CERTIFICATE OF ADOPTION

I hereby certify that this plan is the Noise Element, Section I, Part VIII, of the San Diego County General Plan - 1990, as revised by General Plan Amendment 80-02, Subitem (2), and that it was approved by the San Diego County Planning Commission on the 14th day of November, 1988. (GPA 80-02)

Dianne S. Jacob, Chairperson

Attest: Paul C. Zucker, Secretary

I hereby certify that this plan is the Noise Element, Section I, Part VIII, of the San Diego County General Plan - 1990, as revised by General Plan Amendment 80-02, Subitem (2), and that it was amended by the San Diego County Board of Supervisors on the 17th day of December, 1980. (GPA 80-02)

Roger Hedgecock, Chairperson

Attest: Porter D. Cremans
Clerk of the Board

Adopted February 20, 1975
First Amendment December 17, 1980, GPA 80-02

SUMMARY

In January, 1974, the Board of Supervisors appointed the Noise Element Subcommittee of the Citizens' Committee on the General Plan. It assisted the staff's preparation of a General Plan Element which incorporated policies and action programs designed to minimize unnecessary noise in the acoustical environment.

The major issues addressed include the County's role in enforcing the California Airport Noise Standards, the need for an integrated land use and transportation planning program, and the importance of acoustical insulation techniques in urban development policies.

The recommendations to reduce unnecessary noise in the acoustical environment are in the policies and action programs portion of the Element. Major policies of the Element are the need for simultaneously controlling noise at its source, along its transmission path, and at the receiver's site; placing a higher priority on noise problems in residential rather than other areas; a survey to monitor and record community noise; full use of County, State and Federal regulations to control noise; and coordination of the actions of all departments of County government to protect the acoustical environment. Noise standards for residential and non-residential projects are also presented.

Not included in the text of this Noise Element are maps depicting the contours of present and forecasted noise levels of major transportation facilities. These maps are based on those prepared for the Comprehensive Planning Organization and are supplemented with data supplied by the California Department of Transportation and the San Diego County Engineer. Due to the number and size of the maps needed to effectively depict such contours, it is not practicable to reproduce these maps in this report. Highways for which noise contours have been prepared are summarized in Chapter 5 along with maps showing the 70 CNEL noise contour for Lindbergh Field and two County airports. A full set of noise contour maps adopted as part of Chapter 5 is maintained on file at the County Planning Department and in the Clerk of the Board of Supervisors' office where they may be reviewed.

CHAPTER 1

INTRODUCTION

San Diego County, like all other urbanizing areas, is experiencing increases in the noise levels in its acoustical environment. This acoustical environment consists of background noise levels or ambient noise, and peak noise levels from transportation and fixed point sources.

Unlike air and water pollution, noise pollution is not visible and usually does not remain for extended periods. Partially because it cannot be seen, partially because it can sometimes be eliminated by turning off or moving away from the source, and partially because its cumulative effects are not fully known, noise has not received the full degree of social concern that air and water pollution have received. Perhaps this is because it is the noise of others that bothers us, not the noise we make ourselves.

Depending on the duration of exposure, incrementally higher levels of noise are harmful. Noise can damage hearing acuity, interfere with speech communication, affect the performance of mental and motor tasks and precipitate adverse community reactions. Most of these cumulative effects can be avoided if systematic preventative actions are taken now.

It should be noted that some present development practices are not designed to provide a sufficient measure of protection. Noise attenuation has been successfully provided at the building permit stage of the development sequence. This is attributable to the attention of local professionals concerned with noise intrusion into structures and the relative infrequency of severe transportation and fixed point noise sources in the County. The planning process, however, has not been traditionally concerned with noise. Noise was only recently recognized as a problem warranting the attention of professional land use and transportation planners. In fact, this artificial separation of planning is a major cause of noise being an environmental problem. However, the National Environmental Policy Act of 1970 requires the traditional methods of planning to focus on the causes and effects of environmental noise.

Planning methods for environmental protection and reduction of noise levels must be concerned with:

Noise at its Source: The selected placement of transportation facilities based on studies giving the effects of noise equal consideration with the principle of optimal efficiency of traffic movement.

The Noise Transmission Path: Intensive Site Plan review to reduce noise by diversion, absorption, and dissipation.

The Receiver Site: Consistent modification of the development regulations to require special measures for noise-sensitive land uses affected by either stationary or mobile sources.

The purpose of the Noise Element is to prescribe programs aimed at reducing adverse noise levels in the County by adopting policies which will further improve planning, building, and development practices. The major sections of the Element include:

Background data and findings on the County's acoustical environment indicating the types of programs needed.

Policies and action programs, including standards for accomplishing the plan objective.

A series of maps (summarized in Chapter 5 and available in the San Diego County Planning Department and in the Clerk of the Board of Supervisors' office) depicting the contours of present and forecasted noise levels of major transportation facilities.

Appendices describing the methodology of preparation, technical explanations and data sources (not adopted).

The Noise Element proposes a framework of comprehensive planning and corresponding regulations. In doing so, it recognized the necessity of both remedial measures for existing noise problems and preventative actions to protect future development. THE NOISE ELEMENT ADDS LAND USE CONSTRAINTS TO THE GENERAL PLAN AND SUPERSEDES ALL OTHER ELEMENTS ON THE SUBJECT OF NOISE.

AUTHORITY

Government Code Section 65302(g) requires a noise element of all city and county general plans as follows:

"A noise element in quantitative numerical terms, showing contours of present and projected noise levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:

(1) Highways and freeways,

(2) Ground rapid transit systems,

(3) Ground facilities associated with all airports operating under permit from the State Department of Aeronautics.

These noise contours may be expressed in any standard acoustical scale which includes both the magnitude to noise and frequency of its occurrence. The recommended scale is sound level A, as measured with A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

Noise contours shall be shown in minimum increments of five decibels and shall be continued down to 65 db(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 db(A).

Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan.

The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan, a statement of the present and projected noise levels of the facility, and any information that was used in the development of such levels."

RELATION TO OTHER GENERAL PLAN ELEMENTS AND PLANNING PROGRAMS

The County General Plan is a statement of development policies in the form of a text, maps and diagrams explaining objectives, principles, standards, and proposals. It consists of a number of related elements. The Noise Element of the County General Plan is more directly related to some elements than it is to others, i.e., the Circulation, Housing, and Land Use Elements.

The Circulation Element. Transportation vehicles are the major source of community noise. The location of their supporting facilities relates directly to policies for minimizing noise generation and noise exposure.

The Housing Element. Housing has a critical relationship with the Noise Element because of the high degree of sensitivity existing between residential development and the acoustical environment.

The Land Use Element. The Noise Element provides noise level standards related to compatibility of land use adjacent to transportation facilities. These standards are an important technical planning consideration in the location, distribution, and design of land near such facilities.

The Noise Element is also related to other functional plans. One of these is the Integrated Transportation Plan for the San Diego Region being prepared by the San Diego County Comprehensive Planning Organization, as required by Title 7, Chapter 2.5 of the Government Code. This regional plan is a policy plan to achieve a coordinated and balanced transportation system. It includes policies on all transportation modes, need forecasts, an evaluation of the existing transportation systems, and an intergovernmental program to implement the policies. The policies to be proposed in this plan will have both short and long-term consequences for San Diego's acoustical environment.

The Noise Element is also related to San Diego County's special responsibility to implement the California Airport Noise Standards. This delegated responsibility requires specific review and enforcement of the application of these standards at Lindbergh Field, the major facility studied in the San Diego Plan for Air Transportation.

PUBLIC OPINION

Noise has received a great deal of citizen attention in San Diego County. In an attitude survey completed in January, 1972, by the San Diego County Comprehensive Planning Organization, people were asked if noise pollution existed in their neighborhoods or elsewhere in the County, with 64.7% responding affirmatively. Of those who responded affirmatively, the degree of the problem was rank ordered as follows: No problem (4.4%); slight problem (31.3%); medium problem (34.5%); large problem (26.6%). Asked if enough action is now being taken to prevent noise in San Diego County, 40.4% said no; 30.6% yes; and 29.0% were undecided. Airplanes were identified as the most important single noise source, and motor vehicles were listed as the second most important source.

CHAPTER 2

FINDINGS

INTRODUCTION

The Findings chapter of the Noise Element is based on the present state of scientific knowledge about noise. Unanimous agreement does not exist in this area of science; however, agreement is widespread enough that the following factual information has been accepted by the Congress of the United States as a basis for protecting the public health and welfare with an adequate safety margin.

The findings of fact in this section are presented from two perspectives. The first is a description of the growth of noise in a context familiar to planners. The second is a summary description of the scientific knowledge of the effects of noise on individuals. The chapter is structurally divided into the four aspects of the acoustical environment: general aspects, source, path, and receiver's site.

Aircraft Noise

The introduction of jet aircraft noise at San Diego International Airport increased a relatively high noise level already affecting an older area of the City of San Diego. Neither the noise source nor people moved; instead, a new source was introduced. San Diego County exercises an important responsibility for the State of California in providing a solution of this aircraft noise problem.

Urban development is continuing to occur adjacent to general aviation airports operated by San Diego County. The Countywide Airport Land Use Commission, a regional body required by the State of California, is preparing plans for the development of areas adjacent to these airports.

