>4</sup></i>			
Railroad, Rapid Rail Transit (on-grade)	No	Yes <sup>4</sup>	Yes
Highway and Street Rights-of-Way	Yes <sup>5</sup>	Yes	Yes
Auto Parking	No	Yes	Yes
Communications	Yes <sup>5</sup>	Yes	Yes
Utilities	Yes <sup>5</sup>	Yes <sup>4</sup>	Yes
Other Transportation, Communications and Utilities	Yes <sup>5</sup>	Yes	Yes
<i>D. COMMERCIAL &amp; RETAIL TRADE</i>			
Wholesale Trade	No	Yes	Yes
Building Materials (Retail)	No	Yes	Yes
General Merchandise (Retail)	No	No	Yes
Food (Retail)	No	No	Yes
Automotive, Marine, and Aviation	No	Yes	Yes
Apparel and Accessories (Retail)	No	No	Yes
Furniture, Home Furnishings (Retail)	No	No	Yes
Eating and Drinking Facilities	No	No	No
Other Retail Trade	No	No	Yes
<i>E. PERSONAL &amp; BUSINESS SERVICES<sup>6</sup></i>			
Finance, Insurance, and Real Estate	No	No	Yes
Personal Services	No	No	Yes
Business Services	No	No	Yes
Repair Services	No	Yes	Yes
Professional Services	No	No	Yes
Contract Construction Services	No	Yes	Yes
Indoor Recreation Services	No	No	Yes
Other Services	No	No	Yes
<i>F. PUBLIC AND QUASI-PUBLIC SERVICES</i>			
Government Services	No	No	Yes <sup>6</sup>
Educational Services	No	No	No
Cultural Activities	No	No	No
Medical and Other Health Services	No	No	No
Cemeteries	No	Yes <sup>7</sup>	Yes <sup>7</sup>
Non-profit Organizations including Churches	No	No	No
Other Public and Quasi-Public Services	No	No	Yes
<i>G. OUTDOOR RECREATION</i>			
Playgrounds and Neighborhood Parks	No	No	Yes
Community and Regional Parks	No	Yes <sup>8</sup>	Yes <sup>8</sup>

Nature Exhibits	No	Yes	Yes
Spectator Sports Including Arenas	No	No	No
Golf Courses <sup>9</sup> , Riding Stables <sup>10</sup>	No	Yes	Yes
Water Based Recreational Areas	No	Yes	Yes
Resort and Group Camps	No	No	No
Entertainment Assembly Areas	No	No	No
Other Outdoor Recreation	No	Yes <sup>8</sup>	Yes
<i>H. RESOURCE PRODUCTION &amp; EXTRACTION&amp; OPEN LAND</i>			
Agriculture <sup>11</sup>	Yes	Yes	Yes
Livestock Farming, Animal Breeding <sup>12</sup>	No	Yes	Yes
Forestry Activities	No	Yes	Yes
Fishing Activities and Related Services <sup>13</sup>	No <sup>14</sup>	Yes <sup>13</sup>	Yes
Mining Activities	No	Yes	Yes
Permanent Open Space	Yes	Yes	Yes
Water Areas <sup>13</sup>	Yes	Yes	Yes

Footnotes:

- <sup>1</sup> A "Yes" or "No" designation for compatible land use is to be used only for gross comparison. Within each, uses exist where further definition may be needed as to whether it is clear or usually acceptable/unacceptable owing to variations in densities of people and structures. For heliports and stagefields, the takeoff safety zone is equivalent to the clear zone and the approach-departure zone is equivalent to APZ I for these land use guidelines.
- <sup>2</sup> Suggested maximum density 1-2 dwelling units per acre, possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
- <sup>3</sup> Factors to be considered: Labor intensity, structural coverage, explosive characteristics, and air pollution.
- <sup>4</sup> No passenger terminals and no major above ground transmission lines in APZ I.
- <sup>5</sup> Not permitted in graded area.
- <sup>6</sup> Low intensity office uses only. Meeting places, auditoriums, etc., not recommended.
- <sup>7</sup> Excludes chapels.
- <sup>8</sup> Facilities must be low intensity.
- <sup>9</sup> Clubhouse not recommended.
- <sup>10</sup> Concentrated rings with large classes not recommended.
- <sup>11</sup> Includes livestock grazing but excludes feedlots and intensive animal husbandry.
- <sup>12</sup> Includes feedlots and intensive animal husbandry.
- <sup>13</sup> Includes hunting and fishing.
- <sup>14</sup> Controlled hunting and fishing may be permitted for the purpose of wildlife control.

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## Sample Memorandum of Understanding

Between Scott Air Force Base and

The Counties of \_\_\_\_\_ and

The Cities of \_\_\_\_\_

This Memorandum of Understanding between Scott Air Force Base, the Counties of \_\_\_\_\_, and the Cities of \_\_\_\_\_, is enacted to establish a mutually beneficial process that will ensure timely and consistent notification and cooperation between the parties on projects, policies, and activities. These parties have a mutual interest in the cooperative evaluation, review, and coordination of local plans, programs, and projects in the Counties of \_\_\_\_\_, the Cities of \_\_\_\_\_, and on Scott Air Force Base.

The Cities of \_\_\_\_\_ and the Counties of \_\_\_\_\_ agree to:

Submit information to Scott Air Force Base on plans, programs, actions, and projects that may affect Scott Air Force Base. This may include, but not be limited to the following:

- Development proposals
- Transportation improvements and plans
- Sanitary waste facilities//any infrastructure necessary to support development
- Open space and recreation
- Public works projects
- Land use plans and ordinances
- Rezonings and variances

Submit to Scott Air Force Base for review and comment, project notification, policies, plans, reports, studies and similar information on development, infrastructure and environmental activities within proximity of Scott Air Force Base as defined by \_\_\_\_\_.

Consider Air Force comments as part of local responses or reports.

Include Scott Air Force Base in the distribution of meeting agendas for, but not limited to:

- City Council or County Commission Meetings
- Planning Commission Meetings
- Zoning Boards of Adjustment
- Review Board
- Transportation Studies

Scott Air Force Base agrees to:

Submit information to City and County representatives on plans, programs, actions, and projects which may affect the city or county. These may include, but not be limited to, the following:

- Installation Master Plan
- Air Installation Compatible Use Zone Studies
- Noise Management Studies
- Changes in existing installation use that may change off-base impacts, such as noise
- Appropriate data on troop strength and activities for local plans, programs and projects

Submit to City and County representatives for review and comment, project notification, policies, plans, reports, studies and similar information on development, infrastructure and environmental activities at Scott Air Force Base.

This agreement will remain in effect until terminated by any of the parties. Amendments to this memorandum may be made by mutual agreement of all the parties. Review process details and appropriate forms may be developed to facilitate uniform and efficient exchanges of comments.

This understanding will not be construed to obligate the U.S. Air Force, the Cities of \_\_\_\_\_, the Counties of \_\_\_\_\_ to violate existing or future laws or regulations.

This agreement is approved by:

County

City

Scott Air Force Base

## Sample Real Estate Disclosure

### AREA OF AIRCRAFT OPERATIONAL IMPACTS REAL ESTATE DISCLOSURE FORM

Property at the following location is situated within the vicinity of Scott Air Force Base and/ or MidAmerica St. Louis Airport. The subject property may therefore be exposed to periodic low-level aircraft over-flights, aircraft noise, and impacts associated with airfield activities.

Parcel #: \_\_\_\_\_ Deed Book # \_\_\_\_\_ Page # \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I, \_\_\_\_\_, (owner of the subject property) hereby certify that I have informed \_\_\_\_\_ (prospective purchaser/lessee/renter) that the subject property is located within the vicinity of Scott Air Force Base and/ or MidAmerica St. Louis Airport and may therefore be exposed to periodic low-level aircraft over-flights, aircraft noise, and impacts associated with airfield activities.

\_\_\_\_\_  
*Owner/ Date*

I, \_\_\_\_\_, (prospective purchaser/lessee/renter of the subject property) hereby certify that I have been informed by \_\_\_\_\_ (owner) that the subject property is located in the vicinity of Scott Air Force Base and/ or MidAmerica St. Louis Airport and may therefore be exposed to periodic low-level aircraft over-flights, aircraft noise, and impacts associated with airfield activities.

\_\_\_\_\_  
*Purchaser/Lessee/Renter Date*

Signed before me on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, in the  
County of \_\_\_\_\_, Tennessee/Kentucky

\_\_\_\_\_, Notary Public, State of Tennessee/Kentucky.

My Commission Expires on \_\_\_\_\_. (SEAL)

## Sample Noise Easement

Parcel \_\_\_\_\_ County \_\_\_\_\_

Grantor (s) Name \_\_\_\_\_

\_\_\_\_\_

Grantor (s) Address \_\_\_\_\_

\_\_\_\_\_

### LEGAL DESCRIPTION:

In accordance with section XXXXX of the Land Use Ordinance for XXXXX County, State of XXXXX, approving a permit for residential development on the above described property, and in consideration of such approval, Grantors grant to the owners of all property adjacent to the above described property, a perpetual nonexclusive easement as follows:

1. The Grantors, their heirs, successors, and assigns acknowledge by the granting of this easement that the residential development is situated in an area that may be subjected to conditions resulting from aircraft operations at Scott Air Force Base. Such conditions include the overflight of fixed-wing aircraft, the movement of vehicles, the use of generators, and other accepted and customary military training activities. These activities ordinarily and necessarily produce noise, other conditions that may conflict with Grantors' use of Grantors' property for residential purposes. Grantors hereby waive all common law rights to object to normal and necessary military training activities legally conducted on adjacent Scott Air Force Base which may conflict with Grantors' use of Grantors' property for residential and other purposes, and Grantors hereby grant an easement to the adjacent Scott Air Force Base for such activities.
2. Nothing in this easement shall grant a right to Scott Air Force Base for ingress or egress upon or across the described property. Nothing in this easement shall prohibit or otherwise restrict the Grantors from enforcing or seeking enforcement of statues or regulations of governmental agencies for activities conducted on adjacent properties.
3. This easement is appurtenant to all property adjacent to the above described property and shall bind to the heirs, successors, and assigns of Grantors and shall endure for the benefit of the adjoining Scott Air Force Base. Scott Air Force Base is hereby expressly granted the right of third party enforcement of the easement.

IN WITNESS WHEREOF, the Grantors have executed this easement dated this \_\_ day of \_\_\_\_\_, 20\_\_

\_\_\_\_\_  
Grantor

\_\_\_\_\_  
Grantor

## Sample Lighting Zoning Ordinance #1: Dark Sky Approved Lighting

### LIGHTING ORDINANCE

This ordinance is intended for use by communities anticipating the National Model Lighting Ordinance (MLO) now being developed jointly by the Illuminating Engineering Society and the International Dark Sky Association. Adaption of the MLO is recommended when available.

#### “Chapter xx OUTDOOR LIGHTING

##### xx.1. Title.

This chapter is entitled Outdoor Lighting Code of the (governing unit).