Highway Noise

Until recently, Federal and State freeways and local highways have been planned and constructed throughout the County without prior evaluation of the effects of noise on nearby residents. Sometimes highways were constructed through existing communities, thus moving the noise source (the vehicle) and its transmission path (the highway) close to people. Conversely, new urban development has also occurred adjacent to existing highways, in which case people move close to an existing noise source.

GENERAL

Finding 1 Sound may be defined as vibrational energy resulting in the sensation of hearing. It most commonly is generated by the mechanical vibrations of solid surfaces and transmitted in the form of pressure waves through the air. The human eardrum then vibrates in response to these pressure changes and the signal is carried through the inner ear to the brain

where it is interpreted as sound. Sound is characterized by the intensity (in decibels, dB), the frequency or pitch (in cycles per second or Herz), and the duration of sound. Noise is unwanted sound.(1)

Finding 2 Noise is structured in terms of three system components: the source of the noise, the transmission path, and the receiver. Noise problems have worsened as the noise intensity of the source has grown (e.g., introduction of jet aircraft), and as the transmission path has become shorter (e.g., freeway located near residences or residences located closer to airport). Noise problems can be resolved by reducing noise at the source, by lengthening the transmission path, or by protecting the receiver by noise insulation.

Finding 3 The most appropriate basic unit of measure for community noise is the A-weighted sound level, abbreviated dB(A). This unit gives a lower weight to low and high frequency sounds in a manner similar to the relative lower efficiency of the ear at low or high frequencies. An average person perceives a change of 10 dB(A) as perceived as approximately twice as loud as 60 dB(A). This must be distinguished from a doubling of sound energy or intensity, which results in a sound level increase of only three decibels.(2)

Finding 4 The most appropriate unit of measure for the cumulative effects of community noise is the community noise equivalent level (CNEL). This is the energy average noise level in dB(A) over a 24 hour period with a 5 decibel penalty assigned to evening noise (7 p.m. to 10 p.m.) and a 10 decibel penalty assigned to nighttime noise (10 p.m. to 7 a.m.). This unit is embodied in California Administrative Code regulations regarding airport noise and building sound insulation. It is similar to the day-night average noise level (Ldn) recommended by the Environmental Protection Agency. (Existing regulations are described in Appendix A. A description of these and other units of noise which may be used in this Noise Element is provided in Appendix B.)

Finding 5 The planning process -- which has long- and short-term effects on the habitability of the County -- has not successfully provided protection from noise intrusion into the San Diego County environment. As recently as five years ago, noise was not recognized as a problem warranting the attention of professional land use and transportation planners. This artificial separation of planning is a major reason why the effects of noise are now an environmental problem. However, the National Environmental Policy Act of 1969 and the California Environmental Quality Act of 1970 require the traditional methods of planning focus on the causes and effects of environmental noise.

Finding 6 Noise control authority of local government is both mandated and circumscribed by State and Federal laws. (The most important of these laws are summarized in Appendix A.)

Finding 7 There is no one noise standard or set of noise standards that is universally applicable in San Diego County. The California Airport Noise Standard is 65 CNEL. See Appendix A. The requirement for residential soundproofing is effective at a level of 60 dB(A) CNEL. See Appendix A. The Environmental Protection Agency has identified an outdoor level of

Ldn = 55 decibels (approximately 55 CNEL) as the level requisite to protect the public health and welfare with an adequate margin of safety from the effects of activity interference and annoyance.

Finding 8 Noise control efforts in San Diego County government are currently scattered throughout several different agencies, particularly Health Care (Noise Ordinance enforcement), Public Works (building inspection and transportation system design), and Environmental Development Agency (General Plan Noise Element, Environmental Impact Review). There is no on-going coordination of these programs.(3)

Finding 9 There has never been a major noise survey of the unincorporated areas of San Diego County. This Noise Element represents the first attempt at cataloging all noise data in the County. Information is presently available only for major roads and airports. No provision for on-going noise monitoring currently exists.

Finding 10 San Diego County does not presently have noise performance standards in The Zoning Ordinance. Such standards can, when applicable to new development, require lower noise levels than can be required in a general noise ordinance.

TABLE 1

ASSOCIATION BETWEEN NOISE LEVELS AND HARMFUL EFFECTS

Source: California Department of Public Health

Harmful Effect	Noise Level
Hearing Loss	75-85 dB(A)
Extra Auditory-Physiological Effects	65-75 dB(A)
Speech Interference	50-65 dB(A)
Interruption of Sleep	35-45 dB(A)

SOURCE

Finding 11 Inadequately controlled noise presents a growing danger to the health and welfare of the residents of San Diego County. The making and creating of unnecessary, excessive, offensive or unusually loud noises within the jurisdictional limits of San Diego County is a condition which not only persists, but the level and frequency of occurrence of such noises continues to increase. The following table describes the appropriate noise level at which repeated exposure of unusual duration is associated with hearing loss. It also describes the non-auditory effects of noise associated with exposures of varying duration.

Finding 12 Source noise reductions are usually less costly and less socially disruptive than land use changes or massive programs of retroactive residential soundproofing.

Finding 13 The Noise Control Act of 1972 (PL 92-574) is the first statement of a comprehensive national policy on noise at its source. The Act's declaration of policy states:

> "It is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare by: effectively coordinating federal research activity in noise control; establishing federal noise emission standards for products distributed in interstate commerce; and providing information to the public respecting the noise emission and noise reduction characteristics of such products."

This policy is to be implemented by a division of powers among the Federal, State, and local governments. The Federal government is responsible for noise source emission control of new products involved in interstate commerce. The states and their local governments retain primary responsibility for the modification of noise transmission paths and the levels of noise permitted at the receiver's site.

Finding 14 Existing Federal policy proposes to reduce aircraft noise by reducing engine noise of current models, controls on future type aircraft, changes in aircraft operational procedures and extensive technical research, and to formulate airport noise certification regulations.

TABLE 2

ESTIMATED PERCENTAGE OF URBAN POPULATION (134 MILLION) RESIDING IN AREAS WITH VARIOUS DAY/NIGHT NOISE LEVELS

Source: Information Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety, Washington D.C., Environmental Protection Agency, 1974

Description	Average Ldn in Decibels	Estimated Percentage of Urban Population	Average Census Tract Population Density, Number of People Per Square Mile
Quiet Suburban Residential	50	12	630
Normal Suburban Residential	55	21	2,000
Urban Residential	60	28	6,300
Noisy Urban Residential	65	19	20,000
Very Noisy Urban Residential	70	7	63,000

Finding 15 The Environmental Protection Agency's Report to Congress on Aircraft-Aircraft Noise, has indicated its intention to propose regulations to require retrofitting of existing aircraft with quieter engines, to lower the permissible noise levels for future aircraft, to require the use of noise abatement takeoff, landing, and flight procedures, and to develop airport noise certification regulations (the Agency's term for a cumulative airport noise control system similar to the California Airport Noise Standards).

Finding 16 The provisions for phased reduction of motor vehicle noise in California may be preempted by promulgation of weaker vehicle noise standards by the Federal government. See Appendix A.

Finding 17 The principal noise sources in San Diego County are highway vehicles (most prevalent noise source) and aircraft (most intense noise source). Noise associated with railroads is a relatively localized problem in San Diego County because of the small number of daily passenger and freight trains operated and the small size of the switching yards.

Finding 18 Changes in the nation's acoustical environment have been recorded and are generally applicable to San Diego County. Environmental Protection Agency studies using the limited data from community noise surveys conducted over the past 34 years do not support the estimate that noise is increasing as much as 1 decibel annually. The Agency findings on both residual noise and intruding noise are presented below.(4) Residual noise levels have increased little where the land development pattern remained stable. Where the development pattern has changed, residual noise has increased, probably in accordance with the expected changes among the development pattern categories described in Table 2. The "noisy urban" category is not well-suited to detached housing. In this category, outdoor normal voice conversation is limited to distances of six to ten feet between speaker and listener. Indoor relaxed conversation in a living room at a distance of ten feet with windows or a sliding glass door fully opened is not possible. The "very noisy urban" category is unsuited to apartment living unless the apartments are air conditioned and windows are kept closed to allow relaxed indoor conversation. If the outdoor median noise levels are above 71 dB(A), special soundproofing is necessary to preserve the in indoor noise environment, even with closed windows. In the "suburban" and "urban" categories, the outdoor residual noise level can serve the useful function of providing speech privacy between neighbors. Consideration of speech privacy requirements will set the lower limit of a desired residual noise level of each type of community. A significant increase has been recorded for intruding noise from transportation sources. In some cases, noise sources have moved closer to the affected population, and in other cases, people have moved closer to the noise sources. Intruding noise has increased as the result of the growth of commercial aviation, and from its use of jet aircraft that are 10-20 dB(A) noisier than the older, smaller, piston-powered aircraft. It is also the result of the construction and use of freeways located within urban and suburban areas. land within a Community Noise Equivalent Level of 65 db(A) around those two sources has increased from an estimated 2,000 square miles in 1970; there is also a lesser degree of impact extending over a much larger area, however.

Finding 19 Recent Federal policy changes have increased the accountability of airport owners (and indirectly the air carriers) to the local community when Federal funds are involved in the improvement or development of an airport. The Airport and Airway Development Act of 1970 requires greater citizen (and in some cases local government) participation in airport location and expansion projects prior to Federal funding. At a minimum, public hearings must be held to consider the economic, social and environmental effects of the airport location and its consistency with the goals and objectives of such urban planning as has been carried out by the community. Additionally, the National Environmental Policy Act of 1969 gives local government the opportunity to comment on Federal and Federally supported projects that will significantly affect environmental quality.

Finding 20 The State of California has three policies to control aircraft noise. These include approval of sites of proposed non-military airports and the issuance of operating permits for all existing and proposed non-military airports, the conduct of special planning studies around airports within each county, and airport noise standards.

Finding 21 The California Airport Noise Standards require a progressive reduction of noise at airports until no adjacent resident experiences a community noise level (CNEL) greater than 65 dB(A) by 1986. The responsibility for implementing this policy is divided between the State and its counties which are delegated specific review and enforcement functions.

This policy requires the San Diego Board of Supervisors to determine which public and private civilian airports exceed the maximum noise levels and have a "noise problem". The Board is also required to notify the airport proprietor to begin a noise monitoring program in peripheral areas for frequency and level of aircraft noise within six months, validate the airport proprietor's noise monitoring data, submit quarterly reports to the Department of Transportation's Division of Aeronautics, and review the airport's noise monitoring plan.

Finding 22 In July 1972, acting pursuant to the Administrative Code, Title 4, Subchapter 6, Section 5050, the Board of Supervisors officially designated Lindbergh Field as having a "noise problem". Subsequent notification was sent to the San Diego Unified Port District, to begin a noise monitoring program, and the Port District's noise monitoring plan was reviewed and forwarded to the Division of Aeronautics.

Finding 23 The Lindbergh Field noise monitoring system has functioned since March 1974, and has been validated by the Division of Aeronautics to provide data for the County's enforcement of the California Airport Noise Standards.

Finding 24 The Comprehensive Planning Organization, acting as the Airport Land Use Commission, is required to prepare land use plans for all areas adjacent to each public airport which could exceed the State airport noise standards and for which building height restrictions are needed to maintain navigable airspace. Airport land use plans have been adopted for Palomar Airport and Gillespie Field in the unincorporated area of San Diego County which is responsible for their implementation.

Finding 25 Increasing emphasis is being placed on site and highway planning to minimize the encroachment of outdoor sounds into buildings. The relationship between highway traffic characteristics and the noise level generated is extremely complex. Noise emanating from a given segment of highway is related to the types of vehicles on that highway, their numbers, speed and acceleration, the path of sound and the elevation of the roadway relative to the adjacent terrain.(5)

Finding 26 Design criteria for the reduction of highway-transmitted noise has been adopted by the Federal Department of Transportation for future and existing highways. The 1970 Federal Highway Act requires state highway departments must use the criteria (consisting of noise standards and procedures) in the planning and design of all new (Type I) Federally aided highways. The standards, based on the L10 scale, establish maximum noise levels for different categories of land uses adjacent to highways. This Federal policy is to be implemented by including the cost of abatement measures in the total project cost. These measures include shifting the highway's grade or alignment, property right acquisition for buffer zones or for barrier construction, construction of noise barriers, and in special cases, soundproofing schools, churches, libraries, hospitals, and auditoriums. Suggested design criteria for the reduction of noise transmitted for existing (Type II) highways are also required by the Federal Department of Transportation as authorized by the 1973 Federal Highway Act. Noise abatement measures must promise a significant noise reduction, but are not required to comply with the noise levels specified for future highways.

Finding 27 The California Department of Transportation is implementing a three part program to reduce noise transmitted by highways. The new program is aimed at reducing noise emissions from vehicles and utilizes the provisions of the 1970 and 1973 Federal Highways Acts. Under these provisions, the State will recommend that local government permit only compatible land uses next to freeways. Noise abatement measures will be provided in appropriate locations as the third part of this program. This program will also define a new highway construction program in San Diego and other counties based on the Statewide inventory of noise problems and established construction priorities.(6) San Diego County will be required to establish new planning approaches utilizing its existing land use and building regulations to control the construction of homes, schools, hospitals or other institutions incompatible with freeways before the Department will construct noise abatement structures on existing freeways. The Department will assign priorities to identified problem areas.

Finding 28 San Diego County does not presently have a truck route ordinance. Counties do not have the statutory authority to enact truck route ordinances to assure that truck noise will be confined to major arterials except when necessary for ingress or egress to point of destination or origin.

RECEIVER'S SITE

Finding 29 Exposure to noise of sufficient intensity and duration can cause temporary or permanent hearing damage. The Federal and State governments have

established limits of occupational noise exposure. These limits start at 90 dB(A) for eight hours per day exposure; higher noise levels are permitted for shorter times. See Appendix A. The Environmental Protection Agency has identified a 24 hour noise equivalent level (see Appendix B) of 70 dB(A) as requisite to protect the public health and welfare from hearing loss with an adequate margin of safety. Studies of hearing damage caused by transportation noise have not been conducted in San Diego County.(7)

Finding 30 Noise can disrupt speech communication by affecting the quality, accuracy, and frequency of verbal exchange. At a speaker-listener distance of 5 feet, communication is possible with masking noise levels of 66 dB(A) and becomes increasingly difficult at higher levels of masking noise, becoming nearly impossible above 80 dB(A). At a speaker-listener distance of 12 feet, these noise levels reduce to 55 dB(A) and 72 dB(A) respectively.

Finding 31 Noise can interfere with sleep, causing awakening or changes in sleep state. Noise levels below 30 dB(A) indoors do not ordinarily have any effect, while steady noise levels greater than 48 dB(A) awaken nearly everyone. Fluctuating noises cause more sleep disturbance than steady noise. The potential health hazard that may be associated with sleep disturbance has not been defined.

Finding 32 Noise can have other physiological effects. Noise on the order of 90 dB(A) can effect mental or motor performance that does not involve auditory signals. Noise at any level can affect tasks requiring auditory communication. Noise between dwelling or work spaces can adversely affect privacy. Noise at low levels, particularly above 70 dB(A), can cause responses of the smooth muscles and glands such as constriction in the peripheral blood vessels, acceleration or deceleration of heart rate, changes in skin electrical resistance, changes in breathing pattern, and changes in the gastrointestinal tract. Very intense sounds can activate a complicated series of changes in the endocrine system causing changes in hormone levels, blood composition, or other changes.

Finding 33 Noise cause annoyance to individuals, and, if sufficiently intense, precipitates strong, adverse community reactions. Noise produced at night is much more annoying than noise produced during the day.

Noise causes progressive levels of dissatisfaction as it affects people who are innocent bystanders at the site of the receiver. The degree of dissatisfaction is closely associated with the degree to which the noise-producer demonstrates a concern about lessening the effects upon the receivers.

The degree of annoyance is closely related to both acoustical and non-acoustical factors. The former include the levels and durations and number of occurrences of identifiable noise events; the residual noise level; the variability of the noise levels; the time of day; and special factors related to the character of the information content of the noise. Non-acoustical factors include the particular activity disrupted, the attitude of those affected, and factors specific to particular sound sources, such as neighborhood disagreements over barking dogs.

Finding 34 Noise levels in San Diego County vary widely. Spot noise measurements have shown ambient levels (L90) from 34 to 65 dB(A) during the day (no doubt lower at night). The same measurements show L10 values from 42 to 80 dB(A) during the day suggesting the CNEL levels may be similar. (Detailed noise contours for airports and highways are on file with the Planning Department and in the Clerk of the Board of Supervisors' office and are summarized in Chapter 5.)

CHAPTER 3

OBJECTIVES

To establish a basis for the preparation and implementation of the Noise Element, the Noise Element Subcommittee of the Citizens' Committee on the General Plan invited specialists in the field of noise impact and control to present information at a public hearing on the effects of excessive noise and possible means of reducing excessive noise within the County. Based on this testimony and information gathered by staff, the Subcommittee adopted the following statement as the basic objectives of the Noise Element of the County General Plan:

Establish a coordinated set of policies and noise standards for the reduction of irritating and harmful effects of noise to people within the County of San Diego through effective planning, and, if necessary, regulation.

Protect and enhance the County's acoustical environment by simultaneously controlling noise at its source, along its transmission paths, and at the site of the ultimate receiver. First priority shall be given to residential areas to assure an environment free from excessive or damaging noise. Control of noise at its source shall be given priority over changes to residential structures or neighborhoods where practical.

The policies and action programs specified below establish the basic approach and course of action required to be taken by County government to achieve these objectives. The policies and action programs are grouped into four sections dealing with:

1. The establishment of a coordinated on-going program to protect and improve the acoustical environment of the County;

2. The support and enforcement of regulations to control noise at its source;

3. The establishment and maintenance of programs to reduce noise through control of its transmission paths;

4. The establishment of standards and controls to minimize noise at the site of the receiver.

These four groups of policies and action programs represent a balanced and workable program for continuing the County's efforts to reduce the harmful and irritating effects of noise.

CHAPTER 4

POLICIES AND ACTION PROGRAMS

BASIC GOVERNMENTAL PROGRAMS

POLICY 1 Establish and support a coordinated program to protect and improve the acoustical environment of the County.

Action Program 1.1 Direct the Environmental Development Agency to formulate a comprehensive program to coordinate and guide efforts of appropriate County departments to protect and improve the acoustical environment.

Action Program 1.2 As part of the County's comprehensive program, prepare a total noise program budget for review and adoption as part of the annual County budget.