##### xx.2 Purpose.

The purpose of this Code is to provide regulations for outdoor lighting that will:

1. Minimize the impact of lighting on night aircraft operations;
2. Permit reasonable uses of outdoor lighting for nighttime safety, utility, security, productivity, enjoyment and commerce; and
3. Minimize discomfort and disability glare

##### xx.3 Applicability

1. This article is applicable to:
  - a. Installation of new lighting systems,
  - b. Modifications of existing lighting systems;
  - c. Replacement of lighting fixtures, or
  - d. Installation or replacement of any other lighting equipment, whether attached to structures, poles, the earth, or any other location, including lighting systems installed on private or public property by any third party such as an electric utility.
2. Exemption. The following luminaires and lighting systems are EXEMPT from these requirements.
  - a. Interior lighting.
  - b. Internally illuminated signs.
  - c. Externally illuminated signs.
  - d. Temporary lighting for theatrical, television, and performance areas.
  - e. Lighting in swimming pools and other water features governed by Article 680 of the National Electrical Code.
  - f. Code required exit signs.
  - g. Lighting specifically for stairs and ramps.
  - h. Temporary and seasonal lighting provided that individual lamps are 10 watts or less.
  - i. Lighting required and regulated by the Federal Aviation Administration, U.S. Coast Guard, or other federal or state agency.
  - j. Single-family and two-family dwelling uses are encouraged but not required to comply with this ordinance, with the exception that all exterior pole lighting shall use full-cutoff lighting fixtures.
  - k. Agricultural uses outside of the Night Vision Device Influence Area are encouraged but not required to comply with this ordinance

Cross-reference: See the Sign Code for illumination requirements relating to permanent signs.

#### xx.4 Definitions.

For the purposes of this Code certain terms and words are defined as follows: the words "used for" include "designed for" and vice-versa; words used in the present tense include the future, the singular tense includes the plural and vice-versa; the word "shall" is always mandatory; the word "may" is discretionary; the masculine gender includes the feminine gender, except as otherwise provided. If a term is not defined herein, but is defined by the IESNA, the IESNA definition shall be utilized, unless the context of the word indicates otherwise. The following terms shall mean:

*Artificial Sky Glow.* The brightening of the night sky attributable to man made sources of light.

*Authority.* The person(s) holding the position of (designees).

*Candela.* The unit of luminous intensity of a lighting source emitted into a given direction.

*Canopy.* A roof-like covering over an area, in or under which a lighting fixture is mounted.

*Canopy (structure).* A canopy under which a business provides some service to a customer, such as food service, a bank transaction, or the like.

#### *Common Residential Areas.*

- Areas shared in common by residents of two or more dwelling units, i.e. common open space, play area, trash receptacle area, "common property" under a subdivision or partition declaration, etc.
- Two or more open parking spaces, either abutting or within 10 feet of each other and not separated by a wall or other physical barrier between the two parking spaces, designated or set aside for use by the two or more dwelling units, regardless whether the parking space is assigned for exclusive use of each dwelling unit or non-exclusively used by two or more dwelling units, and are either commonly owned or were developed for the purpose of serving the parking needs of "multiple dwellings" or multiple attached single-family dwellings, as defined in the Community Development Code.

*Code or Lighting Code.* The provisions of this Chapter xx.

*Drip Line Area.* The area on the ground enclosed by vertical planes extending downward from the outer solid edge of a structure's canopy.

*Duplex.* A building on a lot designed to contain two dwelling units and used for residential purposes.

*Dwelling, Multiple -* A building on one or more lots designed to contain three or more dwelling units that share common walls or floor/ceilings with one or more units. The land underneath the structure is not divided into separate lots. Multiple dwelling includes structures commonly called garden apartments, apartments and condominiums.

*Dwelling, Single-Family -* A detached dwelling unit designed and used for that purpose or an attached dwelling unit, located on its own lot, that shares one or more common or abutting walls with one or more dwelling units. The common or abutting wall shall consist of a structural wall which shared for at least 25 percent of the length of the side of the dwelling. An attached house does not share common floor/ceilings with other dwelling units. An attached house is also called a rowhouse, townhouse, or a common-wall house.

*Façade.* The exterior wall or elevation of a building.

*Glare.* Light that causes visual discomfort or disability, and the wattage and/or light distribution is excessive for the purposes for which the illumination is necessary..

*Hardscape* Permanent improvements to a site, including but not limited to, parking lots, driveways, streets, plazas, sidewalks, walkways, bikeways, abutments, stairs, ramps, and architectural features, such as fountains, sculptures, and the like.

*House Side Shield.* For fully shielded luminaires only, an internal shield designed and installed by the luminaire manufacturer that significantly attenuates candlepower in the back photometric hemisphere at all angles greater than 30 degrees relative to nadir.

*IESNA.* The Illuminating Engineering Society of North America (see [www.iesna.com](http://www.iesna.com)).

*Intersection.* A place where two or more public or private rights-of-way (serving vehicular and/or pedestrian traffic) cross. For purposes of this Code, an “intersection” requires the presence of a street name sign and traffic control sign.

*Landscape Lighting.* Luminaires attached to structures, mounted on poles or otherwise, or at grade (luminaire not to exceed 3 feet above grade) and used for solely for landscape rather than area lighting.

*LED* means Light Emitting Diodes.

*Light Source:* The actual bulb or lamp that emits the light.

*Light Trespass.* Spill light that because of quantitative, directional, or spectral content causes light level at the property line that is greater than as provided on Table 4 of this Code.

*Lighting System.* One or more luminaires, together with associated wires, conduits, poles, etc that constitute the illumination system on the parcel.

*Lighting Zone.* An area established by the (governing body), pursuant to Code xx.5. A description and boundaries of these five lighting zones is given in Appendix xx

*Lumen.* The unit of luminous flux: a measure of the amount of light emitted by a lamp.

*Luminaire* (or “Light Fixture”). A complete lighting unit consisting of one or more electric lamps, the lamp holder, reflector, lens, ballast, and/or other components and accessories.

*Luminance.* The amount of light emitted in a given direction from a surface by the light source or by reflection from a surface. The unit is candela per square meter.

*Luminous Flux.* A measure of the total light output from a source, the unit being the lumen.

*Mounting Height.* The vertical distance between the lowest part of the luminaire and the ground surface directly below the luminaire.

*Nadir.* The downward direction; exactly vertical, directly below a luminaire.

Non-residential Use: Commercial, Industrial, or any other non-residential use defined in the (name applicable document).

*Obtrusive Light.* Glare and light trespass.

*Ornamental or Accent Lighting.* Outdoor lighting that is installed mainly or entirely for its decorative effect or to accent an object or a feature, rather than as an aid to visibility.

*Shielding.*

- Directional. A luminaire designed to be aimed or pointed.
- Fully Shielded. A luminaire emitting no more than 0.5 percent of its luminous flux above the horizontal plane, including any luminaire rated “full cut off” according to IESNA RP-8-01.
- Partly Shielded. A luminaire emitting no more than 10 percent of its total luminous flux above the horizontal plane, including any luminaire rated “semi-cutoff” according to IESNA RP-8-01.
- Shielded. A luminaire emitting no more than 2 percent of its total luminous flux above the horizontal plane, including any luminaire rated “cutoff” according to IESNA RP-8-01.
- Unshielded. A luminaire that may emit its flux in any direction.

*Sports Lighting.* Lighting installed specifically for lighting of athletic fields for play at levels exceeding 5 footcandles, average, including but not limited to lighting for baseball, softball, football, soccer, tennis, and golf .

*Temporary Lighting.* Lighting installed with temporary wiring and operated for less than 60 days in any calendar year.

## xx.5. Lighting Zones.

1. The designated Lighting Zone for a parcel or project shall determine the limitations for lighting systems and fixtures as specified in this ordinance.
2. Establishing Lighting Zones. The (Authority) shall recommend to the (governing body), and the (governing body) shall establish by resolution Lighting Zones (LZ) within the boundaries of the Night Vision Device Influence Area.
3. The Lighting Zones shall be:
  - a. LZ 2. Low-density suburban and urban neighborhoods and suburban commercial districts. This zone is intended to be the default condition for urban and suburban areas.
  - b. LZ 3. Medium to high-density urban neighborhoods and districts, shopping and commercial districts, industrial parks and districts. This zone is intended to apply only to Central Business District(s) and areas having unique character such as auto malls.
4. Modification of Lighting Zones.  
Upon recommendation of the (who) the (governing body) may modify the designated Lighting Zones of one or more parcels if the (governing body) finds that the original Lighting Zone was in error or a change in circumstances has occurred since the existing designation was established .
5. The (Authority) shall maintain the current Lighting Zone map and provide public access to the map upon request.

## xx.6 Lighting Systems Standards for Approval.

1. Non-residential Uses and Common Residential Areas.
  - a. All outdoor lighting shall meet all of the following requirements according to Lighting Zone:
  - b. The maximum luminaire lamp wattage and shielding shall comply with Table 1.
  - c. The maximum pole or mounting height shall be consistent with Table 2.
  - d. On-site parking areas shall be constructed of asphalt, dyed concrete or other non-reflective paving surfaces.
  - e. Gas station canopy lighting shall be designed to conceal the illumination source and the lighting fixture shall not extend below the canopy skirt.
  - f. Lighting at publicly owned and privately owned outdoor sports facilities shall be shielded to reduce glare, safety hazards, light trespass and light pollution, and shall provide levels of illuminance consistent with nationally recognized standards such as the Illuminating Engineering Society of North America (IESNA).
  - g. Exterior sign lights shall be shielded and downward facing.

EXCEPTION: upward-facing lighting exclusively for signs and not exceeding 50 rated lamp watts per luminaire. Light sources shall be shielded by orientation with respect to the sign, luminaire construction, and/or louvers or other means of preventing glare.

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Additional Provision: intended to minimize light trespass on adjacent properties

Each luminaire shall be set back from all property lines shall be at least 3 times the mounting height of the luminaire.

EXCEPTION 1: If the subject property is abutting a parcel which is zoned "Commercial" or "Industrial" by the Community Development Code, no setback from the common lot lines of the commercial or industrial property is required.

EXCEPTION 2: If the subject property is abutting a parcel which is zoned other than "Commercial" or "Industrial," the luminaire shall be setback three times the mounting height of the luminaire, measured from the abutting parcel's side yard setback. (Any variance, adjustment, of exception to the abutting parcel's side yard setback shall not be considered in the distance calculation.)

EXCEPTION 3: If the luminaire is used for the purpose of street, parking lot or public utility easement illumination purposes and is located less than 3 mounting heights from the property line, the luminaire shall employ a house side shield (opposite the direction of any public right-of-way nearest the luminaire)

EXCEPTION 4: If the subject property includes an exterior column, wall or abutment within 25 feet of the property line, a luminaire partly shielded or better and not exceeding 60 lamp watts may be mounted onto the building façade or under or within an overhang or canopy attached thereto.

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2. Special Permit for Specific Lighting Fixtures and Systems and When Exceeding Lighting Requirements.

Upon special permit issued by the (Authority), lighting systems not complying with the technical requirements of this ordinance may be installed, maintained, and replaced for lighting that exceeds the maximums permitted by this Code, e.g., Aerial Lasers, Searchlights, Sports lighting systems (including but not limited to, sport fields and stadiums, such as baseball field and football field lighting, tennis court lighting, and swimming pool area lighting), other very intense lighting defined as having a light source exceeding 200,000 lumens or an intensity in any direction of more than 2,000,000 candelas, construction lighting for public infrastructure and similar projects, emergency construction project that require construction at night, bridges, building façade lighting to light portions of buildings over two stories high, and public monuments.

To obtain such a permit, applicants shall demonstrate that the proposed lighting installation:

- a. Has received every reasonable effort to mitigate obtrusive light and artificial sky glow, supported by a signed statement from a registered civil or electrical engineer describing the mitigation measures. Such statement shall be accompanied by calculations indicating the light trespass levels (horizontal and vertical at ground level) at the property line.
- b. The (Authority) shall review each such application. A permit may be granted if, upon review, the (Authority) finds that the proposed lighting will not create excessive glare, sky glow, or light trespass beyond that which can be reasonably expected by application of best lighting practices, available technology. The (Authority) may impose conditions of approval to mitigate any negative impacts resulting to the abutting parcel, based on best lighting practices and available lighting technology. The (Authority) may charge a review fee and may, at the (Authority)'s option, employ the services of a qualified professional civil or electrical engineer to review such submittals, and the cost thereof shall be an additional fee charged to the applicant.

**TABLE 1  
MAXIMUM WATTAGE AND REQUIRED SHIELDING**

Lighting Zone	Fully Shielded	Shielded	Partly Shielded	Unshielded
LZ 2	100	35	39	Low voltage landscape lighting 50 watts or less
LZ 3	250	100	70	Landscape and façade lighting 100 watts or less; ornamental lighting on private streets of 39 watts and less

**TABLE 2  
MAXIMUM LIGHTING MOUNTING HEIGHT IN FEET**

Lighting Zone	Lighting for Private Roads, Driveways, Parking, Bus Stops and other Transit Facilities	Lighting for Walkways, Bikeways, Plazas and other Pedestrian Areas	All Other Lighting
LZ 2	40	18	8
LZ 3	40	18	16

*Lighting mounted onto buildings or other structures shall not exceed a mounting height greater than 4 feet higher than the tallest part of the building or structure at the place where the lighting is installed, nor higher than 33.33 percent of the horizontal distance of the light from the nearest property line, whichever is less.*

3. Street Lighting.

- a. Luminaires shall be fully shielded.
- b. Luminaires shall employ internal house side shields unless located in plan at least 3 mounting heights from the any building, structure, or site upon which a building or structure may legally be located within 3 mounting heights of any luminaire.

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Additional Provisions: intended to regulate the luminescence of street lighting applications

- c. Street lighting installations shall achieve criterion values listed in Table 3.  
Exception: Federal or State requirements that require a higher illumination value than required by this Code.
- d. Unless otherwise approved by the (Authority) street lighting systems shall be designed using the IESNA "Classical" horizontal footcandle method per IESNA/ANSI RP-8-01, and as described below.

- e. The applicant shall submit to (Authority) for approval point-by-point calculations assuming 65 percent light loss factor for metal halide and LED and 80 percent for high pressure sodium, tungsten, fluorescent and induction lamp sources. Submitted street lighting plans shall indicate luminaire types and locations and provide isocandle plots including statistical summaries of roadway lighting.

**TABLE 3**  
**STANDARD CRITERIA FOR STREET AND ROADWAY LIGHTING**  
 (footcandles - fc)

	LZ 2	LZ 3
<b>Local streets</b>	Intersections only*	
Avg: Light Level	0.3 fc	0.4 fc
Avg: Min Uniformity	6:1	6:1
Max: Min Uniformity	40:1	40:1
<b>Neighborhood Collectors</b>	Intersections only*	
Avg: Light Level	0.4 fc	0.6 fc
Avg: Min Uniformity	4:1	4:1
Max: Min Uniformity	20:1	20:1
<b>Major Collector / Minor Arterial</b>		
Avg: Light Level	0.4 fc	0.6 fc
Avg: Min Uniformity	4:1	4:1
Max: Min Uniformity	20:1	20:1
<b>Major Arterials</b>		
Avg: Light Level	1.0 fc	1.5 fc
Avg: Min Uniformity	4:1	3:1
Max: Min Uniformity	20:1	10:1

*\* Luminaires only within 150 feet of the centerpoint of an intersection. Intersections may include significant driveways or site roads as permitted by the Authority.*

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**xx.7 Non-Conforming Uses.**

Outdoor lighting fixtures lawfully existing prior to the adoption of this Ordinance that do not conform to the provisions of this Ordinance shall be deemed to be a lawful nonconforming use and may remain.

1. New or Changed Uses, New Structures, Major Additions or Modifications.

- a. New Uses or Structures, or Change of Use. Whenever there is a new use or upon a property or the use on the property is changed after [effective date of this Ordinance], all outdoor lighting on the property shall be brought into compliance with this Code before the new or changed use commences.
- b. Major Additions. If a major addition occurs on a property, the entire property shall comply with the requirements of this Code. For purposes of this section, the following are considered to be major additions:
- c. Additions of 25 percent or more in terms of additional dwelling units, gross floor area, seating capacity, or parking spaces, either with a single addition or with cumulative additions after [effective date of this Ordinance].
- d. Single or cumulative additions, modification or replacement of 25 percent or more to installed outdoor lighting luminaires existing as of [effective date of this Ordinance].

## 2. Minor Modifications, Additions, or New Lighting Fixtures for Non-residential and Multiple Dwellings

- a. For non-residential and multiple dwellings, all additions, modifications, or replacement of less than 25% of outdoor lighting fixtures existing as of [effective date of this Ordinance] shall require the submission of a complete inventory and site plan detailing all existing and any proposed new outdoor lighting.
- b. Any new lighting on the site shall meet the requirements of this Code.

## 3. Resumption of Use after Abandonment.

If a property or use with non-conforming lighting is abandoned for a period of six months or more, then all outdoor lighting shall be brought into compliance with this Code before any further use of the property occurs.

## 4. Repair of Existing Lighting.

When existing lighting equipment requires any repairs other than re-lamping, it shall be modified so as to comply with the shielding requirements of this Ordinance.

## xx.8 Submittal Requirements

The owner or owners of a tract of land within the lighting review area shall submit to the Authority Planning Office a site plan for the development and use of such tract meeting the requirements set forth in Authority Zoning Ordinance. Subdivisions shall comply with the Authority Subdivision Guidelines.

1. A lighting plan shall be included as part of the required site plan submittal or subdivision construction drawings which shall contain but not be limited to the following:
  - a. The location of the site where the outdoor light fixtures will be installed;
  - b. Plans indicating the location on the premises of each outdoor light fixture, both proposed and any already existing on the site, and the types of outdoor light fixtures;
  - c. A description of the outdoor light fixtures including but not limited to manufacturer's catalog cuts and drawings;
  - d. If any subdivision proposes to have installed street or other common or public area outdoor lighting, a lighting plan shall also be submitted for all such lighting.
  - e. For any property that contains restrictive avigational easements owned by the United States of America, the owner or owners shall also submit a copy of the lighting plan to Fort Campbell, or its agent, and obtain their written approval before any building permits shall be issued by the Authority.

## Sample Lighting Ordinance #2: Village of Homer Glen, Illinois

### AN ORDINANCE REGULATING OUTDOOR LIGHTING IN THE VILLAGE OF HOMER GLEN

WHEREAS, the safety and welfare of pedestrians, cyclists, and motorists depend upon the reduction of glare and the establishment of consistent and well-defined levels of lighting; and

WHEREAS, proper direction and use of light will minimize energy wasted on unnecessary and indiscriminate illumination: and

WHEREAS, the corporate authorities recognize the night sky as a natural resource; and

WHEREAS, the corporate authorities and the Homer Glen Green Vision recognize the need to preserve rural character, aesthetic value, and the unique quality of life of Homer Glen residents by preserving and enhancing the ability to view the night sky: and

WHEREAS, the corporate authorities and the Village of Homer Glen Comprehensive Plan recognize the need to define limits and protect residents and business owners from the trespass of excessive and misdirected light from adjacent properties: and

WHEREAS, establishing a predetermined standard for outdoor illumination will provide residents, business owners, and developers with a clear set of guidelines by which to follow: and

WHEREAS, a clear set of guidelines for outdoor lighting will eliminate the need for commercial establishments to compete for visual attention by escalating outdoor lighting levels; and

WHEREAS, the corporate authorities wish to promote sound environmental policies which will benefit residents and serve as a positive example to surrounding communities; and

WHEREAS, excessive illumination can have a detrimental effect to wildlife that depend on the natural cycle of day and night for survival.

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND VILLAGE BOARD OF TRUSTEES OF THE VILLAGE OF HOMER GLEN, WILL COUNTY, ILLINOIS, THAT:

#### **Section 1: APPLICABILITY**

All zoning lots in the following zoning districts shall comply with the provisions of this Ordinance as of its effective date unless otherwise exempted herein:

- A-1 Agricultural District
- A-2 Rural Residence District
- E-1 Single Family Estate Residence District
- E-2 Single Family Rural Residence District
- R-1 Single Family Residence District
- R-2 Single Family Residence District
- R-2A Single Family Residence District
- R-3 Single Family Residence District
- 2
- R-3A Single Family Residence District
- R-4 Single Family Residence District
- R-5 Single Family Residence District
- R-6 Single Family Residence District
- R-6A Multi-Family Residence District

- C-1 Neighborhood Business District
- C-2 Local Business District
- C-3 General Business District
- C-4 Highway Commercial District
- C-5 Office and Research Park District
- C-6 Commercial Recreation District
- I-1 Industrial District

Unless specifically exempted within this ordinance, zoning lots within all future residential, commercial, and industrial zoning districts created after the effective date of this Ordinance shall comply with the provisions of this Ordinance.

For clarity and organization, references are made within this ordinance to Residential Lighting Zones and Commercial Lighting Zones. These lighting zones are defined in the DEFINITIONS section of this ordinance.

### Section 2: CONFORMANCE

Any existing luminaire or lighting installation used for outdoor lighting in any zoning district on the effective date of this Ordinance that does not comply with the requirements of this Ordinance shall be considered a non-conforming use. Except as otherwise stated herein, such uses shall be made to comply with the requirements of this Ordinance or be removed within such time period as established in Section 10.2-5 b. of the Village of Homer Glen Zoning Ordinance adopted October 24, 2006, effective November 10, 2006.