Action Program 1.3 Conduct an Expanded Noise Survey (ENS) to estimate Community Noise Equivalent Levels (CNELs) in those portions of the unincorporated areas that have not been surveyed previously. The Environmental Development Agency shall budget staff to complete the ENS. Periodic noise monitoring will be accomplished as appropriate.

Action Program 1.4 Establish and maintain a County data bank of noise information within the EDA, including all available noise surveys.

Action Program 1.5 Initiate a Board of Supervisors conference to ensure the establishment of a single depository procedure which will maintain noise data for the entire San Diego County region in cooperation with all of the region's noise abatement agencies.

Action Program 1.6 Interpret and update County noise survey information for inclusion in an annual State of Environment Report (SER) and the quarterly report of airport noise monitoring of Lindbergh Field required by the Public Utilities Code. These reports will contain the following information as appropriate:

Monitoring data depicting the acoustical environment and changes which have occurred related to achievement of quantitative standards.

Description of enforcement actions which have occurred in the previous year.

Changes in Federal, State, and local laws affecting San Diego's acoustical environment and the program implications for County government.

Proposals for changing any of the noise standards, policies, ordinances, or programs resulting from this Noise Element of the General Plan.

Action Program 1.7 Include necessary noise level standards in any

comprehensive revision and codification of the County planning regulations and/or the appropriate Elements of the General Plan. This Noise Element and the County Noise Ordinance shall be used in the formulation of these standards.

Action Program 1.8 Review and amend where necessary the community plans and General Plan Elements based on noise conflicts identified in Airport Influence Area Plans prepared by the Airport Land Use Commission and in existing and future County noise surveys. Whenever possible priority should be given to solutions that control source noise rather than modifications of existing or planned residential land uses.

Action Program 1.9 Encourage citizen participation in the planning of noise reduction techniques in all applicable situations.

NOISE SOURCE CONTROL

POLICY 2 Continue to support, by official advocacy, the control of noise sources through legal regulation and cooperative government efforts.

Action Program 2.1 Officially support programs and actions to resolve aircraft noise problems on a national basis through the cooperative effort of the Federal and State governments, the air carriers, and aircraft manufacturers.

Action Program 2.2 Continue to officially support all reasonable legislative proposals which require the reduction of aircraft noise at its source by retrofitting existing jet aircraft with quieter engines by specific dates.

Action Program 2.3 Continue to officially support the reduction of aircraft noise by changing operating procedures consistent with operational safety.

Action Program 2.4 Request the Division of Aeronautics to amend the Administrative Code provisions to require all requests for variances from the California Airport Noise Standards to be submitted concurrently to the County and the Environmental Development Agency.

Action Program 2.5 Request the Division of Aeronautics to conduct public hearings in San Diego on requests of local proprietors for variances from the California Airport Noise Standards.

Action Program 2.6 Oppose proposals incompatible with the objectives and policies of this Element which weaken the provisions of statutes requiring phased reduction of motor vehicle noise or any proposal to enact less restrictive standards.

Action Program 2.7 Request amendment of the California Vehicle Code to allow counties to adopt a truck route ordinance based on the Circulation Element of the County General Plan.

Action Program 2.8 Direct the Sheriff's Department to emphasize enforcement of the motor vehicle noise provisions of the County Noise Ordinance to extent

practicable.

TRANSMISSION PATH CONTROL

POLICY 3 Establish a coordinated program within the Environmental Development Agency and Public Works Agency to maximize efforts to deamplify noise along its transmission paths.

Action Program 3.1 Establish and appoint a Route Study Team (RST) consisting of an urban planner, a civil engineer, a landscape architect, and an environmental management specialist.

Action Program 3.2 Direct the RST to undertake the following activities:

Coordinate noise transmission path modification programs of the Federal and State Departments of Transportation with San Diego County development review procedures.

Identify those primary arterials and other classes of streets requiring special remedial noise abatement measures and recommend changes in the appropriate ordinances.

Provide technical input to the preparation of the ENS.

Action Program 3.3 Direct the RST, the County Department of Transportation, and the Planning Department to evaluate the Circulation Element of the General Plan based on an integrated planning program which gives equal consideration to the effects of noise on adjacent land uses as well as the efficient movement of traffic and the conservation of energy.

Action Program 3.4 Include the review of Site Plans by the Environmental Development and Public Works agencies specific consideration of modifying noise transmission paths where appropriate by diversion, reflection, absorption, and dissipation.

Action Program 3.5 As part of a coordinated noise program, identify noise sensitive areas requiring sound barriers and recommend programs with annual funding priorities.

Action Program 3.6 Recommendations of modifications to the noise transmission path shall be supported by an evaluation of the consequences so as to allow for trade-offs for other environmental qualities.

RECEIVER SITE STANDARDS AND CONTROLS

POLICY 4a Ensure acceptable noise levels at the receiver's site by incorporating appropriate regulations and standards in the County's development policies and ordinances.

Action Program 4a1 Support changes in the Uniform Building Code that incorporate new technologies for reducing exterior noise intrusion into structures, and the transmission of interior-generated noise within

structures.

Action Program 4a2 Maintain a tri-annual review of County ordinances to ensure conformance with the acoustical standards of the Uniform Building Code, the Noise Element, and the noise provisions of the San Diego County Code.

Action Program 4a3 Add a professional engineer to the Building Inspection Department staff with expertise in the area of noise attenuation.

POLICY 4b

Because exterior Community Noise Equivalent Levels (CNEL) above 55 to 60 decibels and/or interior CNEL levels above 45 decibels may have an adverse effect on public health and welfare, it is the policy of the County of San Diego that:

1. Whenever possible, development in San Diego County should be planned and constructed so that noise sensitive areas are not subject to noise in excess of CNEL equal to 55 decibels.

2. Whenever it appears that new development will result in any (existing or future) noise sensitive area being subjected to noise levels of CNEL equal to 60 decibels or greater, an acoustical study should be required.

3. If the acoustical study shows that noise levels at any noise sensitive area will exceed CNEL equal to 60 decibels, the development should not be approved unless the following findings are made:

   A. Modifications to the development have been or will be made which reduce the exterior noise level below CNEL equal to 60 decibels; or

   B. If with current noise abatement technology it is infeasible to reduce exterior CNEL to 60 decibels, then modifications to the development have been or will be made which reduce interior noise below CNEL equal to 45 decibels. Particular attention shall be given to noise sensitive interior spaces such as bedrooms. And,

   C. If finding "B" above is made, a further finding is made that there are specifically identified overriding social or economic considerations which warrant approval of the development without modification as described in "A" above.

4. If the acoustical study shows that noise levels at any noise sensitive area will exceed CNEL equal to 75 decibels, the development should not be approved.

Definitions (applicable to paragraph 1 through 4 of Policy 4b)

"Development" means any physical development including but not limited to residences, commercial, or industrial facilities, roads, civic buildings, hospitals, schools, airports, or similar facilities.

"Noise Sensitive Area" means the building site of any residence, hospital, school, library, or similar facility where quiet is an important attribute of the environment.

Exemption

1. For the rooms in "Noise Sensitive Areas", which are usually occupied only a part of the day (schools, libraries, or similar), the interior one hour average sound level, due to noise outside, should not exceed 50 decibels.

2. For County road construction projects, the exterior noise level due to vehicular traffic impacting a noise sensitive area should not exceed the following values:

   A. Federally funded projects shall comply with applicable Federal Highway Administration Standards.

   B. Other Projects - CNEL = 60 dB(A), except if the existing or projected noise level without the project is 58 dB(A) or greater a 3 dB(A) increase will be allowed, up to the maximum permitted by Federal Highway Administration Standards.

Action Program 4b1 Recommend programs to soundproof buildings or redevelop areas where it is impossible to reduce existing source noise to acceptable levels.

Action Program 4b2 Study the feasibility of extending the application of Section 1092, California Administrative Code dealing with noise insulation standards to single-family dwellings, and incorporating higher standards for reduction of exterior noise intrusion into structures.

Action Program 4b3. Require present and projected noise level data to be included in Environmental Impact Reports. Designs to mitigate adverse noise impacts shall also be used.

CHAPTER 5

TRANSPORTATION SYSTEM NOISE CONTOURS

As a member of the Comprehensive Planning Organization, San Diego County recently completed its participation in the development of ground transportation system noise contours.

Highways, railroads, and jet engine ground runup tests at Lindbergh Field were analyzed. Existing highways included approximately 180 miles in the western one-third of San Diego County of State and interstate highways and freeways as well as selected primary arterial routes. Highways evaluated for the 1995 forecast time period included only State and Federal freeways. The included highways are listed in Table 4. Existing and forecasted traffic data on State highways not included in the study has been supplied by the California Department of Transportation. Traffic data for existing and future County highways was supplied by the San Diego County Engineer. Noise calculations for both were completed by the San Diego County Engineer. Evaluation of the current railroad operations of both the Atchison, Topeka, and Santa Fe and the San Diego and Arizona Eastern (Southern Pacific) was also completed. Approximately 120 miles of track and 3 classification yards were analyzed. Noise contour analysis of rail transit systems for the 1995 forecast time period was not included pending the resolution of the rapid transit question by the Comprehensive Planning Organization.

The Day/Night Average Sound Level, Ldn, scale was selected as being the most appropriate in response to the State requirements. It is essentially similar to the Community Noise Equivalent Level, CNEL, scale used by San Diego County in describing the airport noise at Lindbergh Field.