ANY non-conforming luminaire or light installation existing on any zoning lot in any zoning district as of the effective date of this ordinance shall be made to comply with the requirements of this Ordinance or be removed within 30 days if any of the following criteria are met:

1. The luminaire is producing glare that is deemed by the Village to create a hazard or nuisance; or
2. The height or location of the luminaire is changed; or
3. The luminaire is changed or replaced (excluding routine maintenance and bulb replacement of equal light output) except if it is part of a parking lot lighting installation consisting of an array of 3 or more identical luminaires and poles or supporting structures; or
4. The supporting structure for the luminaire is changed or replaced except if it is part of a parking-lot lighting installation consisting of an array of 3 or more identical luminaires and poles or supporting structures; or
5. The use of the luminaire is resumed after a period of abandonment.

ALL non-conforming luminaires existing on any zoning lot in any zoning district as of the effective date of this ordinance shall be made to comply with the requirements of this Ordinance or be removed within 30 days if any of the following criteria are met:

1. A cumulative total of twenty-five percent (25%) or more of the nonconforming luminaires or their supporting structures are changed, replaced (excluding routine maintenance and bulb replacement of equal light output), or relocated; or
2. A "Principal Structure" (as defined in the Village of Homer Glen Zoning Ordinance) on said zoning lot is expanded by an amount equal to or greater than 25% of the total square footage of the structure immediately prior to such expansion; or
3. There is a change in zoning of said zoning lot.

### Section 3: ILLUMINATION STANDARDS

#### 3.1 GROSS EMISSION OF LIGHT Commercial Lighting Zones

The total light output from all luminaires used for outdoor lighting on any zoning lot in a commercial lighting zone, except for street lighting, outdoor display lots, and outdoor lighting of playing fields on public property, shall not exceed 100,000 lumens per net acre.

### 3.2 LIGHT INTENSITY AND UNIFORMITY

#### Commercial Lighting Zones

During permitted hours of operation as defined within this Ordinance, outdoor lighting on any zoning lot in a commercial lighting zone shall meet the following requirements for light level as measured in the plane of the illuminated surface:

ILLUMINATED SURFACE	MINIMUM LIGHT LEVEL	MAXIMUM LIGHT LEVEL
NON-INTERNALLY-ILLUMINATED SIGNS, BUILDINGS, & GROUND - (LIGHT COLOR)	---	5.0 FOOTCANDLES
NON-INTERNALLY-ILLUMINATED SIGNS, BUILDINGS, & GROUND - (MEDIUM COLOR)	---	10.0 FOOTCANDLES
NON-INTERNALLY-ILLUMINATED SIGNS, BUILDINGS, & GROUND - (DARK COLOR)	---	15.0 FOOTCANDLES
AUTO DEALERSHIPS: FRONT ROW & FEATURE DISPLAYS	---	20 10
OTHER MERCHANDISE AREAS		
PUBLIC PARKING AREAS*	0.25 FOOTCANDLES	4.5 FOOTCANDLES
VEHICULAR ENTRANCES FROM RIGHT-OF-WAY*	1.0 FOOTCANDLES	4.5 FOOTCANDLES
PLAYING FIELDS	---	IESNA**
AUTOMOBILE SERVICE-STATION	10 FOOTCANDLES	30 FOOTCANDLES

## PUMPING AREAS

DRIVE-IN/DRIVE-THROUGH CANOPIES	---	15 FOOTCANDLES
BUILDING ENTRANCE AND EXIT PEDESTRIAN PATHWAYS*	1.0 FOOTCANDLES	5.0 FOOTCANDLES
STAIRWAYS AND STEPS*	1.0 FOOTCANDLES	5.0 FOOTCANDLES

\*Maximum-to-minimum light level ratio shall not exceed 15:1.

\*\*Illuminance level specified in Table 7 of IESNA document RP-6-01.

## 3.3 LIGHT DIRECTION &amp; CONTROL

Residential Lighting Zones and Commercial Lighting Zones

Any luminaire which is used for uplighting on any zoning lot in a residential or commercial lighting zone shall have the necessary shielding and/or beam-angle control and/or shall be aimed to substantially confine the directed light to the object intending to be illuminated. Uplighting shall only be permitted for landscape lighting, architectural lighting, flag lighting, and lighting of ground-mounted signs that are not internally illuminated. Uplighting applications shall meet the following requirements:

UPLIGHTING APPLICATION	MAXIMUM INCLINATION	MAXIMUM LIGHT OUTPUT
LANDSCAPE LIGHTING	60°	1100 LUMENS† (UP TO 45°)
		800 LUMENS†† (UP TO 60°)
ARCHITECTURAL LIGHTING	45°	1100 LUMENS†
FLAG LIGHTING*	60°	1100 LUMENS† (UP TO 45°)
		800 LUMENS†† (UP TO 60°)
SIGN LIGHTING **	45°	1100 LUMENS†

\* The tradition of lowering flags at sunset is encouraged to avoid the need for lighting.

\*\* Ground-mounted, non-internally-illuminated signs only.

† Typical 75W incandescent bulb or 50W low-voltage halogen landscape bulb.

†† Typical 60W incandescent bulb or 35W low-voltage halogen landscape bulb.

#### Residential Lighting Zones

Any luminaire with a light output exceeding 1100 lumens which is used for outdoor lighting on any zoning lot in a residential lighting zone shall have the necessary shielding and/or beam-angle control and/or shall be aimed so that the direction of all directly emitted light is at or below horizontal. If a motion-activated sensor that illuminates the luminaire for no more than 5 minutes upon activation is used, however, said luminaire may have a light output of up to 2200 lumens.

Any luminaire with a light output exceeding 2200 lumens which is used for outdoor lighting on any zoning lot in a residential lighting zone shall have the necessary shielding and/or beam-angle control and/or shall be aimed so that the light source is not visible along any property line, as viewed at a height of 60 inches above grade.

#### Commercial Lighting Zones

Except as otherwise stated herein, any luminaire on any zoning lot in a commercial lighting zone which emits light directed at a building, sign, billboard, or other outdoor feature shall be located at or above the top of said object and aimed and controlled so that the direction of all emitted light is at or below horizontal and the directed light is substantially confined to the object intending to be illuminated.

#### 3.4 LIGHT TRESPASS

Except for street lighting, light emitted from outdoor lighting on any zoning lot shall not cause the light level along any property line, as measured at a height of 60 inches above grade in a plane at any angle of inclination, to exceed the following limits:

EMITTING ZONING LOT	IMPACTED ZONING LOT	MAXIMUM LIGHT LEVEL
RESIDENTIAL LIGHTING ZONE	RESIDENTIAL LIGHTING ZONE	0.1 FOOTCANDLES
RESIDENTIAL LIGHTING ZONE	COMMERCIAL LIGHTING ZONE	0.5 FOOTCANDLES
COMMERCIAL LIGHTING ZONE	RESIDENTIAL LIGHTING ZONE	0.1 FOOTCANDLES
COMMERCIAL LIGHTING ZONE	COMMERCIAL LIGHTING ZONE	0.5 FOOTCANDLES

#### 3.5 PERMITTED HOURS FOR OUTDOOR LIGHTING

##### Commercial Lighting Zones

Except for street lighting, outdoor lighting on any zoning lot in a commercial lighting zone is permitted to be lighted between one-half hour before sunset and 10:00 p.m. or 1 hour after the close of business based on normal hours of operation of the business, whichever is later. Thereafter, for safety and security purposes, security lighting is permissible at a total light output not greater than 25% of the total light output from all outdoor lighting located on the zoning lot during permitted outdoor lighting hours. During security lighting hours, no luminaire may exceed its light output exhibited during permitted outdoor lighting hours.

#### Property Used for Governmental & Public Purposes

Any zoning lot in any zoning district used for governmental or public purposes, except for street lighting, shall comply with the permitted hours and security lighting limitations for commercial lighting zones. In addition, outdoor lighting of the playing field of an organized sporting event on public property that is in progress at the close of permitted outdoor lighting hours shall be allowed to remain illuminated until 30 minutes after the conclusion of the event but no later than 11:00 p.m. No outdoor lighting of the playing field for any sport or recreational purpose shall be initiated after 10:00 p.m.

### Section 4: LUMINAIRE STANDARDS

#### 4.1 FULL-CUTOFF REQUIREMENT

##### Commercial Lighting Zones

Except for uplighting applications permitted within this ordinance, any luminaire used for outdoor lighting in a commercial lighting zone shall be a full-cutoff luminaire and shall be installed in the proper orientation to achieve full-cutoff performance with respect to a horizontal plane.

##### Street Lighting

Any luminaire used for street lighting shall be a full-cutoff luminaire and shall be installed in the proper orientation to achieve full-cutoff performance with respect to a horizontal plane. Said luminaire, as well as any poles, brackets, supports, and mounting hardware shall comply with current Village design standards.

#### 4.2 INSTALLED HEIGHT

The installed height of any luminaire used for outdoor lighting on any zoning lot, except for street lighting, shall not exceed the following limits:

ZONING LOT MAXIMUM	INSTALLED HEIGHT*
RESIDENTIAL LIGHTING ZONE	20 FT
COMMERCIAL LIGHTING ZONE	25 FT

\* A maximum installed height of 50 ft shall be permitted for lighting of playing fields on public property.

### Section 5: PROHIBITED OUTDOOR LIGHTING

The following outdoor lighting applications are prohibited in all zoning districts:

1. The use of laser light source;

2. The use of flickering, flashing, blinking, scrolling, or rotating lights and any illumination that changes intensity;
3. The use of upward directed lighting, except as otherwise permitted herein;
4. Architectural lighting of any portion of a building or structure with a polished or glass exterior surface that uses uplighting;
5. The use of searchlights;
6. The use of neon light to accent buildings or architectural features;
7. The use of Mercury vapor light source except for existing uses in A-1 or A-2 zoning districts used for "Agriculture" as defined in the Village of Homer Glen Zoning Ordinance;
8. The use of Metal Halide light source for new public-parking-lot lighting installations; and
9. Any luminaire creating glare that is deemed by the Village to create a hazard or nuisance.

#### **Section 6: EXEMPT OUTDOOR LIGHTING**

The following outdoor lighting applications are exempt from all requirements of this ordinance:

1. Underwater lighting used for the illumination of swimming pools and fountains;
2. Lighting required by county, state, or federal law;
3. Temporary lighting used for holiday decoration;
4. Decorative yard lighting characterized by a flame source;
5. Portable lighting temporarily used for maintenance or repair that is not deemed by the Village to create a hazard or nuisance;
6. Emergency lighting used by police, firefighting, emergency management, or medical personnel at their discretion as long as the emergency exists;
7. Lighting approved by the Village for temporary events such as carnivals, circuses, festivals, picnics, fairs, civic events, and exhibitions; and
8. Temporary lighting required for road construction or other public improvements.

#### **Section 7: PROCEDURAL REQUIREMENTS**

##### **7.1 PLAN SUBMISSION**

For subdivision and land-development applications where outdoor lighting is required or proposed, lighting plans shall be submitted to the Village for review and approval and shall include:

1. A site plan complete with all structures, parking spaces, building entrances, traffic areas (both vehicular and pedestrian), vegetation that might interfere with lighting, and all adjacent uses. The site plan shall show, by location, and identify each existing and proposed luminaire and shall specify its installed height, pole foundation details, and mounting methods;
2. Iso-footcandle plots for individual lighting installations, or 10' x 10' illuminance grid plots for multi-fixture lighting installations, which demonstrate compliance with all applicable requirements set forth within this Ordinance. The plots shall indicate the location of each existing and proposed luminaire, the installed height of said luminaires, and the overall light levels in foot candles on the entire zoning lot and at the property lines;
3. A summary table identifying the maximum and minimum light levels for all parking areas, entryways, signs, and walkways.
4. A description of each luminaire identified in the site plan including the manufacturer, model number, a photograph or catalog cut, photometric data verifying any compliance requirements specified within this ordinance, light output in initial lumens, shielding or glare reduction devices, lamp type, and on/off control devices.

##### **7.2 POST-APPROVAL ALTERATIONS**

Post-approval alterations to lighting plans or intended substitutions for approved lighting equipment shall be submitted to the Village for review and approval, with all plan submission requirements set forth within this Ordinance, prior to installation.

### 7.3 RIGHT OF INSPECTION

The Village shall have the right to conduct a post-installation inspection to verify compliance with the requirements of this Ordinance and, if appropriate, to require remedial action at the expense of the applicant.

### Section 8: DEFINITIONS

**ABANDONMENT:** Discontinuance in the usage of a lighting installation, or portion thereof, with no intention to resume the usage of such lighting. A lighting installation or portion thereof, that has not been operated for a period of 24 months or longer, shall be considered to be abandoned.

**ARCHITECTURAL LIGHTING:** Outdoor lighting directed at buildings, facades, structures, monuments, and other architectural features.

**AUTOMOBILE SERVICE STATION (GAS STATION):** Any building or premises used for dispensing or offering for sale automotive fluids or oils, having pumps and underground storage tanks; also, where battery, tire, and other similar services are rendered, but only if rendered wholly within a building. Automobile service stations shall not include the sales or storage (new or used) of automobiles, trailers, or other vehicles. Automobile service stations may include mini-marts as a Special Use.

**AUTOMOBILE SERVICE STATION PUMPING AREA:** The drivable surface of an automobile service station, in the immediate vicinity of a fuel pump, where vehicles are parked during fueling.

**BILLBOARD:** A surface whereon advertising matter is set in view conspicuously and which advertising does not apply to premises or any use of premises wherein it is displayed or posted.

**COMMERCIAL LIGHTING ZONE:** Any zoning lot in any zoning district that does not have as its primary use a single-family residential dwelling, a two-family residential dwelling, or land used for "Agriculture," as defined in the Village of Homer Glen Zoning Ordinance.

**DIRECTIONALLY SHIELDED:** A luminaire which uses shielding, lenses, or other means to provide a distinct focused beam of emitted light.

**FOOTCANDLE:** A unit of measure of luminous flux.

**FULL-CUTOFF LUMINAIRE:** A luminaire having a light distribution (excluding incidental reflection from poles, mounting brackets, and other supporting structures), as determined by photometric test and certified by the manufacturer, such that no light is emitted at or above an angle of 90° above nadir in any direction and the luminous flux emitted in the band between 80° and 90° above nadir in all directions is no more than 10% of the total luminous flux for the luminaire. A luminaire that meets the Illumination Engineering Society of North America (IESNA) full-cutoff definition shall be considered full cutoff for the purposes of this ordinance.

**GLARE:** A visual disturbance produced by a distinct light source within the visual field that is sufficiently brighter than the level to which the eyes are adapted.

**HID LIGHTING:** A high-intensity discharge family of lighting that includes high pressure sodium, fluorescent, mercury vapor, and metal halide type bulbs.

**IESNA** - Illumination Engineering Society of North America.

**ILLUMINANCE:** The amount of luminous flux falling onto a unit of surface area, correlating to the perception of brightness by the human eye. Illuminance is typically measured in lumens per square foot (footcandles) or lumens per square meter (lux).

**INSTALLED HEIGHT:** The height above grade of the lowest point on an installed luminaire.

**INTERNALLY ILLUMINATED SIGN:** A sign illuminated by a light source internal to the sign enclosure which is not directly visible externally. For the purposes of this ordinance, a neon-light sign is considered an internally illuminated sign.

**LAMP:** The source of light being emitted from a luminaire, such as a bulb.

**LANDSCAPE LIGHTING:** Outdoor lighting directed at trees, shrubs, plants, flower beds, fountains, gardens, and other natural or landscaped features.

**LIGHT:** Electromagnetic radiation within a range of wavelengths sufficient for visual perception by the normal unaided human eye.

**LIGHT LEVEL:** The illuminance as measured in accordance with the practices contained in the IESNA Lighting Handbook, Eight Edition.

**LIGHT OUTPUT:** Luminous Flux (see definition for Luminous Flux).

**LIGHTING INSTALLATION:** An arrangement of one or more luminaires including any mounting hardware, brackets, and supporting structures.

**LUMEN:** A unit of measure of luminous flux. For the purposes of this ordinance, "lumens" denotes initial lumens for HID lighting applications.

**LUMINAIRE:** An individual lighting assembly including the lamp and any housings, reflectors, globes, lenses, shields or other components designed to block or distribute light. For the purposes of this ordinance, an internally illuminated sign is not considered a luminaire.

**LUMINOUS FLUX:** The power emitted from a source of electromagnetic radiation, such as a light bulb, in the form of visible light. Luminous flux is measured in lumens (or lux) and is typically specified by the manufacturer for a given lamp or luminaire. Typical luminous flux values for incandescent bulbs are 100W: 1550 lumens, 75W: 1080 lumens, 60W: 780 lumens, and 40W: 450 lumens.

**MOTION-ACTIVATED SENSOR:** A sensor which causes a luminaire to become illuminated automatically upon the presence of motion or infrared radiation or a combination thereof within its field of view.

**NADIR:** The direction pointing directly downward from the light source of the luminaire that originates from a horizontal plane at the lowest point on the luminaire.

**NEON LIGHT:** Brightly colored light generated by using electric current to excite a gas or gas mixture (including neon, argon, helium, or other gases) typically contained in a tube which can be bent into various forms for use as decoration or signs. For the purposes of this ordinance, fluorescent tubes are not considered neon light.

**NET ACREAGE:** "Net Acreage" as defined in the Village of Homer Glen Zoning Ordinance.

**OUTDOOR DISPLAY LOT:** An outdoor area whose primary function is the sale of displayed merchandise, often requiring accurate color perception by customers.

**ORGANIZED SPORTING EVENT:** A prearranged sports or recreational event involving at least one group or team with a published roster and schedule.

**OUTDOOR LIGHTING:** Light generated from an indoor or outdoor source that provides illumination to a surface, building, sign, structure, device, or other outdoor feature which is visible to an observer located outdoors. For the purposes of this ordinance, the light source inside an internally illuminated sign is not considered outdoor lighting.

**PLAYING FIELD:** An open outdoor field or court used for playing sports such as baseball, soccer, football, tennis, volleyball, and basketball.

**PUBLIC PARKING AREA:** A drivable surface intended for use by the general public for parking of motorized vehicles.

**RESIDENTIAL LIGHTING ZONE:** Any zoning lot in a residential or agricultural zoning district that has as its primary use a single-family residential dwelling or a twofamily residential dwelling, as defined in the Village of Homer Glen Zoning Ordinance.

**SEARCHLIGHT:** A lighting installation designed to project a high-intensity beam of approximately parallel rays of light that is typically used to sweep the sky for promotional purposes.

**STREET LIGHTING:** One or more luminaires or light installations designed to illuminate a public roadway or intersection.

**UPLIGHTING:** Lighting applications which direct light above a horizontal plane.

**VISIBLE LIGHT:** See "Light"

**ZONING LOT:** "Zoning Lot" as defined in the Village of Homer Glen Zoning Ordinance.

#### **Section 9: APPEALS FOR VARIATIONS**

Request for variation from the requirements of this Ordinance may be initiated by written application which seeks to vary the provisions of this Ordinance. The application requesting a variation shall be accompanied by a fee equal to the fee charged for a zoning variation and shall be submitted to the Plan Commission for initial consideration. The Application shall indicate the specific provisions of this Ordinance which the applicant seeks to vary. The Plan Commission will schedule a public hearing concerning the Application. The public hearing will be conducted in accordance with the notice and hearing requirements of Village of the Homer Glen Zoning Ordinance as they pertain to and concern public hearings for variations. The Plan Commission may also establish appropriate procedures and filing requirements for the applicants requesting variations to follow. After the Plan Commission conducts the public hearing it shall make a written, recommendation to the Village Board concerning the requested variation. Without further public hearing, the Village Board may grant, deny or amend the recommendation for variation.

#### **Section 10: VIOLATION AND PENALTY**

Any person, firm, corporation or business entity that violates any provision of this Ordinance shall be subject to a fine of not less than \$250.00 and not more than \$750.00 for each separate offense. A separate offense shall be deemed committed on each day a violation occurs or continues to occur.

**Section 11: ENFORCEMENT**

The Chief Building Official, Deputy Building Official and such other persons who are duly appointed as Code Enforcement Officers are hereby authorized to inspect luminaires and lighting installations in the zoning districts subject to this Ordinance to determine compliance with the applicable provisions and, if necessary, to issue notices of violation to the owner, operator or other person or entity responsible for maintenance of the luminaire or lighting installation, if the luminaire or lighting installation fails to comply with the provisions of this Ordinance. The notice of violation shall set forth an appropriate time period of not less than thirty (30) days for compliance. In the event the violation is not corrected within the time limits set forth in the notice of violation, proceedings to enforce compliance with the provisions of this Ordinance may be initiated and conducted in accordance with and pursuant to the provisions of Ordinance 07- which is the Village ordinance establishing a code hearing department for building code violations, or by the filing of an appropriate lawsuit seeking legal and equitable relief in a court of competent jurisdiction.

**Section 12: REPEALER**

All ordinances or portions of Ordinances previously passed or adopted by the Village of Homer Glen that conflict with or are inconsistent with the provisions of this Ordinance are hereby repealed to extent of such conflict or inconsistency.

**Section 13: SEVERABILITY**

The various provisions of this Ordinance are hereby expressly declared to be severable and if any part or portion of this Ordinance shall be held to be invalid by any court of competent jurisdiction, such decision shall not affect the validity of the remaining provisions of this Ordinance, which shall be enforced to the fullest extent possible.

**Section 14: EFFECTIVE DATE**

This Ordinance shall be in full force and effect from and after its passage and approval. Adopted this \_\_\_\_\_ day of \_\_\_\_\_, 2007 pursuant to a roll call vote as follows:

APPROVED by the Village President on \_\_\_\_\_, 2007.

## Lighting Regulation Narrative

(Adopting Agency or Community Name)  
Outdoor Lighting Ordinance

On xxx, the (adopting agency) passed into law a new, state of the art lighting ordinance. Its goals are to permit all necessary and reasonable uses of outdoor lighting, while reducing wasted energy and light pollution. A key consideration is preserving the nighttime visual environment for Night Vision Device training activity at Scott Air Force Base.