Noise contour maps have been prepared on a scale of 1 inch equals 800 feet. For both the current and 1995 forecast time periods, only the Ldn = 65 dB(A) are shown. An exception is made for 13 existing noise sensitive areas in which case the 60 decibel contour is shown. For current highway noise, highways are classified as to their relative elevation or depression with respect to the sideline terrain and the noise propagation from the traffic flowing on them was accordingly adjusted. All highways in the 1995 forecast period, however, are assumed to be at the same grade as the sideline, thus presenting a somewhat more conservative estimate of the future noise contours.

Noise contours from individual transportation systems were not combined to show one composite noise exposure contour. This ensures that the noise of each transportation component can be individually assessed.

TABLE 4

1973 Highways for Which Ldn Noise Contours Were Developed		1995 Highways For Which Ldn Noise Contours Were Developed
INTERSTATE HIGHWAYS		
ISR 5	Mexican Border to Camp Pendleton	Mexican Border to Camp Pendleton
ISR 8	Route 5 to Alpine	Route 5 to Alpine
ISR 15	Route 8 to Escondido	Route 5 (San Diego) to Riverside County Line
ISR 805	Route 94 to Route 5 (Del Mar)	Route 5 (San Ysidro) to Route 5 (Del Mar)
STATE FREEWAYS		
Rte 15	Route 5 to Route 805	
Rte 52	Route 5 to Route 805	Route 5 to Lakeside
Rte 67	Route 8 to Lakeside	Route 8 to Ramona
Rte 78	Oceanside to Escondido	Route 5 to Ramona
Rte 94	Central San Diego to Spring Valley	Route 5 to Dulzura
Rte 109	Ocean Beach to Route 5	
Rte 125	Route 94 to Route 8	Route 75 to Poway
Rte 163	Central San Diego to Miramar	Route 5 to Route 15
STATE HIGHWAYS		
Rte 15	Route 805 to Route 8	
Rte 15	Escondido to Riverside County Line	
Rte 54	Route 94 to Route 8	Route 5 to Route 8
Rte 56		Route 5 to Poway
Rte 67	Lakeside to Ramona	
Rte 75	Route 5 to Route 5 (Coro., Imp Bch)	Route 5 to Route 5 (Coro., Imp Bch) Route 5 to Route 125
Rte 76	Oceanside to Rincon Springs	Route 5 to Palomar
Rte 78	Escondido to Ramona	
Rte 94	Spring Valley to Dulzura	
Rte 209	Route 8 to Cabrillo Nat'l Monument	Point Loma to Route 5
Rte 252		Route 5 to Route 805
Rte 274	Route 5 to Route 163	Route 5 to Route 15
Rte 282	Route 75 to NAS North Island	Route 75 to North Island
URBAN PRIMARY ARTERIALS		
Washington St./El Cajon Blvd.: Rte 5 to 70th St. Ardath Rd./Torrey Pines Rd./Pearl St./La Jolla Blvd./ Mission Blvd./Grand Avenue: Route 5 to Route 5		
Highland Avenue: Division St., to "L" St.		
Clairemont Mesa Blvd. Clairemont Dr. to Route 163		
University Avenue: Hawk St., to 54th St.		

FIGURE 1 GOES HERE

FIGURE 2 GOES HERE

FIGURE 3 GOES HERE

FIGURE 4 GOES HERE

FIGURE 5 GOES HERE

FOOTNOTES

1. Fundamentals of Noise: Measurement, Rating Schemes, and Standards, Washington, D.C., Environmental Protection Agency, p. 1.

2. Ibid.

3. Organizations and Functions Handbook, San Diego, County of San Diego, pps. 34, 110, 112, 135, 125, 126, 130.

4. Community Noise, Washington, D.C., Environmental Protection Agency.

5. Manual for Highway Noise Prediction, Federal Highway Administration, Washington, D.C., Department of Transportation.

6. Policy and Procedure Memorandum PPM74-74, Sacramento, Department of Transportation.

7. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, Washington, D.C., Environmental Protection Agency.

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APPENDIX A

SUMMARY OF EXISTING NOISE CONTROL LAWS AND REGULATIONS

The purpose of this Appendix is to summarize Federal, State, and local statutes pertaining to noise control. The summaries give some idea of the content of each statute or administrative regulation but should not be interpreted as fully setting forth the existing legal requirements.

The organization of this Appendix is: (1) federal laws numerically by Title of the United States Code and numerically by Section within each Title; (2) Federal regulations numerically by Title of the Code of Federal Regulations and numerically by Part within each Title; (3) California laws and regulations alphabetically by Title of Code and numerically by Section within each Code; (4) County codes.

FEDERAL LAWS

23 U.S.C. 109(1)

Highway standards. Requires the Secretary of Transportation to develop and promulgate standards for highway noise levels compatible with different land uses. Plans and specifications for any proposed project on the Federal-aid system must include adequate measures to implement the noise level standards.

42 U.S.C. 1858 and 1858a

The Noise Pollution and Abatement Act of 1970 (PL 91-604 Section 401). Establishes the Office of Noise Abatement and Control within the Environmental Protection Agency, requires an investigation of noise, and requires other Federal agencies to consult with the Environmental Protection Agency.

42 U.S.C. 4332

The National Environmental Policy Act of 1969 requires an Environmental Impact Statement (EIS) on Federal or Federally supported projects that will significantly affect environmental quality and gives local governments the opportunity to comment on the Environmental Impact Statement.

42 U.S.C. 4901-4918

The Noise Control Act of 1972 (PL 92-574) is the first comprehensive statement of national noise policy. In Section 2(b) the Congress declares that "it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare." Federal agencies are required to further this policy (Section 4(a)), to comply with Federal, State, and local noise control requirements (Section 4(b)), and to coordinate their programs through the Environmental Protection Agency (Section 4(c)).

The Act directs the Environmental Protection Agency to develop and publish criteria with respect to noise and information on the levels of environmental noise which are requisite to protect the public health and welfare with an adequate margin of safety (Section 5(a)) and to publish a report identifying products which are major sources of noise (Section 5(b)). (These reports have been published.)

Section 6 of the Act requires the Environmental Protection Agency to prescribe noise emission regulations for construction equipment, transportation equipment, motors or engines, and electronic equipment. States and local governments may not set different emission standards but may regulate environmental noise through regulation of the use, operation, or movement of such equipment.

Section 7 requires the Environmental Protection Agency to study and report to Congress on the aircraft noise problem and to propose to the Department of Transportation's Federal Aviation Administration such regulations as are deemed necessary to protect the public health and welfare. The Report to Congress has been completed (see Finding 8). The Federal Aviation Administration must then either prescribe such regulations or publish an explanation providing reasons for any decision not to prescribe such regulations and thereafter consult with the Environmental Protection Agency which may request a review of such decision.

Section 8 requires the labeling of certain products with regard to noise to allow a more informed consumer choice.

Section 12 provides that any person may start a civil action on his own behalf against any person including the United States or any other governmental agency for violation of the provisions of the Act. Similarly, civil action may be brought against the Environmental Protection Agency and/or the Federal Aviation Administration for failure to perform any non-discretionary duty. No rights which a person may have under different statutes or the common law to enforce any noise control requirement are restricted.

Section 17 requires publication of noise emission regulations for interstate rail carriers and Section 18 requires publication of noise emission regulations for interstate motor carriers.

49 U.S.C. 1431

The Federal Aviation Act of 1958, Section 611, Control and Abatement of Aircraft Noise and Sonic Boom. Requires the Federal Aviation Administration to prescribe such regulations as may be necessary to provide for the control and abatement of aircraft noise and sonic boom. Amendments resulting from the Noise Control Act of 1970 establish relative roles for the Environmental Protection Agency and the Federal Aviation Administration.

49 U.S.C. 1701, 1727

The Airport and Airways Development Act of 1970 requires greater citizen (and in some cases local government) participation in airport location and

expansion projects prior to Federal funding. At a minimum, public hearings must be held to consider the economic, social, and environmental effects of the airport location and its consistency with the goals and objectives of such urban planning as has been carried out in the community.

Department of Housing and Urban Development Circular 1390.2

Noise Abatement and Control. This policy consists of a scale of noise exposure standards for qualifying all Federally assisted public and private physical development projects, and sound transmission class requirements for housing developed with Federal financial assistance.

Noise exposure standards are applicable under a 1971 Department of Housing and Urban Development policy. Standards exist for:

Multiple- and single-family residential construction.

Interior noise exposures for new and rehabilitated structures.

Insulation between dwelling units of multiple-family structures.

Other land uses and existing housing.

This policy requires that noise sources and the effects of noise exposure must be considered in several Federal grant programs. Further, these standards are used in Departmental program decisions on approving local programs and are an additional Federal support of noise abatement policies of the State of California and San Diego County. The following are excerpts from Circular 1390.2 of Federal noise standards.

STANDARDS.

a. Standards, incorporating both technical and policy considerations, will be promulgated on the basis of review of the nature of problem cases identified in the regions, advice from consultants, R&D contracts as appropriate, and further study by the Departmental Working Group on Noise. Technical noise assessment manuals may be issued by HUD to provide further guidance on noise assessment and measurement to facilitate implementation of this circular.

b. Interim Standards. The following interim standards are established. In applying these interim standards, projected noise exposures shall form the basis for decision.

(1) External Noise Exposures: Sites for New Residential Construction (single of multi-family).

(See attached Chart: External Noise Exposure Standards for New Construction Sites.)