The law applies to all new outdoor lighting, including new lighting, replacement lighting and additions to new lighting. Single-family houses and two-family dwelling units are among the exempted uses.

### Basic Principles

Light pollution is a broad term describing the undesirable side effects of outdoor lighting. The most negative effects of outdoor lighting include:

- *Artificial sky glow*, the illumination of clouds and airborne particles, causing the sky to glow and preventing astronomy and star gazing;
- *Light trespass*, the unwanted illumination caused by light from neighboring properties.
- *Glare*, when lighting causes discomfort or visual disability
- *Circadian Interruption*, when lighting causes unwanted changes in the circadian cycles of living organisms
- Other impacts to flora and fauna, particularly those causing changes in habitat or behavior

Most light pollution is the result of carelessly applied lighting. This Ordinance helps prevent most light pollution by limiting the wattage of lighting that can be used, by requiring most lighting to be shielded, and requiring lighting to be installed thoughtfully with respect to mounting height, setback, and in some critical cases, additional shielding. In addition, while the Ordinance does not absolutely prohibit incandescent lighting, preference is given for energy efficient lighting, and for most installations, the use of energy efficient sources is strongly urged.

### Demonstrating Compliance with the Ordinance

**Lighting for Homes** Multi-family buildings with common areas such as parking garages or lots will be treated as commercial buildings for purposes of lighting standards.

**Private Non-Residential Uses** The Ordinance governs all new lighting as well as replacement lighting and expansions of existing lighting systems. The law is strict; even if a luminaire is broken, it must be replaced with a complying luminaire. For new installations including major additions and alterations, lighting plans including schedules and cutsheets must be supplied complete with calculations showing compliance. Lighting plans with fixture schedules and calculations must be submitted for approval, along with compliance documentation forms (*compliance documentation forms can be downloaded from the city/county website*).

**Special Permit Applications** Some lighting systems, such as sports lighting or searchlights, cannot comply with the Ordinance. A special permit will be required. Applicants may be required to submit detailed calculations and to pay for an independent engineering review.

**Street Lighting Applications** In addition to demonstrating compliance with the Ordinance's power and shielding requirements, plans for street lighting systems must be submitted using point-by-point calculations to demonstrate compliance with street lighting criteria contained in the Ordinance.



*A fully shielded wall lantern*



*A fully shielded dusk to dawn luminaire*

### Multi-Family Residential Lighting Requirements

In general, lighting for homes must be:

- Limited to 40 watts per luminaire (light fixture) and designed so that the lamp (light bulb) can't be seen from a neighboring property. Examples of appropriate luminaires are posted on the (city/county) website. Also check the International Dark Sky Association website ([www.darksky.org](http://www.darksky.org)) for appropriate luminaires. Luminaires don't have to be fully shielded, but they must hide the lamp sufficiently to prevent glare and obtrusive light onto adjacent properties
- **Energy Star** rated, which generally means uses compact fluorescent lamp(s).
- Mounted at or lower than the eave line, or 12 feet above the ground, whichever is **lower**.

There are three *exceptions*.

- You can use PAR-lamp directional luminaires with halogen PAR lamps up to 100 watts. But they must be aimed away from neighboring properties. These fixtures are commonly used for residential security lighting.
- You can use fully shielded luminaires up to 100 watts, and they can be mounted up to 25' feet above grade as long as they are at least 3 times the mounting height away from the property line. These fixtures are generally used for dusk-to-dawn area lighting, especially for rural and agricultural sites.
- You can install low voltage landscape lighting, except in lighting zone 0 and 1A.

### Non-Residential Lighting Requirements

Most community complaints about lighting involve commercial or industrial sites. Poorly designed and/or wasteful lighting causes off-site glare and detracts from the night time beauty of the community. For this reason, all new and replacement lighting from now on must meet the following rules:

#### Lighting Zones

For lighting, the Night Vision Device Influence Area is divided into two zones. A current map of the lighting zones is available from the (fill in) website. Zones are set by the (Authority).

LIGHTING ZONE	CONDITION	TYPICAL PARTS OF THE (AREA)
LZ0	AREAS WHERE PROHIBITION OF NIGHT LIGHTING IS STRONGLY DISCOURAGED	SOME EXAMPLES INCLUDE WILDLIFE PRESERVES, NIGHT TRAINING AREAS, AND ASTRONOMICAL OBSERVATORIES AND OBSERVATION AREAS
LZ1	AREAS WHERE MAN-MADE LIGHTING IS USED IN LOW AMOUNTS IN RURAL AREAS	RURAL COMMUNITIES
LZ2	AREAS WHERE MAN-MADE LIGHTING IS USED IN MODEST AMOUNTS FOR SAFETY, SECURITY AND TRADITIONAL USES	URBAN NEIGHBORHOODS AND MOST COMMERCIAL DISTRICTS
LZ3	AREAS WHERE MAN-MADE LIGHTING IS AN IMPORTANT ASPECT OF A DISTRICT OF NIGHT ACTIVITY, OR WHERE SECURITY OR SAFETY ARE ESPECIALLY IMPORTANT	CENTRAL BUSINESS DISTRICT
LZ4	SPECIAL HIGH-LIGHT ZONES	BY SPECIAL PERMIT ONLY

#### Mounting Height

The mounting height of luminaires is limited according to Table 3 below. If luminaires are mounted to poles, the pole height may be taller as long as the highest part of the luminaire's optics is mounted at or below the appropriate value from the table below. These mounting height limits apply whether the luminaire is mounted to a pole, building or other structure and is measured relative to the grade directly below the luminaire. If there are excessive changes in grade on the site, be sure to adjust the design to prevent off site impacts for lower adjacent properties.

Table 3  
MAXIMUM LIGHTING MOUNTING HEIGHT IN FEET

Lighting Zone	Lighting for Private Roads, Driveways, Parking, Bus Stops and other Transit Facilities	Lighting for Walkways, Bikeways, Plazas and other Pedestrian Areas	All Other Lighting
LZ 0	20	8	4
LZ 1	25	12	4
LZ 2	40	18	8
LZ 3	40	18	16
LZ 4	Height limit to be determined by Special Use Permit Only		

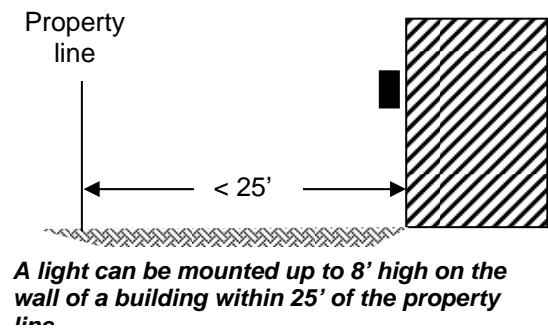
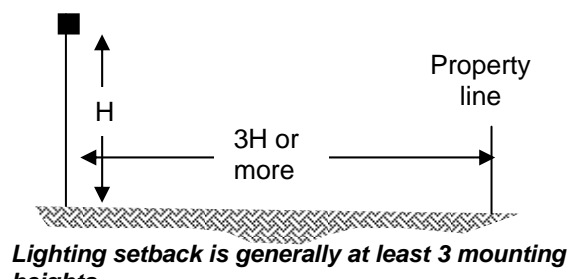
#### The Prescriptive Method

This method requires simple hand calculations and installations must follow specific rules, but detailed lighting calculations are not required. This method is recommended for most outdoor lighting installations, especially those undertaken by persons with little or no lighting expertise.

#### Prescriptive Method Setback Requirements (Note this provision is identified as optional in the Ordinance)

Setback, when combined with other prescriptive requirements, helps minimize off-site impacts. The setback requirements are fairly simple:

- As a general rule, luminaires must be at least 3 times their mounting height from the property line.
- If your property abuts a property zoned "industrial", then luminaires can be mounted anywhere on your property relative to that property line.
- If your property abuts a property zoned other than industrial or commercial, then luminaires must be mounted at least 3 times their mounting height from the abutting property's side yard setback line.
- If a luminaire on your property is used for the purpose of street, parking lot or public utility easement illumination purposes, it can be located less than 3 mounting heights from the property line, but it must employ a house side shield and the luminaire must be aimed away from the property line. A house side shield is an internal component available for most suitable luminaires. External shields added after the fact are not permitted.
- If a building or structure is mounted within 25 feet of the property line, then shielded or fully shielded luminaire(s) can be mounted onto the structure at a mounting height not to exceed 8 feet above grade at the foundation. Lighting recessed into a canopy or enclosed by an awning or similar structure can also be used,

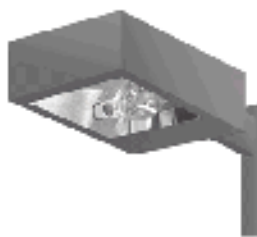


**Prescriptive Method Luminaire Requirements**

In order to prevent luminaires from being too bright and causing glare, the rated wattage is limited according to lighting zone and shielding by Table 1. Better shielding allows more power per luminaire, within the limits for each lighting zone.

Table 1 MAXIMUM WATTAGE AND REQUIRED SHIELDING

Lighting Zone	Fully Shielded	Shielded	Partly Shielded	Unshielded
LZ 2	100	35	39	Low voltage landscape lighting 50 watts or less
LZ 3	250	100	70	Landscape and façade lighting 100 watts or less; ornamental lighting on private streets of 39 watts and less



**Fully shielded** means that light is not emitted above the horizontal plane, and that the amount of light emitted at high angles is limited.



**Shielded** means that a small amount of light may be emitted above the horizontal plane, but that the source is still shielded and most of the light is downward.



**Partly shielded** means that the light source is hidden and that there is a solid top to prevent upward light; but light is radiated sideways as well as downward.



**Unshielded** means that light is emitted indiscriminately, or is purposely aimed upwards.

**Prescriptive Method Total Lighting Limits**

The primary cause of light pollution is the *amount* of electric light, as light from even the most shielded light sources bounces up when it hits the ground. For non-residential sites (including multiple residences with common areas) calculate the maximum allowed lighting power as follows:

1. Refer to Table 2.
2. Note which lighting that is EXEMPT. You do not have to include exempt lighting in any way. It is unregulated and you can use as much as you want.
3. With the exception of building entrances, determine the allowed lighting power for each application by multiplying the area in plan by the allowed lighting power density for the lighting zone of the property. Only one lighting power allowance can be claimed for any area.
4. Count up the number of building entrances and multiply by the allowance per entrance.
5. Add all of the values calculated in (3.) and (4.). The actual lighting rated lamp watts must be equal to or less than this sum.

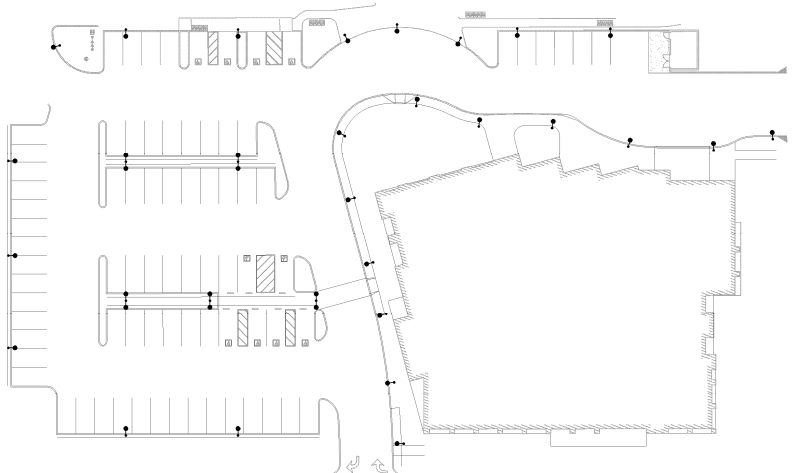
Table 2  
 ALLOWED LIGHTING POWER  
 (watts per square foot (w/ft<sup>2</sup>) unless otherwise noted)

Lighting Application	Allowed Area	LZ 0	LZ 1	LZ 2	LZ 3	LZ 4
Hardscape	Watts per square foot of paved or improved area	0.04	0.06	0.08	0.1	0.2
Building entrances	Per Door (stated values are watts, not watts per square foot).	13	18	26	32	70
Building entry, drive-up sales, and general use canopies	Drip line area under canopy.	0	0.1	0.2	0.4	0.7
Vehicle Service Station Canopy	Drip line area under canopy	0	0.30	0.60	1.2	2.4
Outdoor Sales, Service or Industrial Lot	Portion of uncovered hardscape used exclusively for display of vehicles or other merchandise for sale, for the service of vehicles, aircraft or watercraft, or for exterior manufacturing.	0	0.25	0.45	0.9	1.8
Ornamental Lighting	Entire site	0	0	0.01	0.02	0.04
Landscape Lighting	Landscaped area	Exempt	Exempt	Exempt	Exempt	Exempt
Building Façade Lighting	Non-Residential and Multiple Dwelling	Exempt	Exempt	Exempt	Exempt	Exempt
ATM Security Lighting	Within 5 feet of ATM facility	Exempt	Exempt	Exempt	Exempt	Exempt
Flagpole lighting	Illuminating flags on flagpole	Exempt	Exempt	Exempt	Exempt	Exempt

Example: An office building in LZ3 has a parking lot, driveways and sidewalks with two main entrances (4 doors each), a loading dock with door and two emergency exits. Using AutoCAD, the paved area is 48,000 square feet.

The allowed power is  
 $48,000 \text{ sf} \times .1 \text{ w/sf} = 4,800 \text{ watts}$   
 $11 \times 32 = 352 \text{ watts}$   
 Total Allowed = 5,152 watts

The design has (35) 100 watt pole lights and (16) 26 watt wall lights. The design is 3,916 and meets the ordinance.



### Exempt Lighting and Street Lighting

Most lighting can be designed and implemented within the explicit terms of the Ordinance. But there are a few special cases that can't, and need to be addressed in special ways.

#### Exempt Lighting

The following lighting systems are generally not regulated. However, if they are used in lieu of regulated lighting to circumvent the ordinance, there may be ramifications:

- a. Interior lighting.
- b. Temporary lighting for theatrical, television, and performance areas.
- c. Lighting in swimming pools and other water features governed by Article 680 of the National Electrical Code.
- d. Code required exit signs.
- e. Lighting specifically for stairs and ramps.
- f. Temporary and seasonal lighting provided that individual lamps are 10 watts or less.
- g. Lighting required and regulated by the Federal Aviation Administration, U.S. Coast Guard or other federal or state agency.

In addition, sign lighting is not regulated in this section, but it regulated under the Sign Ordinance.

#### Street Lighting

Developers are generally responsible for installing street lighting before turning streets over to the (authority). New Street Lighting systems are required to meet the requirements of the Ordinance. In general:

- In Lighting Zone 2 and above, lighting is provided for all streets and roads

Lighting levels in all applications must meet requirements contained in Table 3 of the Ordinance. Note that these lighting levels are much lower than many current installations, and will require lower wattage lamps than in the past. In addition, fully shielded luminaires are required with internal house side shielding in most situations.

## Sample Lighting Installations

### Sample Compliant Lighting Installations for the Night Vision Device Influence Area Gas Stations

In lighting a gas station, there are three main areas to be considered; lighting under the pump canopy, lighting around the convenience store or office, and lighting for the apron areas including drives, parking and service areas that aren't under the canopy, such as air or water stations. For lighting under the canopy, the most basic design is a grid of metal halide downlights. Use flat lens fixtures, evenly spaced, with the maximum allowed "fully shielded" lamp watts. Employ 2 luminaires per car to meet IESNA recommended light levels, but fewer fixtures may be considered for conservation purposes.

Apron lighting should be performed using fully shielded pole luminaires, with the mounting height generally 20 feet or less. Lighting "in" from the perimeter is normally used to keep poles away from the drive areas. Using the maximum lamp watts allowed for fully shielded luminaires, lay-out type III distribution luminaires with a least 300-500 square feet of apron (not under canopy) per fixture.



Figure 1 - (Left) Gas station with fully shielded lighting and (right) with ordinary drop lens lighting. The reduced glare and light pollution of fully shielded lighting is required by the Ordinance (*Benya Lighting Design*)

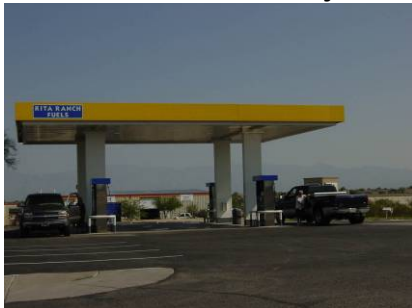


Figure 2 - detail of fully shielded canopy lighting (*Monrad Engineering, Inc.*)

Note: because recommended light levels for service areas are much higher than for ordinary parking, it may be necessary to put two or more fixtures on each pole to reduce the number of poles.

Lighting for the building needs to be coordinated with lighting for the apron. In general, the apron lighting will meet the safety and security needs of the building, so additional lighting will generally be limited to a compact fluorescent fixture at each door. Special lighting should be provided for ATMs on site.

Figure 3 - Every Other Row Option Parking Lot with Fully Shielded Luminaires (*Monrad Engineering, Inc.*)



#### Large area - pole mounted

To light a large area such as a parking lot, there are two very important “rules of thumb” design options:

- **All Rows Option** Luminaires atop 17-20 foot poles must be mounted at every bumper line (about 65-70 feet across) and 50-80 feet on center. Single-headed luminaires should be used around the edge of the lot with double-headed luminaires in the center. Employ flat lens fixtures with type III distribution and use the maximum allowed lamp watts.
- **Every Other Row Option** Luminaires atop 35 foot poles should be mounted at every other bumper line (about 120-130 feet) and 80-100 feet on center. Employ 2 luminaires per pole at the edge and use four luminaires per pole in the center. Employ flat lens fixtures with type III distribution and use the maximum allowed lamp watts.

High pressure sodium lamps produce more lumens per watt than metal halide, and have better lumen maintenance. However, metal halide lamps have superior color and appear brighter. Choose between these lamps depending on project conditions.

## Decorative Lighting



Figure 4 - Fully shielded high performance decorative lighting. *Top*, flat lens wall lanterns (Lumec); *Bottom*, post luminaire (GE)

Lanterns, sconces and other types of luminaires are often mounted on buildings to light doorway areas as well as to reinforce an architectural style. In other cases, traditionally styled globes and "acorns" are mounted atop poles or posts. Unfortunately, most traditional luminaires are unshielded and create a great deal of glare and light pollution. The Ordinance restrictions permit traditional luminaires but depending on shielding, the lamp watts are often very restricted. For this reason, it's probably best to avoid using unshielded or semi shielded decorative lighting, especially for area lighting on posts or poles.

If decorative lighting is very important to the design, investigate the new generation of fully shielded decorative lighting. The lamp is hidden in the top of the luminaire and casts light downward, but the shape of the luminaire is still traditional. There are a number of styles and periods available, making good lighting for these projects possible while maintaining a traditional or historic daytime appearance. Using pole lights of this type, follow the design suggestions for street lights or parking lots.

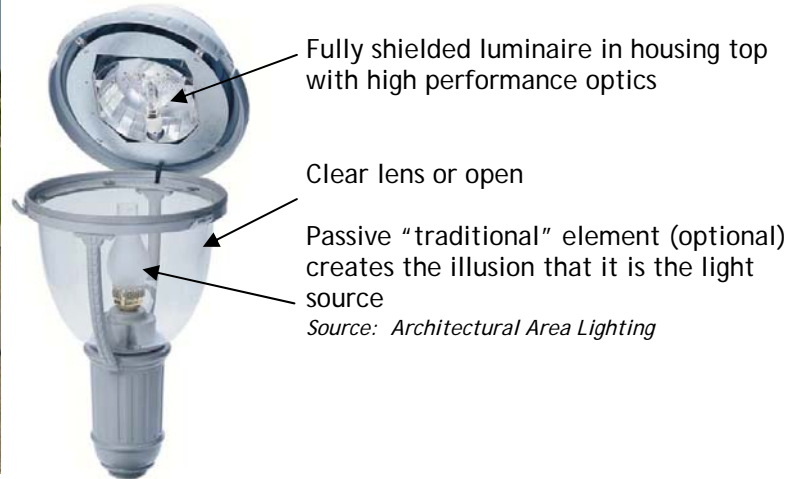


Figure 5 - Anatomy of a high performance decorative "fully shielded" luminaire

### Externally lighted billboards and signs

To minimize impacts to the environment, it is necessary to light billboards and signs “top down” with full shielding. Good results can be obtained with either linear fluorescent or several HID luminaires designed with the special wide throw needed for signs. Most manufacturers provide good information on how to use their products. However, maximum lamp watts are regulated, which will tend to favor fluorescent systems in Zones 1 and 2.



Figure 6 - Several luminaires for top lighting of building signs



Figure 7 - Top Mounted, fully shielded sign luminaires. Note shielding in the direction of the viewer is critical as well as shielding for potential spill light over the top of the sign (*Monrad Engineering Inc.*)

## Sports Lighting

Sports lighting causes such significant light pollution that extra care must be taken in designing, installing, aiming and maintaining sports lighting systems. Sports lighting should use the tallest practical poles and luminaires should be aimed mostly downward. Because high light levels must be used even in the most sensitive lighting zones, there are no lamp wattage limits, and most systems will use metal halide lamps up to 2000 watts. Instead, the use of sports lighting will be limited to sports applications, and hours will be strictly limited.



Figure 8 - A Tale of Two Ballparks. *Left* Ordinary unshielded sports lighting *Right* State of the art sports lighting (Monrad Engineering, Inc.)

In addition, designers should seek modern sports systems with sophisticated shielding and avoid low cost systems that tend to be extremely glaring. A simple top shield does not do much. A new generation of extremely well shielded sports products is now available, and to meet the intent of the Ordinance, their use is required.