(2) Interior Noise Exposures (for new and rehabilitated residential construction).

(Note: The standards listed below are performance standards. The means required for achieving them will depend on, among other things, the external noise levels, the equipment and layout used in the building, and the noise attenuation characteristics of the building's floors and walls. These standards assume open windows unless other provision is made for adequate ventilation.)

(a) "Acceptable":

Sleeping Quarters. For the present time, HUD field personnel should consider existing and projected noise exposure for sleeping quarters "acceptable" if interior noise levels resulting from exterior noise sources and interior building sources such as heating, plumbing, and air conditioning

-- do not exceed 55 dB(A) for more than an accumulation of 60 minutes in any 24 hour period, and

-- do not exceed 45 dB(A) for more than 30 minutes during nighttime sleeping hours from 11 p.m. to 7 a.m., and

-- do not exceed 45 dB(A) for more than an accumulation of 8 hours in any 24 hour day.

Other Interior Areas. HUD personnel should exercise discretion and judgment as to interior areas other than those used for sleeping. Consideration should be given to the characteristics of the noise, the duration, time of day, and planned use of the area.

(3) Insulation Between Dwelling Units

(a) "Unacceptable"

For multi-family structures, including attached single-family units, floors and dividing walls between dwelling units having Sound Transmission Class (STC) of less than 45 are always unacceptable.

(4) Other Land Uses and Existing Housing. Until HUD establishes a broader range of noise exposure standards, HUD administration at all levels shall take noise into consideration in the development of policies and guidelines and in the review and decisions on specific projects. Wherever feasible, standards along the lines of the above shall be employed in a manner consistent with proposed uses, densities and construction types.

c. Philosophy in Application of Standards. HUD personnel in the exercise of discretion should be guided by a desire to prevent noise problems from

coming into being and by an overall philosophy of encouraging the control of noise at its source. Particular attention should be paid to fostering land utilization patterns for housing and other municipal needs that will separate uncontrollable noise sources from residential and other noise sensitive areas. HUD personnel should encourage use of the A-95 notification and review processes to detect potential noise problems as early as possible.

Department of Housing and Urban Development Minimum Property Standards for Housing

These departmental standards, often described as a type of national building code, are applicable only to housing that has its financing insured by the Federal Housing Administration, and the Veterans Administration. These standards also are used as a reference by local building and planning agencies and private lending institutions. The first comprehensive revision of these standards will be adopted in later 1974, and contain tighter performance standards for the reduction of noise in one and two family dwellings, care type housing, and multiple-family housing.

FEDERAL REGULATIONS

23 CFR 772

Highway Noise Standards. This regulation establishes design noise levels applicable to all new Federally aided highways. The standards and relation to land use are shown in the following Table:

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Design Noise Level -- L10	Description of Land Use Category
55 dB(A) (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. (Applies when no exterior noise sensitive land use or activity is identified.)
60 dB(A) (Exterior)	Amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
70 dB(A) (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
75 dB(A) (Exterior)	Developed lands, properties or activities not included in the above categories.

Also included in these Federal design criteria for new highways are procedures for highway noise analysis, identification of solutions, requirements for coordination with local officials, and noise abatement measures for both developed and undeveloped land. Implementation of this Federal policy occurs by including the cost of abatement measures in the total project cost. These measures include shifting the highway's grade or alignment, property right acquisition for buffer zones or for barrier construction, construction of noise barriers, and in special cases, soundproofing schools, churches, libraries, hospitals, and auditoriums.

The design criteria are also recommended for the reduction of noise transmitted for existing highways. Noise abatement measures must promise a significant noise reduction, but are not required to comply with the noise levels specified for future highways. Noise abatement measures recommended for future highways (such as soundproofing of public institutional buildings and acquisition of unimproved property for buffers) and noise abatement measures for activities and land uses which occur after the effective date of the regulations are not applicable to existing highways. Noise abatement measures for older highways are limited to the acquisition of property rights for installation or construction of noise abatement barriers or devices. These measures may include landscaping both within the right-of-way or on an easement.

STATE LAWS AND REGULATIONS

Administrative Code -- Title 4, Subchapter 6, Sections 5000 through 5080.5, Airport Noise Standards

These regulations are designed to cause the airport proprietor, aircraft operator, local governments, pilots, and the Department of Transportation's Division of Aeronautics to work cooperatively to diminish noise. The regulations accomplish these ends by controlling and reducing noise in communities in the vicinity of airports (Section 5000). The level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a Community Noise Equivalent Level (CNEL) value of 65 dB (Section 5005). The limitations on airport noise in residential communities is established to be (Section 5012):

a. The criterion Community Noise Equivalent Level (CNEL) is 65 dB for proposed new airports and for vacated military airports being converted to civilian use.

b. Giving due consideration to economic and technological feasibility, the criterion Community Noise Equivalent Level (CNEL) for existing civilian airports (except as follows) is 70 dB until December 31, 1985, and 65 dB thereafter.

c. The criterion CNEL for airports which have 4-engine turbojet or turbofan air carrier aircraft operations and at least 25,000 annual air carrier operations (takeoffs plus landings) is as follows:

Date	CNEL in Decibels
Effective date of regulations to 12/31/75	80
1/1/76 to 12/31/80	75
1/1/81 to 12/31/85	70
1/1/86 and thereafter	65

The methods whereby the impact of airport noise shall be controlled and reduced include, but are not limited to the following:

a. Encouraging use of the airport by aircraft classes with lower noise level characteristics and discouraging use by higher noise level aircraft classes;

b. Encouraging approach and departure flight paths and procedures to minimize the noise in residential areas;

c. Planning runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft and noise sensitive time periods;

d. Reduction of the flight frequency, particularly in the most noise sensitive time periods and by the noisier aircraft;

e. Employing shielding for advantage, using natural terrain, buildings, etc.; and

f. Development of a compatible land use within the noise impact boundary.

Preference shall be given to actions which reduce the impact or airport noise on existing communities. Land use conversion involving existing residential communities shall normally be considered the least desirable action for achieving compliance with these regulations.

Enforcement of these regulations is to be by counties. The county shall require noise monitoring by airports that are deemed to have a noise problem as determined by the county. The counties are required to validate monitoring data supplied by the airport proprietor and to submit quarterly reports to the Division of Aeronautics (Section 5050).

No airport proprietor may knowingly operate his airport with incompatible land use based on the applicable standards unless he has a variance (Section 5062).

An airport proprietor may request variances from the requirements of the regulations for periods not to exceed one year (Section 5075).

The regulations also include detailed technical guidelines for noise measurement, establishment of noise impact areas, and the type of monitoring equipment required.

Administrative Code -- Title 25, Chapter 1, Subchapter 1, Article 4, Section 1092, Noise Insulation Standards

Establishing noise insulation standards for interior wall and floor-ceiling assemblies in new hotels, motels, apartment houses, and dwellings other than detached, single-family dwellings. Basic design standard is a Sound Transmission Class (STC) of 50 for walls and an Impact Insulation Class (IIC) of 50 for floor-ceiling assemblies. Also requires that for residential structures (other than single-family dwellings) to be located within an annual CNEL contour of 60 dB from transportation noise sources be designed so that interior noise levels with windows closed will not exceed an annual CNEL of 45 dB(A).

Business and Professions Code

Section 11549.5 (of the Subdivision Map Act) requires a governing body of a city or county to deny approval of a Tentative Map or Final Map if it finds that the design of the subdivision or improvement are likely to cause substantial environmental damage.

Government Code

Section 65302(g) requires a noise element in local general plans which shows contours of present and projected noise levels associated with major transportation elements. Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan.

Harbor and Navigation Code

Sections 654.05 and 654.06 regulate noise emission levels of motorboats sold in California or operated in inland waters. These levels are:

Date of Engine Manufacture	Noise Limit
On or After January 1, 1974 and Before January 1, 1976	86 dB(A)
On or After January 1, 1976 and Before January 1, 1978	84 dB(A)
On or After January 1, 1978	82 dB(A)

Health and Safety Code -- Sections 17922.6 and 17922.7, Noise Insulation Standards

These statutes require the Commission of Housing and Development to adopt regulations which establish uniform minimum noise insulation standards for hotels, motels, apartment houses, and dwellings other than detached, single-family dwellings. Counties must adopt the same or stricter standards. (This statute implemented by the Administrative Code, Title 25, Article 4,

Section 1092.)

Health and Safety Code -- Sections 24180 and 24181

These sections express concern over noise levels from proposed supersonic transports and prohibiting the landing or takeoff within the State of aircraft which produce noise in excess of the Federal certification limits for subsonic jet transport aircraft.

Health and Safety Code -- Sections 39800 through 39880, Noise Control Act of 1973

Establishes a State Office of Noise Control in the Department of Health, establishes its duties which include assistance to local agencies, coordination of State and Federal activities, research, and public information.

Motor Vehicle Code

Sections 23130 and 23130.5 establish maximum noise emission limits for the operation of all motor vehicle at any time under any conditions of grade, load, acceleration, or deceleration. These limits are as follows:

Section 27001 prohibits the use of horns except when reasonably necessary to ensure safe operation.

Section 27150 requires motor vehicles to be equipped with an adequate muffler to prevent excessive noise.

Section 27160 provides that new motor vehicles cannot be sold which produce a maximum noise exceeding the limits shown in the following table at a distance of 50 feet from the centerline of travel under test procedures established by the Highway Patrol Department.