Figure 9 -*Left* State of the Art Sports Lighting (Musco) *Right* generic unshielded sports lighting



(Musco and Benya Lighting Design)



## Roadway/Highway



The largest cause of light pollution is roadway lighting. Even if the light is properly shielded, the light reflected by pavement and cars is significant. So as a preliminary consideration, always ask the question whether lighting is really required. There are many streets and roads that don't require lighting; there are others that require lighting at intersections but not continuously. The Ordinance includes regulations for new developments and streets, including "when to light" and appropriate light levels.

It is common for municipalities and utility companies to have "standard" lighting systems and performance requirements. Many of these employ improperly shielded lighting and/or overly high wattage lighting. These standards should be revised as quickly as possible to meet the Ordinance. For existing street lighting, there is huge potential to reduce overall light pollution by changing existing systems to conform with the Ordinance, especially if light level and watts are reduced.



Note that street light design using "full cut off" luminaires is required by the Ordinance. For maximum energy efficiency and minimum maintenance, high pressure sodium lighting is generally preferred. Pole height is not restricted, but as a general rule street lights should be between 20 and 35 feet above grade. Poles are generally mounted 5-6 mounting heights apart along the roadway.

For reasons of cost and maintenance, the most common street lights are "cobra head" style, and both traditional and upscale designs are available in fully shielded flat lens types. For downtown streets and historic districts, consider using decorative fully shielded luminaires as their performance is similar.



**Figure 10 - Street and Roadway lighting systems (Monrad Engineering, Inc. and AAL)**

### Landscape and Façade Lighting

The ordinance treats these two types of lighting similarly. Both generally are mounted on the ground and light upwards, an obvious concern for controlling light pollution. Neither façade lighting nor landscape lighting are permitted in lighting zones LZ0 and LZ1a, but in all other zones the use of low voltage landscape lighting up to 50 watts is not restricted. For most applications, this is plenty of lighting for trees and landscape features, as well as being affordable and attractive. Also note that path lighting can use fully shielded lights, even though they are not required. High wattage landscape lighting and façade lighting is only permitted in lighting zones 3 and 4, limited to 100 watts in lighting zone 3 and 250 watts in lighting zone 4.



Figure 11- Installations using high wattage floodlights are only allowed in lighting zones 3 and 4. (Left) building façade lighting and (right) commercial landscape lighting (Kim Lighting)



Figure 12 - Lighting equipment for accent lighting (left) above grade PAR (center) above grade low voltage MR16 (right) high wattage HID (Hydrel)

### Pedestrian and Walkway Lighting

Like street lighting, there are many situations where no lighting or only occasional lighting is required. As a general rule, first evaluate whether continuous lighting is actually required. Once lighting is determined to be needed, use pole lights or bollards meeting the design conditions. Note that the height of pole lights is limited and for all luminaires, lamp watts are limited by lighting zone and shielding.



Figure 13- Walkway lighting with (*left*) bollards and (*right*) short pole lights (AAL)

The most common choice is often between bollards and short poles (<12'). With current technology, a wide variety of fixture choices are available meeting the Ordinance's "fully shielded" and "shielded" requirements. In lighting zones 3 and 4 it may also be possible to provide some lighting using ornamental, unshielded luminaires, although the watts are restricted.

### Lighting for Monuments, Flagpoles, and Public Art

There are a number of special cases where the basic lighting regulations don't work. In the case of poles flying the Flag of the United States, when the Flag flies at night it is to be lighted. Such lighting is not permitted in Lighting Zone 0, but is permitted in all other lighting zones. Because only a small amount of the light actually illuminates the Flag, the amount of power is limited to 40 watts in lighting zone 1A and to 70 watts in zones 1-4. There are other exemptions such as lighting for ATM machines, because lighting for these machines is frequently controlled by banking laws.



Figure 14 - Lighting for Public Art, Monuments, and Statuary is allowed but a special permit is required to ensure that the lighting is designed to mitigate light pollution (*Hydrex*)

Monuments and public art including statuary, bridges and other important community structures are among a number of lighting situations where lighting is needed and can't meet the more stringent requirements for more ordinary projects. For these situations, a formal special permitting process is provided. Applicants must demonstrate that the lighting is appropriate and designed to mitigate light pollution. Communities are encouraged to hire consultants to check the designs for compliance.

Note: a list of lighting manufacturers approved by the International Dark Sky Association is available at <http://www.darksky.org/mc/page.do?sitePageId=56423&orgId=idsa>

## Draft Amendment to the International Code Council's 2003 International Building Code

The draft building code amendment presented below is a variation on noise insulation standards in effect in California (California Administrative Code, Title 25, Article 4). The draft building code amendment has been numbered to allow easy incorporation into the 2003 International Building Code. The amendment includes single-family dwellings as well as nonresidential structures used for noise-sensitive activities and provides standards for soundproofing against noise and other sources of community noise.

### Section 1211 Sound Attenuation Standards - Aircraft Noise

#### **1211.1 Purpose**

The purpose of these standards is to establish uniform minimum noise attenuation performance standards to protect persons within hotels, motels, apartment houses, attached and detached single-family dwellings, and other noise-sensitive activities within structures from the effects of excessive noise, including but not limited to hearing loss or impairment and persistent interference with speech and sleep.

#### **1211.2 Application and Scope**

The provisions of this article relating to noise attenuation performance standards apply to all applications for building permits made subsequent to the effective date of these regulations for new or redeveloped hotels, motels, dwellings, and other structures used for noise-sensitive activities.

#### **1211.3 Definitions**

The special terms used in this section are defined as follows:

##### **Day-Night Average Sound Level (DNL)**

A method for describing the estimated cumulative aircraft or other noise exposure that affects communities. The DNL metric represents decibels of noise as measured by an A-weighted sound-level meter. In the DNL procedure, noise exposures are accumulated for a typical 24-hour period. Daytime and nighttime noise exposures are considered separately. A weighting factor equivalent to penalty of 10 decibels is applied to aircraft operations or other noise sourced between 10 p.m. and 6:59 a.m. to account for the increased sensitivity of people to nighttime noise. The DNL values can be expressed graphically on maps using either contours or grid cells.

##### **Decibel (dB)**

A unit for measuring the volume of a sound, equal to the logarithm of the ratio of the sound intensity to the intensity of an arbitrarily chosen standard sound.

##### **Noise**

Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

##### **Noise Contours**

Lines drawn on a map that connect points of equivalent DNL values. They are usually drawn in 5-DNL intervals, such as connections of DNL 75 values, DNL 70 values, DNL 65 values, and so forth.

**Noise Grid**

Squares or “cells” of equal size superimposed over a base map of an airport or other noise source and its environs. Numbers printed in each grid cell represent the DNL value of noise at the center of the square for a particular year being studied. Several numbers representing several years can also be displayed. Grid cells may be of any size, depending on the study area. Usually, a cell of about 1,000 feet to 1,400 feet per side (23 to 45 acres) is used for purposes of noise analysis and land use planning.

**Noise-Sensitive Activities in Nonresidential Structures**

Activities in office buildings, offices within other types of structures, research facilities, meeting rooms, and similar activities in structures not intended for residential or transient lodgings. Such uses and activities could be affected by high levels of exterior noise that penetrate into interior spaces.

**Redeveloped Structure**

Renovations of existing structures when the cost modification is 50% or more of the value of the original structure at the time the renovation is to begin.

**Residential Structures**

Any structure for the purpose of housing occupants either on a permanent or transient basis. Residential structures shall include, but shall not be limited to, detached single-family dwellings, attached single-family dwellings (townhouses and patio homes), boarding and rooming houses, mobile homes, manufactured or prefabricated houses, apartment houses (single-story or multistory), motels, and hotels.

**1211.4 Noise Insulation from Exterior Sources****1211.4.1 Location and Orientation**

Consistent with land use standards, residential structures or nonresidential structures used for noise-sensitive activities located in noise-critical areas shall be designed to prevent the intrusion of exterior noises beyond prescribed levels with all exterior doors and windows closed. Noise-critical areas are those near (a) airports; (b) county roads, city streets, and freeways; (c) railroads; (d) rapid transit lines; or (e) industrial areas. Proper design shall include, but shall not be limited to, orientation of windows or other openings in structures away from the noise source, setbacks, shielding, and sound attenuation of the building itself.

**1211.4.2 Interior Noise Levels**

Interior day-night average sound level (DNL) attributable to exterior sources shall not be exceed an annual DNL 45 in any habitable room with windows closed.

**1211.4.3 Community Determination of DNL Contours and Grid Cells**

The local jurisdiction shall prepare or shall have prepared a map showing DNL contours or grid cells for the areas exposed to noise levels of DNL 65 or higher from the sources specified in Section 1211.4.1. In the case of civil and military airports, the airport operator shall be responsible for preparing or have prepared a map of such contours or grid cells.

**1211.4.4 Airport Noise Source**

An acoustical analysis shall be required for new or redeveloped residential structures or nonresidential structures used for noise-sensitive activities located in areas where the exterior noise level due to aircraft operations is DNL 65 or higher. The acoustical analysis shall show that the structure or rooms in which the noise-sensitive activity takes place has been designed to limit intruding noise to the allowable interior noise level prescribed in Section 1211.4.2.

**1211.4.5 Vehicular and Industrial Noise Sources**

An acoustical analysis shall be required for new or redeveloped residential structures or nonresidential structures used for noise-sensitive activities located in areas where the exterior noise level due to vehicular noise or industrial operations is DNL 65 or higher. Vehicular noise of DNL 65 or higher can occur in the vicinity of an existing or adopted freeway, express-way, major street, thoroughfare, railroad, or rapid transit line. The acoustical analysis shall show that the structure or rooms where the noise-sensitive activity takes place has been designed to limit intruding noise to the allowable interior noise level prescribed in Section 1211.4.2.

## ***1211.5 Compliance***

### **1211.5.1 Evidence**

Evidence of compliance shall consist of an acoustical analysis report, prepared under the supervision of a person experienced in the field of acoustical engineering, with the application for building permit. The report shall show the following: (a) topographical relationship of noise sources and dwelling or activity site; (b) identification of noise sources and their characteristics; (c) predicted noise spectra at the exterior of the proposed structure considering present and future land use; (d) basis for the prediction (measured or obtained from published data); (e) noise attenuation measures to be applied, if any; and (f) an analysis of the effectiveness of the proposed construction showing that the prescribed interior noise-level requirements are met. If interior noise levels are met by requiring that windows be unopenable or closed, the design for the structure must also specify the means that will be employed to provide ventilation, and cooling if necessary, to provide a habitable interior environment.

### **1211.5.2 Field Testing**

Field testing may be required only when inspection indicates that the construction is not in accordance with the approved design. Interior noise measurements shall be taken under conditions of typical maximum exterior noise levels within legal limits. A test report showing compliance or noncompliance with prescribed interior allowable levels shall be submitted to the Building Official.

If a field test is required to resolve a complaint of noncompliance with these standards, the complainant shall post a bond or adequate funds in escrow for the cost of the test. If the field test shows compliance, the cost of the test shall be borne by the complainant. If the field test shows noncompliance, the cost of the test shall be borne by the owner or builder.