(1) Any motorcycle manufactured before 1970..... 92 dB(A)

(2) Any motorcycle, other than a motor-driven cycle manufactured after 1969 and before 1973..... 88 dB(A)

(3) Any motorcycle, other than a motor-driven cycle manufactured after 1972 and before 1975..... 86 dB(A)

(4) Any motorcycle, other than a motor-driven cycle manufactured after 1974 and before 1978..... 80 dB(A)

(5) Any motorcycle, other than a motor-driven cycle manufactured after 1977 and before 1988..... 75 dB(A)

(6) Any motorcycle, other than a motor-driven cycle manufactured after 1987..... 70 dB(A)

(7) Any snowmobile manufactured after 1972..... 82 dB(A)

(8) Any motor vehicle with a gross vehicle weight rating of 6,000 lbs. or more manufactured after 1972, and before 1973..... 88 dB(A)

(9) Any motor vehicle with a gross vehicle weight rating of 6,000 lbs. or more manufactured after 1972, and before 1975..... 86 dB(A)

(10) Any motor vehicle with a gross vehicle weight rating of 6,000 lbs. or more manufactured after 1974, and before 1988..... 83 dB(A)

(11) Any motor vehicle with a gross vehicle weight rating of 6,000 lbs. or more manufactured after 1977, and before 1988.....80 dB(A)

(12) Any motor vehicle with a gross vehicle weight rating of 6,000 lbs. or more manufactured after 1987..... 70 dB(A)

(13) Any other motor vehicle manufactured after 1987, and before 1973..... 86 dB(A)

(14) Any other motor vehicle manufactured after 1972, and before 1975..... 84 dB(A)

(15) Any other motor vehicle manufactured after 1974, and before 1978..... 80 dB(A)

(16) Any other motor vehicle manufactured after 1977, and before 1988..... 75 dB(A)

(17) Any other motor vehicle manufactured after 1987..... 70 dB(A)

Section 38275 requires off-highway motor vehicles to be equipped with an adequate muffler to prevent excessive noise.

Section 38280 establishes maximum limits for the sale of new off-highway motor vehicles. These limits are:

Date of Manufacture	Noise Limit
On or After January 1, 1972 and Before January 1, 1973	92 dB(A)
On or After January 1, 1973 and Before January 1, 1974	88 dB(A)
On or after January 1, 1974	86 dB(A)

Public Resources Code

Sections 21000 through 21174, California Environmental Quality Act of 1970 (CEQA) establishes State policy to "Take all action necessary to provide the people of this State with ... freedom from excessive noise" (Section 21001(b), and requires and Environmental Impact Report (EIR) on any project which may have a significant effect on the environment. "Environment" by the definition of Section 21060.5 includes noise.

Public Utilities Code

Section 21662.5 prohibits construction of any heliport within 1,000 feet of a school without approval of the Division of Aeronautics. Section 21666 establishes the authority for the Division of Aeronautics to approve sites for all proposed non-military airports and issue operating permits for all existing and proposed non-military airports. Requires that the advantages to the public in selection of the site outweigh the disadvantages to the environment.

Section 21669 through 21669.4 directed the Division of Aeronautics to adopt noise standards governing the operation of aircraft and aircraft engines for airports operating under a valid State permit to the extent not prohibited by Federal law. The standards are to be based upon the level of noise acceptable to a reasonable person residing in the vicinity of the airport, and are subject to the following guidelines:

> Statewide uniformity in standards of acceptable aircraft noise need not be required, and the maximum amount of local control and enforcement shall be permitted.
>
> Due consideration must be given to the economic and technological feasibility of complying with the standards promulgated by the Division of Aeronautics.

For airports with a traffic volume of more than one million persons per year and which the County determines to have a noise problem, the noise level may not increase beyond that which existed at the date of such determination or beyond such reduced level of noise that may subsequently occur. (This Act implemented by Title 4, Chapter 9, Subchapter 6 of the California Administrative Code.)

Sections 21670 through 21676 create an Airport Land Use Commission in each county having at least one airport operated for the benefit of the general public and served by an air carrier certified by the State Public Utilities Commission or the Federal Civil Aeronautics Board. In San Diego, the County and the 13 cities have agreed to delegate this function to the Comprehensive Planning Organization. The duties of the Airport Land Use Commission include formulation of a comprehensive land use plan that will provide for the orderly growth of the airport and will safeguard the general welfare of inhabitants int he vicinity and the public in general. The plan must reflect the anticipated growth of the airport during at least the next 20 years and shall not be inconsistent with the State Master Airport Plan. A public agency proposing an action which is inconsistent with the plan may overrule the Commission by a four-fifths vote of its governing body. (Plans have been adopted for Palomar Airport and Gillespie Field in the unincorporated area of San Diego County.)

Streets and Highways Code

Section 216 requires the California Department of Transportation to measure the noise levels in classrooms, libraries, and multi-purpose rooms produced by the traffic on State freeways. If the noise level generated by freeway traffic exceeds the standard of 50 dB(A), the Division of Highways is given certain responsibilities for noise abatement in the affected rooms.

Section 75.7 requires a report on selection of the location for a State highway in which noise is one required consideration.

SAN DIEGO COUNTY CODE

Sections 36.401 through 36.443, Noise Abatement Control

The County's Noise Ordinance prescribes noise regulations for a wide variety of noise sources. Each source, by its nature, requires standards specific to it. The following standards, for fixed and non-stationary sources (Section 36.404), are of interest for this appendix (a violation occurs when the Sound Level Limit is exceeded by five decibels):

(a) Zone Ambient Noise Level Limits. "Noise level limit" or "sound level limit" referred to in this section shall mean that noise level limit as determined from the table below:

Zone	Time	Sound Level Limit (A-Weighted) Decibels
R-1, R-1-A	7 a.m. to 7 p.m.	50
E-1-A, R-1-B, R-1(15)	7 p.m. to 10 p.m.	45
LO, LO-A, T-Temporary, R-2 and R-2-A	10 p.m. to 7 a.m.	40
R-3, R-4, R-5, R-P, PRD	7 a.m. to 7 p.m.	60
and all other residential	7 p.m. to 10 p.m.	55
and estate zones	10 p.m. to 7 a.m.	50
All commercial zones	7 a.m. to 7 p.m.	60
	7 p.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	55
M, M-1, M-2	Anytime	70
M-3 and all other industrial and agricultural zones, including E-2-B	Anytime	75

If a measurement location is on a boundary between two zoning districts, the noise level limit for the zone from which the sound is emanating shall apply.

(b) Time Duration Correction Table. The time duration allowances set forth in the table below shall apply to those noise level limits set forth in subsection (a) above.

Allowances for sound levels lasting less than an hour:

Duration	Allowance Decibels
Up to 30 minutes per hour (50%)	+ 3
Up to 15 minutes per hour (25%)	+ 6
Up to 10 minutes per hour (16%)	+ 8
Up to 5 minutes per hour (8%)	+11
Up to 2 minutes per hour (3%)	+15

Permissible construction noise level limits shall be governed by Section 36.410 of this chapter.

APPENDIX B

ACOUSTICAL SCALES

Various quantitative noise rating scales exist to assess the impact of noise. The basic noise measuring scale is the A-weighted sound pressure level (decibels A) which approximates the frequency response of the human ear. The associated noise levels are widely correlated with degrees of community impact and individual effects. Five common scales use a modified A-weighted sound level as a base. These are the Ln, Leq, Ldn, CNEL and a methodology developed by the California Department of Transportation, Test Method Number California 701-A.

The statistical levels of Ln method describes the noise level which is exceeded for a stated percentage of time. For example, a common measure expressed by the statistical method will be L10 denoting the value of the noise level exceed 10% of the time. This method is used by the Federal Department of Transportation in establishing noise levels for existing and proposed highways.

The Equivalent Noise Level or Leq method is an average noise level based on the average energy content of sound rather than the average sound pressure level. It is the sound pressure level in decibels (A), which corresponds to the average energy of a sound propagating past a point during the average time period. This "energy mean" level differs from the arithmetic mean of sound pressure levels due to the mathematical definition of the decibel. The Equivalent Noise Level is thus not directly measured but is calculated from the sound pressure levels measured in decibels (A). This unit is the basis for both the Day/Night Average Sound Level and Community Noise Equivalent Level scales discussed below. The Equivalent Noise Level scale is used by the Environmental Protection Agency to identify noise levels associated with hearing loss; it is not used in San Diego.

The Day/Night Average Sound Level or Ldn scale measures the cumulative noise exposure in a community. It sums the hourly equivalent noise levels over a 24 hour time period with an increased weighting factor applied to the nighttime period. This scale defines day as 7:00 a.m. to 10:00 p.m. with a weighting factor of unity; night is defined as 10:00 p.m. to 7:00 a.m. with noise occurrences during this period weighted ten times as significant as daytime. This scale is used by the Environmental Protection Agency to measure yearly average equivalent sound levels identified as requisite to protect the public health and welfare with an adequate margin of safety. It is also used by that Agency to assess vehicular, railroad, and aircraft noise. It is also used by the Comprehensive Planning Organization in measuring transportation noise in San Diego.

The Community Noise Equivalent Level or CNEL scale is similar to the Day/Night Average Sound Level scale but weights by an additional factor of 3 the 7:00 -- 10:00 p.m. evening time period. This methodology is used for noise regulations at California airports; thus the San Diego Unified Port District and the County's Department of Transportation use this scale to monitor noise

at Lindbergh Field. (The Noise Element Subcommittee recommends that all County noise monitoring programs use this scale.)

The 701-A methodology used by the California Division of Highways for highway design is based on field measurement data on maximum A-weighted noise levels produced by diesel trucks. The noise contours resulting from this method present A-weighted decibel levels from truck operations versus distance from the roadway. This scale is one of several used by the State of California to assess highway noise.

APPENDIX C

GLOSSARY

AMBIENT NOISE -- The residual sound in the absence of specific identifiable noise sources.

COMMUNITY NOISE EQUIVALENT LEVEL (CNEL) -- This is the energy average noise level in dB(A) over a 24 hour period with a 5 decibel penalty assigned to evening noise (7 p.m. to 10 p.m.) and a 10 decibel penalty assigned to nighttime noise (10 p.m. to 7 a.m.). The California Airport Noise Standard used 65 CNEL as a criterion level.

COMPOSITE NOISE RATING (CNR) -- This is related in a constant fashion to the energy average noise level in PNdB over a 24 hour period with an approximate 12 decibel penalty assigned to nighttime noise. Substantial adverse impact is thought to being at about 100 CNR.

DAY/NIGHT AVERAGE NOISE LEVEL (Ldn) -- This is the energy average noise level in dB(A) over a 24 hour period with a 10 decibel penalty assigned to nighttime noise (12 p.m. to 7 a.m.). Substantial adverse impact is thought to begin about Ldn=65.

DECIBEL (dB) -- A unit measure of a sound pressure ratio. The reference sound pressure is 0.0002 dynes per square centimeter, the smallest sound a human can hear.

DECIBEL, A-WEIGHTED (dB(A)) -- The human ear cannot hear sounds of all pitches equally well. When modified by what is called an "A" weighting, the decibel (dB(A)) corresponds more closely to how people perceive noise.

DECILE NOISE LEVELS (L10, L50, L90) -- This is the noise level exceeded for a certain percentage of the time. For example, L10=70 dB(A) means that 10% of the time the noise level is above 70 dB(A). The Federal Highway Department uses L10=70 dB(A) during the noisiest hour as a criterion. The numerical value of L10 for the noisiest hour approximates the value of Ldn or CNEL for 24 hours.

EFFECTIVE PERCEIVED NOISE DECIBELS (EPNdB) -- This unit of sound level is similar to dB(A) in that it emphasizes sounds in the 1,000 to 4,000 cycles-per-second pitch range. It is much more complicated and expensive to measure and compute, however, requiring a detailed frequency analysis including corrections for pure tones and time duration. The same noise will measure about 13 decibels higher on the EPNdB scale than on the dB(A) scale.

FREQUENCY -- Number of complete oscillation cycles per unit of time. The unit of frequency often used is the hertz (Hz).

HEARING THRESHOLD LEVEL, HEARING LEVEL, HEARING LOSS -- For an impaired ear and for a specified signal, the amount in decibels by which the threshold sound pressure level for that ear exceeds a standard threshold of hearing.

HERTZ -- Unit of frequency equal to one cycle per second.

HOURLY NOISE LEVEL -- The average noise level during the hour. More specifically, for airborne sound it is the mean-square A-weighted sound pressure level over the hour. The unit is the decibel (dB).

LEVEL -- For communication and acoustics, the logarithm of the ratio of a given quantity to a reference quantity. The base of the logarithm, the reference quantity, and the kind of level must be indicated. The unit of the level, such as the decibel, serves to identify the base of the logarithm including any constant of proportionality.

LOUDNESS -- The intensive attribute of an auditory sensation, measured in sones. Calculated loudness of a sound is obtained by a stated empirical rule from the sound spectrum in octave or third-octave bands.

LOUDNESS LEVEL -- Of a sound, numerically equal to the sound pressure level of a 1 kHz, frontally-presented tone subjectively judged equally loud. The calculated loudness level of a sound is the weighted sound pressure level obtained by a stated empirical rule from the spectrum of the sound in octave or third-octave bands. The calculated loudness level is a predictor of the loudness level that would be judged in a psychophysical test. The unit of loudness level, judged or calculated, is the phon which is equal to the decibel.

NOISE EXPOSURE FORECAST (NEF) -- This is related in a constant manner to the energy average noise level in EPNdB over a 24 hour period with an approximate 1 decibel penalty assigned to nighttime noise (10 p.m. to 7 a.m.). Substantial adverse impact is thought to begin at about 100 NEF.

NOISINESS -- Subjective magnitude of a sound. Calculated noisiness of a sound, in noys, is obtained by a stated empirical rule from the sound spectrum in octave or third-octave bands.

NOY -- Unit of noisiness either judged or calculated. One noy is the judged noisiness caused by a frontally-presented octave band of pink noise centered on 1 kHz of 40 dB sound pressure level and duration 0.5 second.

OCTAVE -- Interval between two sounds whose frequency ration is 2:1.

PERCEIVED NOISE DECIBELS (PNdB) -- This is the same as EPNdB without the time duration or pure tone corrections.

SOUND LEVEL -- The quantity in decibels measured by a sound-level meter satisfying requirements of the American National Standard Specifications for Sound Level Meters S1.4-1971. Sound level is the frequency-weighted sound pressure level obtained with the standardized dynamic characteristic "fast" or "slow" and weighting A or C; unless indicated otherwise, the A-weighting is understood. The unit of any of the sound levels is the decibel. The A-weighting makes the sound-level meter relatively less sensitive to low-frequency sound, somewhat in the way the ear is progressively less

sensitive to sounds of frequency below kHz. The C-weighting gives the sound-level meter a constant sensitivity in the frequency range 32 to 8000 Hz.

SPEECH INTERFERENCE LEVEL -- For a sound that might interfere with understanding speech, the arithmetic mean of octave-band sound pressure levels, in decibels, centered on 500, 1000, and 2000 Hz. For many sounds it is seven decibels less than the sound level, A-weighted. Originally the speech interference level was the mean of the octave-band sound pressure levels in the 3 octaves from 600 to 4800 Hz. The presently-used bands are centered on preferred frequencies; hence the common usage preferred-frequency speech interference level.

APPENDIX D

SOUNDPROOFING TECHNOLOGY

Soundproofing reduces exterior or construction noise through various building construction techniques. A reasonable amount of noise reduction can be attained before costs become prohibitive.

Soundproofing techniques, however, are usually not applicable at the discretion of the designer or developer. Building codes require the selection of appropriate construction methods and materials that will match acoustical performance requirements.

Determining the actual noise reduction for a specific type of construction is simple; intruding noise, however, takes several paths, such as doors, windows, and walls. Soundproofing must account for each of these paths. Any building material or component through which noise passes produces a sound transmission loss. The sound transmission loss is an intrinsic property of the building material and is not the same as the noise reduction. Measurement of the transmission loss through a building material or component is generally obtained in a laboratory according to a specification standard.

The specification standard is known as a sound transmission class. It is a single number rating which provides an estimate of sound transmission loss performance of a wall or floor as related to airborne sound. The higher the number, the better the performance.

Sound transmission class ratings are applicable to all common building materials and types of construction. The weakest links in residential construction are doors and windows. For example, a typical exterior door has a sound transmission class of 20, as does a sliding glass single strength window. However, a simple wall with stucco on one side of wood studs and ½ inch gypsum board on the other has a class rating of 40. Table D-1 displays sound insulation factors, with normal California frame type residential construction, by building type and window conductor. Fortunately, the noise reduction is generally higher than the sound transmission class rating of the weakest part of a composite construction, since doors and windows generally occupy only a small fraction of the total wall area. Table D-2 displays the composite noise reduction for common building construction, assuming that no special acoustical insulation measures are utilized.

Several practical techniques are commonly used to improve the noise reduction of typical California light frame residential construction by 10 to 20 dB(A). These methods generally involve one or more of the following:

Utilization of heavy weatherstripped exterior doors.

Fixed, sealed double windows; forced air ventilation or air conditioning is required in rooms with sealed windows.

Elimination of baffling or openings through exterior walls, including

wall air conditioning units, mail slots, and attic and crawl spaces.

Adding materials to certain wall and ceiling surfaces, especially beamed ceilings where no attics exist.

TABLE D-1

SOUND INSULATION FACTORS BY BUILDING TYPE AND WINDOW CONDITIONS

BUILDING TYPE	WINDOW CONDITION	NOISE REDUCTION
All	Open	10 dB(A)
Light Frame	Ordinary Sash	
	Closed	20 dB(A)
	With Storm Windows	25 dB(A)
Masonry	Single Glazed	25 dB(A)
Masonry	Double Glazed	35 dB(A)

TABLE D-2

NOISE REDUCTION PROVIDED BY COMMON BUILDING CONSTRUCTION METHODS

Construction Type	Typical Occupancy	General Description	Range of Noise Reduction, dB(A)
1	Residential, Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Windows partially open.	15 - 20
2	Same as 1, above	Same as 1 above, but windows closed.	25 - 30
3	Commercial, Schools	Same as 1 above, but windows are fixed ¼ inch plate glass.	30 - 35
4	Commercial	Steel or concrete framing. Curtainwall or masonry exterior wall. Fixed ¼ inch plate glass windows.	30 - 40

The range depends upon the openness of the windows, the degree of seal and the window area involved.

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